Государственное образовательное учреждение
высшего профессионального образования
**«Томский государственный университет
систем управления и радиоэлектроники»**

ТЕМАТИЧЕСКИЙ РЕФЕРАТИВНЫЙ СБОРНИК № 18-2/2

“Radar Target Detection”
(«Обнаружение РЛ целей»)

Публикации в трудах конференций

Источник: *Digital Library IEEEXplore*
Язык: *английский*
Глубина поиска: *2006 – 2008 гг.*
Дата формирования: *март 2011 г.*
Составитель: *В.И. Карнышев*

Томск – 2011

"Adaptive spatial processing applied to a prototype passive covert radar: Test with real data"

This paper describes an upgrade of the design of a passive covert radar (PCR) [1] to add the capability of adaptively cancel the co-channel interference in the spatial domain. The PCR exploits a single non co-operative frequency modulated (FM) commercial radio station as its transmitter of opportunity. The system has been conceived in order to detect low flying and low radar cross section (RCS) targets even in disturbed and hostile electromagnetic environments. In the first phase of the PCR design, the co-channel interference has been removed via an adaptive algorithm operating in the time domain. In the second phase of the PCR development, it has been decided to improve the adaptive cancellation performance operating in two domains separately; first the adaptive spatial cancellation is applied to reduce the co-channel power which is definitely removed in a second stage via an adaptive temporal processing. Future step will be the contemporaneously process of data in a 2D domain via a STAP (space time adaptive processing) algorithm. [C906]

"Ground moving target detection using bistatic image feature-based space-time processing (BIFSTP) for airborne bistatic radars"

Bistatic image feature-based space-time processing (BIFSTP) is proposed for effective ground moving target detection for airborne bistatic radars. Moving target detection from ground clutter using BIFSTP is performed based on the separation of target and clutter and their different features in the Doppler-angle domain without the need for clutter estimation. The proposed algorithm is simulated for typical airborne bistatic radar operation geometries. [C907]

"Performance tradeoffs for multi-channel parametric adaptive radar algorithms"

Airborne radar systems employing radar sensor arrays utilize multi-channel (MC) signal processing techniques for optimal detection and localization of targets. The detection and localization statistics have mathematical structures that typically require evaluating the inverse of an estimated covariance matrix. Due to the size of sensor arrays and the number of pulses in a coherent processing interval (CPI), the dimension of the covariance arrays is very large (1000s); the computational burden of estimating and inverting such large arrays has led to the development of parametric methodologies that significantly reduce both the computational requirements and the amount of measured data to create the estimated inverse covariance matrix. This paper compares the relative merits, by using performance tradeoff plots of six different parametric algorithms when compared to the conventional sample matrix inversion (SMI) approach. [C908]

"The concept of a forward scattering micro-sensors radar network for situational awareness"

The concept of a novel forward scattering micro-radar wireless network for ground targets detection and recognition is presented. The system topology and structure are described first, followed by a summary of the systempsilas capabilities and applications. Signal processing strategies used for target detection, parameter estimation and automatic target recognition are briefly explained and supported with experimental results. [C909]

"Effect of integration time on detection performance of MTI and STAP algorithms in HF radar"

Surface wave over the horizon radar systems have a potential to detect targets falling far beyond optical horizon. Unfortunately, first and second order clutter scattered from the ocean surface, in combination with interferences, can prevent successful deployment of such systems. In this paper we compare different adaptive MTI and space-time adaptive processing algorithms applied to the surface wave high frequency radar system data. The aim of the experiments was to detect small targets (20-30 m long) at distances about 50 km. Radar system used in the experiments is an oceanographic, surface-wave, high-frequency system WERA, designed to perform continuous monitoring of sea currents and waves. System used in this research is located at the east coast of France, in Brittany. Main task of the system is to provide continuous, real-time information about currents and waves in the English (La Manche) Channel entry area, where heavy ship traffic is present. [C910]

"Mathematical and numerical modeling of moving inhomogeneous weakly ionized gas-plasma flows for determination of target scattered fields"

The electrodynamic models of scattered fields of moving inhomogeneous weakly ionized plasma media are based on the study of its gas dynamic and plasma physical properties. The solution of different radio physical (radar) problems requires the determination of the electron density distribution over jet volume. Such distributions have been obtained by the help of presented in this paper full and simplified analytical and numerical models of gas dynamical jet in air wake. It has been detected that these distributions are not connected with the gas density distribution and are determined by the temperature distribution. The developed model allows simulating the jet behaviour with high enough accuracy. The calculations of spatial electron density distribution in the wide range of flight velocities and power plant parameters and for different regimes of jet effluxes in ambient space were performed. [C911]

"Study on simulation of signal processing system of space surveillance radar"

This paper simply introduces the structure and working principles of one space surveillance radar simulation system, and analyzes the signal processing (SP) simulation system. In order to improve the radarpsilas ability to detect multiple targets and keep the false alarm probabilities constant, 2D-OS-CFAR and Clutter-Map CFAR are adopted as the algorithms of CFAR, and the detection threshold coefficient of OS-CFAR is studied and modified. Finally it gives the simulation results. The results show that the signal processing sub-system can detect the targets and their position, velocity exactly. And it can also satisfy the need of detecting far target, high measuring precision, the ability of detecting multi-targets and the false alarm probabilities in heavy clutter background. [C912]

"Signal-to-noise ratio analysis in satellite-airship bistatic space based radar"

For the special bistatic space based radar system which is composed of an illuminator on a geostationary satellite and a receiver on an airship, the analysis to the signal-to-noise ratio (SNR) is very important for the realization of detecting capability to moving targets. In this paper, based on the practical receiver platform coordinate frame and the spherical-earth assumption, the method of SNR calculation is first introduced, then the iso-SNR contours characteristics analysis for the special bistatic space based radar of operations for area surveillance are depicted in detail. It is shown that the changes in the iso-SNR contours are closely correlative with the special geometry configurations. The conclusions are acquired by comparing with those of monostatic and general bistatic space based radar. [C913]

"Controlling track coalescence with scaled Joint Probabilistic Data Association"

Track coalescence is undesirable when estimating the states of multiple manoeuvring targets, with a less-than-unity probability of detection, in clutter. Simple and compound forms of coalescence are defined and discussed. Simple coalescence is when two or more identical tracks follow a single target; compound coalescence is when two or more identical tracks follow the midpoint (or centroid) of two or more targets. It is shown that the incidence of compound track coalescence in joint probabilistic data association (JPDA) may be reduced using a scaling factor to favour the most likely association hypothesis. This prevents multiple hypothesis equivalence when tracking closely-spaced or crossing targets. The performance of the scaled JPDA (SJPDA) algorithm is compared with probabilistic data association (PDA) and JPDA using real and simulated data. Larger scaling factors decrease the likelihood and duration of compound track coalescence; however, they also increase the likelihood of track divergence on clutter or other targets. A value of unity corresponds to JPDA. The optimal value may be chosen to suit the application. A factor of two was found to give good results in the test data. [C914]

"Inverse methods for Refractivity From Clutter"

Predicting the radar coverage in low troposphere is a critical problem for detection of the low above sea flying or floating targets. To predict the radar coverage, the electromagnetic wave propagation can be modeled using parabolic wave equation resolution methods, but a description of the refractive index of the medium is required. Refractivity from clutter is a method to obtain this refractive index from the backscattered power received by the shipborne radar. An advantage of the method is that it does not require additional equipment. This paper presents a comparison of four inversion methods, whose two recent, in the refractivity from clutter purpose on ideal simulated data and shows the feasibility of a system using inversion methods based on pre-generated databases. [C915]

"Multiscan association as a single-commodity flow optimization problem"

Multiscan data association can significantly enhance tracking performance in critical radar surveillance scenarios involving multiple targets, low detection probability, high false alarm probability, evasive target maneuvers and finite radar resolution. Unfortunately, however, this approach is affected by the curse of dimensionality which hinders its real-time application for tracking problems with short scan periods and/or long association windows and/or many measurements. In this paper it is shown how the formulation of the multiscan association as a single commodity flow optimization problem allows a relaxation of the association problem which, on one hand, guarantees close-to-optimal association performance and, on the other hand, implies a significant reduction of the computational load. [C916]

"Integrated detection and tracking via closed-loop radar with spatial-domain matched illumination"

We develop a framework for closed-loop detection and tracking of targets. The framework is based on a Bayesian representation that assigns probabilities to potential realizations of the radar channel. In this case, different realizations are characterized by different number and locations of targets present. The Bayesian channel representation can then be used to customize a transmit illumination pattern. The probabilistic representation is updated based on received measurements and Kalman-based prediction of the states of possible targets. Simulation results from a trial experiment of the closed-loop system are provided. [C917]

"Research of radar automatic target recognition in practical high resolution range profile"

Radar target automatic recognition is a comprehension problem. We have researched the practical radar data and concluded some valuable viewpoint. With it we put forward a whole scheme to achieve radar automatic target recognition. First the OS CAFR and binary accumulation algorithm is taken to accurately detect target. Here we lower self-adapt threshold to get more targets which maybe be false target. Then we use target trace management to remove the illusion target. The novel algorithm, called as endpoint detection based on moving window, can get more valuable data to classification. For 3D target we must build more templets in classification. So we use Neural Net as classification algorithm to reduce memory space. The simulation results prove that this scheme can get better recognition results. [C918]

"Comparison of MHT and PDA track initiation performance"

The relative performance of multiple hypothesis tracking (MHT) and probabilistic data association (PDA) track initiation is investigated using simulated wide-area-surveillance radar data. The scenarios involve single targets that are low-observable (i.e. a low probability of target detection and a high probability of clutter detection) and non-manoeuvring. Divergent track counts and the receiver operating characteristics (ROCs) are determined and compared. The PDA implementation is extended to incorporate automatic track initiation using the concept of target visibility (PDAv). The MHT implementation uses a log likelihood track score to rank and prune hypotheses. A normalised overlap integral is used to eliminate duplicate hypotheses. The correlation between performance and the number of maximum number of retained MHT hypotheses was examined. A favourable linear performance/complexity relationship was observed. It was found that PDAv is more likely to suppress false tracks and to quickly confirm true tracks than MHT; however, the confirmed true PDAv tracks are more likely to be divergent. [C919]

"Signal processing techniques for maritime surveillance with skywave radar"

Detection and tracking of maritime targets using skywave radar is influenced by the propagation medium, interference environment and target scenario. Acquired data display distortion, fading, non-stationarity, and heterogeneity. Brief examples of data are given, then signal processing techniques are developed to provide robust adaptive Doppler processing, rejection of impulsive noise, improved CFAR using the Weibull distribution with robust two-parameter estimation, and a simple track-before-detect scheme for enhancing small SNR target detection performance. [C920]

"Robust detectors for targets of unknown correlation in clutter"

A multilayer perceptron (MLP) based detector is proposed for approximating the average likelihood ratio (ALR) detector in composite hypothesis-testing problems. The case of detecting colored gaussian targets with Gaussian autocorrelation function (ACF) and unknown one-lag correlation coefficient (rhos), in colored Gaussian interference with Gaussian ACF is considered. The robustness of the likelihood ratio (LR) detector for known rhosis studied, and and the ALR detector for rhosvarying uniformly in [0, 1] is formulated. Due to the complexity of the involved integral, neural network (NN) based solutions are proposed. NNs not only are capable of approximating the ALR detector, but the implemented approximation is expected to have lower computational

cost that other numerical approximations, a very important characteristic in real-time applications. MLPs of different sizes have been trained using a quasi-Newton algorithm to minimize the cross-entropy error. Results prove that MLPs with one hidden layer with 17 neurons can implement very robust detectors. [C921]

"Full digital High Frequency Surface Wave Radar: French trials in the biscay bay"

Assessment of actual detection capabilities obtained with high frequency surface wave radar (HFSWR) is a key issue for the global surveillance of the exclusive economic zone (EEZ). ONERA (The French Aerospace Lab) has just finished a ten month trial cycle of its new full digital HFSWR system. This system uses digital signal generation, digital receivers, high computational power workstations and low power transmitters. All results extracted from the trial database are compliant with the theory in particular concerning sea clutter and ionospheric clutter. Moreover, the detection of vessels up to 170 km and aircrafts up to 75 km (results obtained with cooperative targets and ground truth data) shows the over the horizon capabilities of the system. Finally, clutter reduction prospects are also presented. [C922]

"adaptive mitigation of spread clutter in high frequency surface-wave Radar"

High frequency surface-wave (HFSW) radars are cost-effective systems for maritime surveillance and sea-state mapping of ocean areas in the Exclusive Economic Zone (EEZ). The effective mitigation of disturbances, either from interference sources or unwanted radar echoes scattered from the ionosphere, is fundamental to ensure the successful operation of such systems. This paper addresses the mitigation of ldquoionospheric clutterrdquo spread in delay (i.e. range) and Doppler frequency by adaptive spatial filtering for the problem of target detection in surveillance applications. An alternative adaptive processing method that jointly exploits the spatial and temporal information of range-gated signals, over receivers and pulses, is proposed and applied to experimental data from an Australian HFSW radar. Target detection performance is compared against conventional and standard adaptive beamforming techniques. The author thanks the High Frequency Radar Branch of the Defence Science and Technology Organization (DSTO), Australia, for supporting this work and making the experimental data available. [C923]

"Denial jamming technique development against pulse-doppler radars using genetic algorithms"

Modern radar jammers offer great flexibility in programming jamming techniques. While this results in opportunities for producing more efficient jamming techniques, it also poses a challenge in terms of technique optimization. The increased flexibility results in a vast solution space of potential techniques. In this paper we demonstrate the applicability of using genetic algorithms for developing jamming techniques for advanced digital RF memory jammers against pulse-Doppler radars employing constant false alarm rate detection algorithms. Results against different types of radar processing and target dynamics are obtained through simulations and tested empirically in a lab-based radar-jammer experiment. [C924]

"In band interference to radar for swerling targets"

Recently, the International Telecommunication Union (ITU) has opened the access to radar frequency bands to other users. Widening of this access resulted in a review of the ITU recommendation and tightening of the requirements of protection criteria for radar performance in the presence of unintentional emissions. As a result ITU has recommended the maximum allowable level of interference to noise ratio of -10 dB, for maritime, radionavigation radars, and -6 dB for meteorological radars. In this paper, the effects of Gaussian and non-Gaussian interference on probability of detection were investigated. A series of theoretical calculations for various Swerling target models for Gaussian noise and non-Gaussian noise interference confirmed that the maximum levels of I/N allowed by the ITU recommendations cause the degradation of Pd=0.8 by 2.7% for Swerling V models. For other Swerling target models, the degradation is smaller than for Swerling V. These calculations confirmed that I/N levels recommended by ITU are sufficient to protect radars from unintentional interference. [C925]

"Target detection by passive coherent FM based bistatic radar"

Bistatic passive radars have many advantages over the monostatic ones because they are undetectable and silent. In passive coherent location, the original source of energy is derived from a waveform of opportunity in the environment and the re-radiated energy from the target is processed to decide about the existence of the target. More over bistatic radars receive forward scatters from target in place of the backscatters in monostatics systems. As a result of the larger forward scattered RCS, the stealth targets can be detected easier. Passive radar does not need any frequency allocation so are very attractive for surveillance. Multipath effects and direct path interference are two problems that should be solved. For accurate position measurement we used new ambiguity function processing and TDOA methods. This system by using terrestrial FM radio signals could detect

a civil plane about 210 Km away. [C926]

"A new adaptive displaced phase centre antenna processor"

Employing the principle of displaced phase centre antenna (DPCA) and the model of autoregressive (AR) processing, we construct an optimal adaptive DPCA processor for moving target detection in airborne phased array radar data collected under non-DPCA conditions. The proposed processor is fundamentally different from the existing ADPCA which is not optimal. The number of range samples needed to estimate its parameters is only approximately twice the number of antenna elements, significantly less than the number required by the conventional space-time adaptive processing (STAP) and other algorithms. Computationally it only requires 5-10% the cost of STAP. The processor has been tested using both simulated and measured airborne phased array radar data. With ample samples, its performance approaches optimum. In the case of a reduced number of samples, it considerably outperforms STAP and the other algorithms examined. [C927]

"Optimum two-pulse UWB detector for different target fluctuation models"

Single pulse UWB detectors do not have good performance as two-pulse or multi-pulse detectors. The more signals we use the better performance we have if we use optimum detectors. In this paper, we derive two-pulse optimum detectors for different target fluctuation models and extend them to multiple pulses. In each section of fluctuation model, suboptimum detectors are proposed to have good performance for targets with different number of bright points. [C928]

"Sensor scheduling for multiple target tracking and detection using passive measurements"

An algorithm for scheduling and control of passive sensors is proposed. This algorithm is based on a partially observed Markov decision process and an expected short- or long-term reward given by the sum of Renyi information divergences between Gaussian densities. This allows effective and efficient implementations and is demonstrated on simulations of situation scenarios of practical interest. The different situations scenarios are composed of multiple unmanned aerial vehicles (UAVs), equipped with passive radar sensors, and multiple unknown targets using active radars. The rewards, in terms of measurement information gains, are then maximized to achieve the objectives of scheduling different sensors and trajectory controls. [C929]

"Multi scan target tracking with finite resolution sensors"

Target tracking algorithms operate in an environment of uncertain measurement origin. Targets are randomly detected, and clutter measurements from unwanted random scatterers are present. A vast majority of target tracking algorithms have been developed with the assumption of infinite sensor resolution, where a measurement can have only one source. This assumption is not valid for real sensors, such as radars, where measurements from multiple sources may merge. This paper presents a multi-scan target tracking algorithm which removes this restriction. For each measurement the probability that this is a measurement formed by merging a clutter measurement with the target detection is calculated. The merging event creates new data association possibilities, and alters the track quality measure. Both a single target and a suboptimal multi target tracking algorithms are presented. A simulation study shows the benefits of this approach. [C930]

"Radar/AIS data fusion and SAR tasking for Maritime Surveillance"

Numerous national and multinational initiatives in maritime surveillance have been initiated, with the goal of having knowledge of all coastal and open-seas activities relevant to national security. As part of this effort, NATO is pursuing research activities to exploit existing multi-sensor systems in support of maritime surveillance. Multi-sensor fusion of data from maritime surveillance assets provides a consolidated surveillance picture for anomaly detection. This paper develops a model for multisensor fusion and Bayesian anomaly detection that quantifies the value of sensor data for maritime surveillance performance. An approach to satellite imagery tasking for optimal surveillance performance is also given. Simulation results corroborate our analysis. [C931]

"Object-level fusion and confidence management in a multi-sensor pedestrian tracking system"

This paper describes a multi-sensor fusion system dedicated to detect, recognize and track pedestrians. The fusion by tracking method is used to fuse asynchronous data provided by different sensors with complementary and supplementary fields of view. The confidence in detection and recognition is calculated based in geometric features and it is updated using the transferable belief model framework. The vehicle proprioceptive data are filtered by a separate Kalman filter and are used to estimate the relative and the absolute state of detected pedestrians. Results are shown with experimental data acquired in urban environment. [C932]

"Coherent Ka-band radar with a semiconductor transmitter for airport surface movement monitoring"

The paper outlines the operation principles, technical characteristics and the field tests results of the innovative Ka-band radar for airport surface monitoring. Advantages and disadvantages of operation in the Ka-band with respect to a shorter one, i.e. the W-band, are discussed. It is shown that in the Ka-band the coherent operation regime can be realized. This regime enables one not only to essentially reduce the radiation power to the level provided by the available semiconductor devices, but also to perform moving target detection on a interference created by reflections from surface objects and rain as well as to perform automatic classification of targets according to their radial velocity of movement. Main performance specifications, principle of operation, and design of the innovative antenna developed for the radar are described in details. The results of the field tests confirm the predicted radar operation characteristics. The radars of the proposed type can find use as radar-sensors for systems of airport surface monitoring. [C933]

"Evaluation of some features for extended target extraction in polarimetric radar"

Detection in most surveillance radars is based on the condition of point targets against a more or less homogeneous background. Currently, the resolution of many new types of radar is increasing, at least in the range dimension. Therefore many objects no longer can be considered as points. Also as a consequence, the background is getting more diverse, in statistical terms. The scene addressed in this paper concerns a ground clutter environment, and extended objects observed with a polarimetric radar with modestly high resolution (i.e. 6m resolving power in range). A staged approach is proposed to detection and parameter assessment of extended objects and adding classification based on polarimetric features. The evaluation of this approach is based on recordings of real natural scenes and artificially inserted extended objects. It has been observed that in the multi-stage detection the object classification benefits from several features, amongst which polarimetric ones. It is proposed that the quality of the contour circumscribing the object is the prime factor for quality of the features next to the polarimetric features. Clutter is affecting the edges of the contours, and therefore may have a major impact on features that are dependent on these contours. [C934]

"1090 MHz channel capacity improvement in the Air traffic control context"

This paper is focused on the 1090 MHz SSR channel capacity increase by innovative transmission and decoding techniques. A lot of Air traffic control systems use the 1090 MHz channel: SSR downlink (on-board transponders), ADS-B messages, TIS-B, FIS-B. We focus the attention on the MLAT (multilateration) system, useful to localize and identify transponder-equipped targets (aircraft and vehicles). Today multilateration receiver stations have omni-directional antennae, so considering the aircrafts traffic and including the extension of surveillance to cooperating vehicles, the reception of super-imposed signals is more and more probable especially in high traffic density airports. In this paper we show the problem mitigation introducing a technique proposed in the international patent, and the decoding techniques proposed in and. We analyze the channel capacity improvement, then exploit the detection and the TOA estimation of the frequency-shifted and separated signals, and finally the EUROCAE requirements compliance. [C935]

"An intelligent through-the-wall recognition system for homeland security"

The increasing demands for homeland security boost the development of an intelligent recognition system for through-the-wall sensing. A novel intelligent through-the-wall life recognition engine based on support vector machine (SVM) is provided herein. In this system, micro-Doppler signatures detected from through-the-wall radar are extracted and fed into a SVM classifier. Micro-Doppler effect has great potential for life recognition of human activities, nonhuman but vital subjects, and lifeless targets. Due to time-varying non-stationary characteristic of micro-Doppler feature and its high dimensionality, the SVM classifier is found effective in achieving both computation efficiency and accuracy for this application. Simulation results show that high classification performance is achieved using the proposed recognition system. [C936]

"Extrinsic calibration between a multi-layer lidar and a camera"

In this paper, we present a novel approach for solving the extrinsic calibration between a camera and a multi-layer laser range finder. Our approach is oriented for intelligent vehicle applications, where the separation distance between sensors frames are frequently very important. For this purpose, we use a circle-based calibration object because its geometry allows us to obtain not only an accurate estimation pose by taking advantage of the 3D multi-layer laser range finder perception but also a simultaneous estimation of the pose in the camera frame and the camera intrinsic parameters. These advantages simplify the calibration task in outdoor environments. The method determines the relative position of the sensors by estimating sets of

corresponded features and by solving the classical absolute orientation problem. The proposed method is evaluated by using different synthetics environments and real data. An error propagation analysis is made in order to estimate the calibration accuracy and the confidence intervals. Finally, we present a laser data projection into images to validate the consistency of the results. [C937]

"State dependent detection and object tracking"

Target tracking algorithms usually treat the probability of detection as a constant, independent of the target state. In most cases this is not true, one obvious example being the Doppler frequency based clutter rejection, the other is obfuscation (shadowing) of ground based targets. This dependency modulates the measurement likelihood, which in turn introduces measurement non-linearity. In this paper we first present a general algorithm for target tracking in clutter when the probability of detection is target state dependent, and then proceed to an algorithm where both target state estimate and the probability of detection are modeled as Gaussian Mixtures. Probability of target existence is recursively updated as the track quality measure used for false track discrimination. A two sensor based ground target tracking in clutter simulation validates this approach. [C938]

"An adaptive ground penetrating radar imaging system based on complex-valued self-organizing map-recent progress and experiments in Cambodia -"

This paper reports recent progress in an adaptive ground penetrating radar imaging system based on a complex-valued neural network (CVNN), i.e., a complex-valued self-organizing map (CSOM). In the CSOM processing, we deal with feature vectors that represent complex-amplitude texture in space and frequency domains. We developed a switched walled linearly tapered slot antenna (walled-LTSA) array for the front-end. A higher resolution results in a better classification quality. To realize a high resolution in range and azimuth directions, we utilize a wide frequency bandwidth in frequency stepping operation, and a special switching scheme for the walled LTSA. We conducted experiments in Cambodia. In this paper, we report successful plastic landmine visualization, not only for targets buried in normal sand but also for those in wet laterite soil at the Siem Reap test site. Adaptive coherent radar imaging is one of the most potential application fields of the CVNNs. [C939]

"Multistatic target tracking using specular cue initiation and directed data retrieval"

The effective fusion and tracking of multistatic active sonar contacts is challenging, due to high levels of false alarm clutter present on all sonar nodes. Exploiting the occurrence of high strength detections generated by the specular geometric condition, a cueing approach can be used to selectively extract further data stored locally on the individual sonar nodes for ingestion into the multi-sensor, multitarget tracker. This approach can significantly reduce the data rate at the input to the fusion/tracking algorithm, and reduce node-to-fusion-center communication link throughput requirements. This paper describes this concept, its associated multistatic tracking algorithm, and provides results obtained using simulated multistatic data from the Multistatic Tracking Working Group (MSTWG). The results show effective tracking performance using this approach, yielding a single high quality target track with zero false tracks. The method is shown to have excellent potential in reducing the overloading of the communication links, the automated tracking algorithm, and the operator. [C940]

"Estimation of the parameters of complex exponentials under radar land clutter and single snapshot observation using Modified Forward Backward Linear Prediction"

Estimation of the frequencies, amplitudes and phases of complex exponentials that model the targets present in radar data under additive white Gaussian noise and land clutter, is investigated stating Maximum Likelihood (ML) and employing spectrum estimation techniques. Use of Tufts & Kumaresanpsilas Modified Forward Backward Linear Prediction (M-FBLP) [D.W. Tufts and R. Kumaresan, 1982] in the defined problem, to the best of our knowledge, seems unpublished. The essential part of the work is that line spectra estimation techniques model the clutter process also as a complex exponential. To estimate the amplitudes and phases given the frequency estimates, two methods are employed and compared. Cramer-Rao bounds are also provided. It has been concluded that for the selected SNR range, M-FBLP shows better performance compared to others. In addition, it is stated that the optimum linear time invariant filter that can be placed before the M-FBLP deteriorates the operation. [C941]

"A W-band quasi-optical homodyne Doppler radar for detection of very slow-moving targets"

A simple homodyne, quasi-optical W-band (99 GHz) Doppler radar utilizing free-space optics to reduce the number of expensive mm-wave components was designed, assembled, and characterized. The system exploited the low 1/f noise and high responsivity of a zero-bias Schottky diode detector. Target velocity as slow as 1.3

mm/sec was measured with a resolution of 94 mum/sec and an detection time of 16 seconds. A SNR greater than 20 dB was measured, off a target with a radar cross section of 11.3 cm2at a 1 m range and a total source power of -10 dBm, and was also detected with a target power as low as -26 dBm. From our measurements, a 1/f noise-limited maximum range was found to be 3.6 m at a total power of -10 dBm. [C942]

"Ground Moving Target Tracking with context information and a refined sensor model"

For the detection of targets moving on ground, airborne ground moving target indicator (GMTI) radar is well-suited. In the tracking process, complex target dynamics, particularly stop and go maneuvers, and target masking due to Doppler blindness, often lead to track losses. By means of a refined sensor model it is possible to detect and handle such diverse target states. In addition, the generation of precise and continuous tracks from GMTI radar plots often is a demanding task due to terrain and technical obscuration and clutter. The exploitation of topographic background information such as road maps and terrain data is therefore highly desirable for the enhancement of track quality and track continuity. In the present paper these two aspects have been merged. The significant gain in track quality and track continuity is demonstrated in a number of simulation scenarios involving Doppler blindness and terrain obscuration. [C943]

"Analysis of ISAR images of a helicopter by a facet model"

A triangular facet model of targets is proposed to generate ISAR images. Targets are composed of solid objects which are modeled by triangular facets. It is shown that the facets have an equivalent point-scatterer whose radar cross section and position depend on the shape of the triangle, the frequency and the angle of incidence. It is developed a shadowing algorithm to detect the facets which actually have influence on the signal received by the radar. This model is applied to study the ISAR images of a helicopter with two different transmitted signals, a rectangular pulse waveform and a linear frequency modulated waveform to identify the main features of the ISAR images for future classification purposes. [C944]

"2D spatial model matching using HRR multi-radar data"

In this paper, the problem of target classification from multiple high range resolution (HRR) radars data is studied. The use of multi-sensor angle-diverse data aims at shortening of the required time before a decision is made, as compared to using single-sensor data. In order to avoid the high-dimensional HRR profile databases, involved in the classic automatic target recognition (ATR) approaches, the classification is based on 2D spatial target profile matching. Stochastic target modeling is further applied, as a more robust way to deal with more realistic target scattering behaviors at variant aspect angles. Raw video measurements are used, with the objective to circumvent problems due to missed detections and false alarms in the thresholded profiles. This paper proposes a new method, where the above elements are combined. Some first encouraging simulation results are given. [C945]

"UWB array-based radar imaging using modified Kirchhoff migration"

This paper presents a new modification of Kirchhoff migration algorithm for ultra-wideband (UWB) array-based radar imaging. The developed algorithm is evolved from traditional Kirchhoff migration which is based on the classical integral theorem of Helmholtz and Kirchhoff. The new algorithm is designed for array-based radar imaging with arbitrary multiple input multiple output (MIMO) configuration. The developed algorithm is compared with conventional diffraction stack migration using both synthetic data from numerical simulation and measurement data from landmine detection. The results have shown promising improvements in the aspects of beamwidth, side-lobe rejection ratio and the ability to reconstruct shapes of distributed targets. [C946]

"Sharpening of shadow edges in ultra high resolution SAR images"

In this paper, the equations describing the centroid location of target shadow and the terms which cause it to defocus are derived for images formed by spotlight SAR algorithm. Based on the derived equations, a shadow edge sharpening technique is proposed. The proposed technique is tested on real data and results show that it can sharpen and bring out even faintly visible shadow in ultra high resolution SAR images. [C947]

"Characterisation of low-PRF X-band sea-clutter doppler spectra"

Understanding the characteristics of the sea is critical in forming a picture of the sea-clutter as seen by a radar. Current research at the DSTO is interested in the properties of sea-clutter at medium grazing angles, over all azimuth directions, with full polarisation and differing weather conditions. This paper builds on previous work which studied the Doppler spectrum over all azimuth directions using the three component Walker scattering model. An improved model is presented here which includes the aliasing present in low pulse repetition

frequency (PRF) data collected using Ingara-the DSTOpsilas X-band synthetic aperture radar (SAR). This enables a large number of data sets to be analysed with differing grazing angles and weather conditions. The goal of this work is to characterise the sea-clutter and improve the fidelity of future analysis into the performance of medium grazing angle target detection algorithms in the maritime environment. [C948]

"Partial differential equation-based GPR signature discrimination for automatic detection of bridge deck delamination"

Accurate assessment of the quality of concrete bridge decks and identification of corrosion induced delamination leads to economic management of bridge decks. It has been demonstrated that ground penetrating radar (GPR) can be successfully used for such purposes. The growing demand on GPR has brought into the challenge of developing automatic processes necessary to produce a final accurate interpretation. However, there have been few publications targeting at automatic detection of bridge deck delamination from GPR data. This paper proposes a novel method using partial differential equations (PDEs) to detect rebar (or steel-bar) mat signatures of concrete bridges from GPR data so that the delamination within the bridge deck can be effectively located. The proposed algorithm was tested on both synthetic and real GPR data and the experimental results have demonstrated its accuracy and reliability, even for diminished contrast and low signal-to-noise ratio. [C949]

"Automated detection of moving person from small pulse battlefield radar"

The paper presents algorithm for automatic detection of moving person, utilizing signal from small pulse battlefield radar. The automation process presumes real signal analysis from radar coherent channel, signatures recognition for aimed specific group of targets, following signal preprocessing to enhance the most suitable expected signal parameters and reduce jamming compounds and final appropriate algorithm development with respect to specific application constrains. The analytic portion was realized on the real moving persons (equipped with corner reflector) measurement basis and further algorithm verification on real samples of moving persons. [C950]

"Multi-target UWB passive ranging with local template uncertainty"

Modified phase-only correlator (MPOC) has been proposed for high-resolution multi-target ranging. However, its performance has been found to be deteriorated by Ultra Wideband (UWB) pulse distortion in practical two-way ranging systems, where there are multiple passive reflectors. From experimental measurement, a new received signal model that accounts for the pulse distortion has been proposed, and an MPOC-based ranging algorithm that uses a parametric local template is presented accordingly. The new MPOC algorithm has a higher probability of correct detection of the reflectors. Moreover, it only requires one-time calibration for the local template, which is advantageous for practical applications. [C951]

"GLR approach for MIMO radar signal sampling in unknown clutter parameter"

Multiple-input multiple-output (MIMO) radar has been shown to provide enhanced performance in theory and practice. The MIMO radar is a type of multi-static radar, that uses multiple antennas at both the transmitter and receiver to improve the detection performance. In this paper, we propose a generalized likelihood ratio test (GLRT) for target detection by MIMO radar in unknown Gaussian clutter. We focus on MIMO radar with widely separated antennas. Mathematical results indicate that the number of receiver antennas should be more than the number of received signal samples in a pulse repetition interval (PRI); i.e, in each processing round, the number of secondary data set (from different antennas), should not be less than the number of the received signal samples in each antenna receiver. [C952]

"Insideness and collision detection algorithms"

Motivated by the need of ATC systems for insideness, intrusion and collision detection, a number of efficient algorithms were designed and implemented. For the determination of the insideness of points in polygons, a simple generalization of the commonly used zero winding and even-odd rules is presented, and, building thereupon, a point-in-polygon algorithm based on the binary addressing of quad-tree nodes and prefix hashing. Subsequently, an octree-based high-performance algorithm for the intersection of rays with polygonal meshes is presented. For all of the presented methods, tests and performance analyses were conducted that confirm the low theoretical runtime complexity. The methods are in practical use in the PHOENIX radar data processing system. [C953]

"Modification of IPCP for different target fluctuation models in UWB radars"

The most famous two-pulse UWB detector is inter-period correlator processing (IPCP). IPCP is not the optimum

detector when we have targets with different target fluctuation models. In this paper, we compare IPCP performance with a modified version which optimizes the 2ndstage detectors used after multiplier block for different target fluctuation models. For each model of fluctuation, suboptimum detectors are proposed to have good performance for targets with different number of bright points. [C954]

"A fundamental study of bistatic UWB radar for detection of buried objects"

We have developed a bistatic radar system for detection of buried objects. The targets include buried land mines, and explosive material in a wall. The system is composed of a fixed transmitting antenna and a small receiving antenna. The receiving antenna uses a passive optical electric field sensor. Due to its small size of the receiving sensor, the operation of the system is easy in various conditions. Then we propose an effective signal processing by F-K filtering. By suppressing the strong transmitting signal, we could obtain clear images of the buried objects. We think this radar system is useful in various security issues. [C955]

"Radar sensor management for detection and tracking"

Advancements in sensor technology provide new multi-sensor systems with increasing flexibility. The sensor management process aims to perform sensor actions that support the overall goal of the user of a multi-sensor system. Some sensors can support multiple functions. When the different sensor functions utilise shared resources then the sensor actions must be chosen as a compromise between competing actions. The problem of managing a multifunction electronically scanned array (ESA) radar is considered. The ESA radar is capable of performing surveillance (search) and tracking (revisit) functions. Two criteria are used to determine sensor actions with revisit actions based on the expected information gain and surveillance actions based on the probability of detection for previously undetected targets. The characteristics of the resulting sensor management policy are examined in an illustrative scenario. [C956]

"Delay-doppler ambiguity function of ultrawideband-throb signals"

The performance of ultrawideband (UWB) radar in target detection, resolution, and recognition depends on the structure of the radar waveform. In this paper, the principles of waveform diversity and design (WDD) for generating periodic and orthogonal UWB-impulse signals are described. A mathematical model for a UWB-throb signal that yields the practical advantages of the widely used linear frequency-modulation (FM) ldquochirprdquo signal is presented. The structure of the UWB-throb signal is designed based on a pulse-time modulation scheme. The delay-Doppler ambiguity function of the UWB-throb signal is derived for performance analysis. Computer plots of the UWB-throb signal, its autocorrelation function, and ambiguity function are generated to illustrate its characteristics and advantages for high-resolution impulse radar. [C957]

"Radar sea clutter suppression and target detection with α-β-γ filter"

Sea clutter refers to the radar returns from a patch of ocean surface. When a radar detects targets on or above the sea surface, it has to overcome the interference from sea echo itself. Sea clutter presents obviously non-Gaussian, non-stationary for many diverse factors, such as radar polarization mode, working frequency, antenna visual angle, sea state and wind direction, which limit the detection capability of radar. In this paper, we elaborate the production mechanism of sea clutter in detail and propose a new alpha-beta-gamma filter to suppress sea clutter and detect targets. In addition, the performance analysis and parameter choosing standard are given and the algorithm is proved to be effective with real data. [C958]

"RCB-based imaging method for 3-D target via curvilinear SAR"

The curvilinear synthetic aperture radar (SAR) is considered as a more practicable three-dimensional (3-D) SAR imaging system. Its received data, however, are the sparse data in 3-D frequency space. Therefore, the core problem in image formation is removing the influence of the severe high sidelobes on azimuth-height plane. Robust Capon beamforming (RCB) is a non-parametric adaptive method, which can dramatically suppress the sidelobes. In this paper, the curvilinear SAR data with same range frequency are regarded as snapshots. To eliminate the coupling between the range parameter and azimuth/height parameters, the point of interest is shifted to the zeros in the directions of azimuth and height by phase compensation. With these preparations, the RCB can be utilized to estimate the amplitude of the corresponding point. The image of 3-D target is obtained when all point in the scene have been estimated. Simulation results show that the proposed method can dramatically suppress the influence of sidelobes in curvilinear SAR image formation, and the more better 3-D target images are obtained. [C959]

"Coherent detection and ambiguity resolution for Frequency Diversity Separated Subarray Radar"

Radar system using separated subarrays can improve both angular accuracy and resolution at a reduced cost as well as easier transportation. However, the inherent ambiguities due to the existence of grating lobes deteriorate the performance greatly. Frequency diversity technique can be adopted to reduce the ambiguities. In this paper we have investigated the coherent detection and ambiguity resolution performance of the Frequency Diversity Separated Subarray Radar (FDSSR). We have introduced a structure that is suitable for spacial and temporal coherent processing. Based on this structure, one detector is developed for detection of target with unknown amplitude embedded in Additive White Gaussian Noise (AWGN) with known power using the generalized likelihood ratio test (GLRT). Performance of this detector has been evaluated analytically. The results show that the FDSSR with coherent processing obtains better performance compared with its counterpart using single frequency. [C960]

"Application research of keystone transform in weak high-speed target detection in low-PRF narrowband Chirp radar"

Because of the high speed and the long repeat interval of the radar, there would be serious echo envelope migration while using low-PRF narrowband chirp radar to detect weak high speed targets. The coherent integration method of envelope migration compensation based on keystone transform is studied, the problem of Doppler ambiguity is analyzed, and the influence on the coherent integration effect of Doppler ambiguity degree error and signal band width is simulated, which helps to determine the step of Doppler ambiguity degree search step. The algorithm is introduced and finally experiments on real data are made to testify the algorithm. The results of 128 echo pulses procession show that the SNR could be enhanced by 6 dB, which confirm the effectiveness of this method and improve the ability of weak high speed target detection. [C961]

"A new method for anti-noise FM interference"

Noise frequency modulated (NFM) interference causes a disaster to almost all types of radar systems. The echo signal and the interference are overlapped because of the strong energy of the NFM interference, and in the radar receiver system nothing could be detected except the interference. Up to now no good method against NFM has been declared, conventional methods are based on the passive radar to track the interference source. Here a new anti-noise FM method is proposed to suppress the NFM interference, the method multiply the echo signal two times by different reference signals, and results show that the method can eradicate NFM effectively which is useful for detecting and tracking the target. Whatpsilas more, in the presence of several interferences from different directions, the passive Radar can not track the interference source but the method supposed here can work well. [C962]

"A novel approach for clutter cancellation in HPRF stepped-frequency radar"

In this paper, a novel approach is proposed to canceling clutter in high pulse repetition frequency (HPRF) stepped-frequency radar by utilizing the Doppler spectrum diversity between target and clutter, via the DFT of the data within different bursts at a same carrier frequency. Both the signal processing steps and particular parameters design rules are brought forward in detail. The simulation results show, it is not subject to the product of pulse width and frequency step size. Even if the target is masked by the clutter in range profile, it also can obtain both high detection performance and fine high resolution range profile (HRRP) with lower SCR or SNR. [C963]

"A long-term coherent integration method of phase-coded pulse train"

In pulsed Doppler radar, the phase-coded signal is used to achieve high range resolution profiles. When the target radial velocity is high, linear range migration occurs. It results in the degradation of a long-term coherent integration. A novel coherent integration method of coherent phase-coded pulse train is proposed based on Keystone transform. In order to reduce the computation complexity, the FT-IFT (Fourier transform-inverse Fourier transform) algorithm is presented for the implementation of Keystone transform. By using the proposed method, the detection sensitivity of weak targets is improved. Some computer simulation results are presented which illustrate the effectivity of the method. [C964]

"Discrimination method to track before detect based on Dynamic Programming"

The TBD algorithm based on dynamic programming is an effective method for detecting dim target. But the DP process during the multi-frame integration causes the expansion of targets and strong noise which may produce a large amount of false targets. To reduce them, a new discrimination method which takes advantage of the feature of trajectory is proposed in this paper. The false alarm caused by noise reveals strong randomicity on its trajectory which is different from that caused by true target, and the new method based on the statistics of different level direction histogram can be used to reduce false targets caused by noise. Moreover a new

concatenated discrimination scheme of SDH+LEV is proposed. The simulation indicates that the discrimination method of SDH is good for reducing false alarms caused by noise and preserving real targets at the same time. The concatenated discrimination scheme can delete false alarms caused by noise effectively. [C965]

"A detector based on fractal for range extended targets"

This paper analyzes the statistical characteristic of clutter and that of signal plus clutter, and then a new detector of range extended target is proposed, which is based on box dimension of high resolution radar range profile. The box dimension is calculated as the detection statistic, and then is compared with the threshold. Finally, the detection performance of the proposed detector with different azimuths and in different clutter is analyzed. Experiment results show that the proposed method outperforms integrator in a certain azimuth, and its detection performance in non-Gaussian clutter is better than that in Gaussian clutter. In comparison with the energy accumulation method, the proposed method does not need to estimate the power level of the clutter and has strong applicability. It is also a CFAR detector. [C966]

"Automatic target recognition of aircrafts using translation invariant features and neural networks"

Automatic target recognition (ATR) of aircrafts using translation invariant features derived from high range resolution (HRR) profiles and multilayered neural network is presented in this paper. The HRR profile sequences are translation variant in the range resolution cell because of the non-cooperative target maneuvering. The differential power spectrum (DPS) is introduced to extract the translation invariant features. Several learning algorithms of feed-forward neural network are implemented to determine an optimal choice in the recognition phase. The range profiles are obtained using the two-dimensional backscatters distribution data of four different scaled aircraft models. Simulations are presented to evaluate the classification performance with the DPS based features and neural networks. The results show that this method is effective for the application of radar target recognition. [C967]

"Performance characterization of two adaptive range-spread target detectors for unwanted signal"

The adaptive detection of range-spread targets in non-Gaussian clutter is addressed. The clutter is modeled as spherically invariant random vector. After the sample covariance matrix based on secondary data, is inserted, in place of the true normalized covariance matrix, into the test, two adaptive detectors are derived, which are called as ANSDD-GLRT and ASDD-GLRT. The constant false alarm rate property for both detectors is proved. The experimental results show that the ANSDD-GLRT converges faster than the ASDD-GLRT, while the latter can reject the unwanted signal more effectively. [C968]

"An effective BSE-ST method for radar target detection in inhomogeneous clutter/interference environments"

This paper proposed a novel BSE-ST processing framework for improving the detection performance of radar array in inhomogeneous clutter/interference environments. We suggested BSE algorithm based linear prediction and the localized GLR algorithm for this framework. The results showed that the detection probability is close to 1 when the normalized Doppler frequency is more than plusmn0.1 Hz under SINR ges -10 dB. The detection performance of the proposed method is close to that of the joint-domain optimal processing in homogeneous clutter/interference environments at this SINR. The feasibility and the effectiveness of the proposed method are verified. [C969]

"Long-Term integration algorithm using the HPRF stepped frequency waveform"

A long-term integration algorithm using the HPRF stepped frequency waveform is presented to improve the range and Doppler resolution of moving targets. A stepped frequency radar signal is applied to realize high range resolution; a long-term integration is applied to realize high Doppler resolution. Besides, with the long-term integration, the gain from coherent integration can also be improved a lot, which is of great benefit to the detection of small targets. During this processing, a segment accumulation method is proposed to reduce the storage and computational requirements; a velocity compensation method based on the keystone transform is presented to overcome the image aliasing due to the coupling effects of moving targets; then a synthetic high resolution image generation method is introduced to synthesize an unambiguous range-Doppler image of moving targets. Finally the performance of this algorithm is demonstrated using simulated data as well as experimental results. [C970]

"New fast methods for moving target detection in non-cooperative bistatic pulse radar"

According to the characteristics of non-cooperative bistatic pulse radar systems and the issue that the Doppler

mismatched loss of the cross-correlation detection of moving targets is serious, two fast methods for joint time delay and Doppler shift estimation of moving targets, based on segment correlation-FFT processing and modified partial segment correlation-FFT processing, are proposed, after analyzing the common methods for cross-ambiguity function processing such as direct calculation, FFT, zoom-FFT method. The processing performance of direct calculation and partial segment correlation-FFT processing of LFM pulse-series is analyzed in theory and by simulation. And the simulation shows that the weak moving target can be detected effectively and the time delay and Doppler shift can be fast estimated by the methods presented in this paper. [C971]

"Application of Radial Symmetry for Caldera Detection"

For geoscientific applications, automatic shape-based feature detection offers a fast and non-subjective means of identifying geological structures within data. Most previously published examples of circular feature detection for geoscientific applications aimed to identify impact craters from optical or topographic data. Various techniques used include the Hough transform, template matching, and machine learning. This paper presents a circular feature detection technique based on the fast radial symmetry transform, which is applied to volcanic caldera detection using topographic data. The detection method combines the fast radial symmetry transform with high-level interpretation. Our system identifies areas with both elevated and depressed circular landforms using the radial symmetry measures and detects the size of the summit crater using an energy minimising spline. An experiment using data from Papua New Guinea demonstrated that the technique can accommodate calderas with variations such as incomplete rims. The technique used is capable of rapidly processing large datasets as an initial screening tool to assist a manual identification process. [C972]

"SAR image segmentation algorithms: Performance comparison and improvement proposals"

Several SAR image segmentation algorithms, also known as extended target detection algorithms are studied and the results are compared. The schemata obtained are evaluated using criteria based on the similarity with visual segmentation of the image, and the computational resources used in the process. Finally, based in the algorithms studied some supplementary techniques are proposed in order to improve the segmentation results or the computational cost. [C973]

"Moving target detection and velocity estimation using multiple subband DPCA and ATI method for triple-channel UWB SAR"

With long coherent processing time, the ATI method is suitable to detect moving targets with multi-channel UWB SAR system. However, the traditional ATI method will induce the blind velocity and the velocity ambiguity. Moreover, its detection performance will drop rapidly when the moving target signal is contaminated by the foliaged clutter. To overcome these shortcomings of traditional ATI method, this paper proposes a new multiple subband DPCA and ATI method for triple-channel UWB SAR. By applying a DPCA step before ATI, the introduced method can ldquosift outrdquo the interfering clutter from moving targetpsilas signal and alleviate the influence of clutter on the interfering phase. Moreover, the introduced method can detect moving targets without blind velocity and estimate their range velocities without ambiguity by combining the interferograms at different subband central frequencies. The validity of the proposed method is proved based on the experiments on UWB SAR real data. [C974]

"Optimization of power consumption using trespassers' favorite path and variable sensing range integrated sleep schedule in surveillance wireless sensor networks"

Coverage problems related to the wireless sensor networks are widely studied during the last few years. Generally, the coverage of the whole area is taken into account in those studies, giving the entire region the same importance. On the other hand, in the real life, some of the covered regions can be more important compared to other parts. In border surveillance applications, some paths are favored by intruders and it is important to keep these areas under constant surveillance. But keeping these points under constant surveillance means more energy consumption for these sensors and shorter lifetime. In order to solve these contradicting objectives, we introduce the minimum power maximum coverage sensor (MPMC) heuristic. Using MPMC, sensors adjust their ranges and construct clusters during operation to decrease the power consumption with minimum performance loss in coverage and detection. We also present simulation results which indicate the distinctive energy-coverage balance achieved by the proposed heuristic. [C975]

"Development of a microwave proximity sensor for industrial applications"

The paper presents the fundamentals, design, realization and characterization of a state-of-the-art microwave (muW) based proximity sensor (PS) for position detection of stationary or moving targets in industrial

applications. PS using popular sensing technologies (inductive, capacitive, magnetic, optical, ultrasonic, etc.) have a large utilization range in rugged industrial environments and are able to fulfill the tough specific requirements. On the other hand every version has specific weaknesses, which dramatically limit the application fields. Microwave technology is established in many sectors except for factory automation. In this study we describe an initial implementation of muW technology in an industrial PS for this field. The result represents an upgrade from the sensors based on the classical operating modes. The degree of novelty consists in the determination of the specifically addressed difficulties, new ideas and the description of the original solutions to adapt the muW technology to PS demands. [C976]

"Performance analysis of a minimum selected cell-averaging CFAR detection"

In this paper, a new cell-averaging constant false alarm rate (CA-CFAR) detector based on minimum selected cell in sub-reference windows (SRW) is proposed. It takes the minimum cells in sub-reference sliding windows for rejecting some strong interferences or alleviating the clutter-edge effect surrounding the test cell, and then it uses the general cell-averaging technique to detect the target. Under Swerling II target fluctuating model, the analytic expressions of PFA, PD and the average detection threshold (ADT) of the proposed CFAR detector are derived. By the performance comparison with other schemes through the simulation, it is found that the detection performance of minimum selected cell averaging (MSCA)-CFAR has a similar performance to that of OS-CFAR in nonhomogeneous background with strong interfering target. [C977]

"Method of stepped frequency signal processing based on fractional Fourier transform"

This paper proposes a method of the stepped frequency signal processing based on fractional Fourier transform. Conventional IDFT processing of stepped frequency signal without velocity compensation will cause high resolution range profile aberration, thus reduce the detection performance. As the echo wave of the moving target in Doppler dimension can be considered as chirp form, so high resolution range can be obtained by detecting and estimating the parameters of the chirp signal through fractional Fourier transform (FRFT). As a linear transform, the FRFT avoids the cross term interference while dealing with multi-component signals. The method based on FRFT does not need velocity compensation, furthermore it realize the combinational estimation of the high resolution range and velocity of the target. Fast algorithm of the FRFT is adopted in this paper, which makes the computations of the FRFT be comparable to that of FFT. Simulation results and experiments on real data show the efficiency and validity of the proposed method. [C978]

"Study on range window in HPRF Stepped Frequency radar system"

High pulse repetition frequency (HPRF) Stepped Frequency radar can achieve both unambiguous velocity and high resolution ranging in a single dwell, but it need the range window to detect the different interval. This paper presents the principle of range window for Stepped Frequency radars working in the mode of HPRF. The influence of range window on the high range resolution (HRR) profile is analyzed in detail and we have found that the range window may cause a coupling time shift in HRR profile of the target, which may lead to range aliasing. As a solution to this problem, several constraints on the system parameters are proposed. The effectiveness of the proposed method is verified by simulations. [C979]

"Transmitted beam optimization design for the satellite-airship bistatic space based radar system"

The special bistatic space based radar (BiSBR) system, which is composed of an illuminator on a geostationary satellite and a receiver on an airship, can be operated for area surveillance. It is anticipant for the realization of detection and tracking capabilities to moving targets that the high signal-to-noise ratio (SNR) is distributed uniformly in the theater area. In this paper, based on three coverage manners of transmitted beam for the theater area, an optimal transmitted beam design is proposed by comparison with the others. It is shown that the receiverpsilas elevation subbeams coverage in sequence according to different residence times is the optimal transmitted beam design for the special satellite-airship BiSBR system. The overall high SNR can be distributed uniformly in the theater area for the optimal transmitted beam design. The simulation results prove the validity of the conclusion. [C980]

"Geostationary orbital objects detection based on spaceborne radar imaging"

The geostationary orbit is the most significant orbit. Space objects in the orbit could be detected by imaging nearby using spaceborne inverse synthetic aperture radar (ISAR). Based on the analysis of RCS characteristic of geostationary orbital targets, the orbital altitude and revisiting period of space-based radar are designed in detail, so are the antennapsilas size. The relationship between imagepsilas resolutions of spaceborne ISAR and system parameters is discussed. Finally, the accumulated time according to appointed cross range resolution is proposed both in direct orbit and retrograde orbit. The research work is meaningful as a guide to engineering

realization. [C981]

"Research for scattering properties of spatial and frequency diversity MIMO radar targets"

In this paper, for the problem of spatial correlation and frequency correlation of targets echoes in receiving channels of diversity MIMO radar, based on two-dimensional scatter model in polar coordination system, correlation coefficient and independent condition of radar target echoes in spatial and frequency diversity receiving channels are developed, indicating that for round shaped scatter model targets with scatters intensity isotropic and i.i.d zero-mean distributed, its spatial correlation and frequency correlation are unified. Therefore in view point of target detection, spatial diversity technique and frequency technique in MIMO radar are equivalent. The correlation coefficient is rectified by numerical experiment. [C982]

"Moving target focusing and parameter estimation based on ROI of multi-channel UWB SAR images"

Image domain GMTI methods are very suitable for the multi-channel UWB SAR system. However, present image domain GMTI methods are mainly on the moving target detection and 1D range velocity estimation, but seldom refer to moving target focusing and 2D velocity/position parameter estimation. This paper proposes a new method for moving target focusing and parameter estimation based on the ROI of multi-channel UWB SAR images. As the consequent step after GMTD of image domain, the proposed method firstly focuses the moving target and estimates its relative velocity based on its ROI. Secondly, the method estimates the range velocity of the moving target based on its focused multi-channel images. Finally, the method estimates other parameters, including azimuth velocity, azimuth position and range position. The method has been proved to be valid based on multi-channel UWB SAR data. [C983]

"The representation of moving targets in multi-channel UWB SAR images and it's application in the generalization of image domain GMTI methods"

To generalize the image domain GMTI methods for slow moving targets to be suitable for detection fast moving targets with multi-channel ultra-wide band (UWB) SAR system, the representation of moving targets in multi-channel UWB SAR images is studied in this paper. By analyzing the local back projection (LBP) SAR imaging process for the moving target, this paper gives the analytic expressions of the moving target in the multi-channel UWB SAR images. Following the results, the image domain GMTI methods can be generalized to be suitable for fast moving targets that defocus in multi-channel UWB SAR images. This generalization is demonstrated via the ATI method. [C984]

"Doppler compensation for orthogonal netted radar systems"

Orthogonal netted radar systems (ONRS) can fundamentally improve radar performance by using a group of specially designed orthogonal polyphase code signals. However, the existing numerical solutions only address autocorrelation and cross-correlation properties with the result that the signals degrade severely in the presence of small Doppler shifts. In the context of these problems, a new hybrid polyphase code set which combines single frequency pulse with the designed orthogonal polyphase signal, is presented to implement Doppler compensation and keep ONRS a good resilience to Doppler shifts. Doppler frequency of the target is firstly estimated based on interpolated FFT in the time span of single frequency pulse and the Doppler compensated signal can be constructed to maintain Doppler tolerance. The construction of Doppler compensated signals is illustrated. Simulation results show that the proposed hybrid polyphase code set is effective for moving target detection in ONRS. [C985]

"Control and signal processing system of hyperspectral FLS LiDAR"

The paper is addressed at the developing of the real-time control and data acquisition system for the FLSreg-series hyperspectral LiDAR, The FLSregstands for Fluorescent Light Detection And Ranging (LiDAR)System aimed at pollution monitoring of terrestrial, river, lake and marine targets, oil pipeline leak detection and oil exploration. Real-Time operation with the FLSregLiDAR generates immense amount of data received, transmitted and handled synchronously with other processes of LiDAR control and communication with peripheral devices.The paper describes the structure of control and signal processing systems of the FLSreg, split and optimization of its data streams, and defines the directions of further developments. [C986]

"Empirical Study on Ultra-Wideband Vehicle Radar"

High range-resolution radar using ultra wideband radio attracts considerable attention as a short range automotive radar. Radar echo from a target often contains unwanted echoes called as clutter, which make it

difficult to detect the target. In order to suppress the clutter, therefore, it is important to investigate the clutter distribution and to develop the clutter model. In this paper, traffic road clutter is measured and characterized for various bandwidths from 10 MHz to 5 GHz. It is also quantitatively compared with the model of log-normal, Weibull and log-Weibull. [C987]

"Tracking algorithm using N-back scan MHT under dense environments"

MHT(multiple hypothesis tracking) is well-known tracking algorithm for its association performance in dense environments. In the MHT, hypotheses are reduced by calculating probability and upper hypotheses are selected in a usual way to reduce computational burden. In the field of visual tracking, the N-back is applied as hypothesis reduction method and its efficiency is verified. The method maintains all hypotheses in recent N scans and selects the best hypothesis in past over N-scan, for hypotheses reduction. We apply the method to radar tracking and evaluate its performance, through Monte Carlo simulation of track maintenance for a low observable target. From the result of simulation, we have confirmed that N-back scan MHT shows better performance than conventional MHT. For example, the former has shown 30 point improvement with respect to tracking success rate for tracking a maneuvering target than latter. [C988]

"A Novel Approach Research on Low Altitude Passive Acoustic Target Recognition Based on ICA and HMM"

An approach is proposed to classifying simultaneous multiple low altitude targets in battlefield. Based on Independent Component Analysis (ICA), the mixed signal is separated into several single and pure signals, and the noise is removed from the acoustic signal. mel-frequency cepstrum coefficients (MFCC) which responses the characteristic of the sound more aggressively is extracted as characteristic parameters in the system. For the hidden Markov models (HMM), in order to work better performance in representing the time-variant signal, the HMM are employed to simulate the model change of the sound signals as the with time going. K-means algorithm is used as clustering MFCC to produce training and identifying eigenvector. Simulation results indicate that this approach's is effective in target recognition. [C989]

"Inverse Synthetic Aperture Radar imaging at 580 GHz"

We have demonstrated sub-centimeter resolution inverse synthetic aperture radar (ISAR) imaging using a 580 GHz, frequency modulated continuous wave (FMCW) radar. This ISAR technique uses pulse compression possible with the FMCW waveform to achieve resolution in range, and exploits rotation of the target to achieve resolution in cross-range. The technique relies on the illumination of the entire target rather than scanning with a narrow beam, which permits larger ranges or smaller apertures than real-aperture approaches. The data collection time required for an ISAR image is less than the collection time with a mechanically scanned beam, which is an advantage in highly dynamic scenarios. The ISAR algorithms presented here accommodate radial motion of the target and non-uniform rotation rates. Thus, the algorithms are suitable for applications where the target motion is not under the control of the observer. These algorithms enhance submillimeter-wave radar technology for surveillance and concealed-object detection. [C990]

"A whole scheme for aircraft target identification in HRRP"

This paper describes the authorspsila efforts in practical high resolution range profile target automatic recognition. The practical high resolution range profile has more difference to simulation results, so this paper presents a novel algorithm to detect and extract the target range profile data and also create a whole scheme to deal with this difference. First it takes OS CAFR and binary accumulation algorithm to detect target. Here we lower self-adapt threshold to get more targets which maybe be false target. Then we use target trace management to remove the illusion target The novel algorithm, called as endpoint detection based on moving window, can get more valuable data to classification. Practical data has more noise and low PSN, so K-mean algorithm can remove the bad data. Due to variation of target high resolution range profile we build a suffice sample set, which require us to use PCA algorithm to reduce the computer time and memory. Classification is N near classifier, which can get a nonlinear classification effect. The test results prove that this scheme can get better recognition results. [C991]

"Cooperative control of multiple Electronic Combat Air Vehicles for electronic attack"

This paper presents a cooperative control scheme for electronic attack of multiple electronic combat air vehicles (ECAVs). The stealthy ECAVs equipped with ECM can deceive the radar by using range delay deception technique. This makes the radar to detect a fake target called phantom beyond the ECAV location. The important feature of generating phantom track is kinematic and dynamic constraints. These constraints restrict the freedom of Phantom tracks. This paper presents three-dimensional mathematical relationships between the

motion of the ECAV and the motion of the phantom. Based on the mathematical model, the trajectory generation problem is formulated as an optimal control problem. The control input parameterization converts the optimal control problem into the parameter optimization problem with inequality constraints. This problem is solved by using the sequential quadratic programming method. The numerical result for the optimal phantom trajectory generation is presented. [C992]

"Maritime UWB forward scattering radar network: Initial study"

A scenario for an ultra-wideband (UWB) forward scattering radar (FSR) network for detection of low radar cross section (RCS) maritime surface targets is suggested. A chain of buoys equipped with transceivers which forms a FSR for target detection is considered. In this paper, the first stage of the study is described and major aspects of future work are discussed. It was shown that the high level of surface clutters related to FSR might be reduced by utilisation of UWB technology. As a preliminary further investigation, a numerical simulation of the 3-D RCS for comprehensive models of small maritime targets is obtained and comparisons with simplified target models are made. [C993]

"Low power High Frequency Surface Wave Radar application for ship detection and tracking"

High-frequency (HF) radars are operated in the 3-30 MHz frequency band and are known to cover ranges up to some thousand kilometers. Sky wave over-the-horizon radars (OTHR) utilize reflection by the ionosphere, but they require a transmit power up to 100 kilowatts. Especially for oceanographic applications, low power high frequency surface wave radar (HFSWR) systems have been developed, which use ground wave propagation along the salty ocean surface. The WERA HF radar system transmits a power as low as 30 watts, but achieves detection ranges up to 200 kilometers, which are far beyond the conventional microwave radar coverage. Due to external noise, radio frequency interference, and different kinds of clutter, special techniques for target detection have to be applied. This paper describes a new signal processing approach based on a curvilinear regression analysis for thresholding combined with a constant false-alarm-rate (CFAR) algorithm for detection. The target locations detected by the HF radar are passed to a tracking filter utilizing range, azimuth, as well as radial and azimuthal velocities to track the ship locations. For a 12-hour period real HF radar data from the WERA system were processed and secondary ship locations were recorded from the automatic identification system (AIS). This data set is used to assess the performance of the HF radar detections. Comparisons have been made for a maximum distance of 5 km between AIS and radar detected locations. The deviation between AIS and radar detected locations was below 1 kilometer in 77% of these comparisons. A number of ships was detected and tracked by the radar, but could not be used for comparisons due to the lack of AIS information. [C994]

"Small-target detection in sea clutter based on the Radon Transform"

Small target detection in sea clutter is a challenging problem. This paper presents a novel and heuristic approach based on the application of the Radon Transform to a set of consecutive range profiles. The performance of the detection technique has been tested with real sea clutter data, acquired with a high resolution CWLFM (continuous wave linear frequency modulated) millimetre-wave radar demonstrator. Results show that performing the detection on the Radon domain makes the detection of very small targets possible while keeping the false alarm rate controlled. [C995]

"Occlusion Handling for Object Tracking Using a Fast Level Set Method"

Tracking objects in image sequences is a difficult problem because of the frequent occlusions encountered among the objects and people. In this paper, a method for tracking objects through occlusions based on a level set technique, is presented. Two ca.ses are considered: 1-the object is obstructed by another one of a different color. 2-the object is obstructed by another one of the same color.In the first case, the classical algorithms based on active contours fail to track the object's contour because the curve disappears from the scene. In this proposal, occlusion is detected and the solution is based on keeping the curve in the same place until the object of interest appears in the scene again.In the second case, the classic algorithms based on active contours do not distinguish between two image objects of the same color, so due to the possible changes in the topology, the curve fits the edge of both objects and it is divided. We solve this problem by means of localizing the centroid of the curve.The experimental results show that these methods significantly improve the tracking with occlusions. [C996]

"Sea target detection using passive DVB-T based radar"

This paper presents a new approach to passively detect targets using noise-like emitters of opportunity. This method combines Wiener filtering to improve clutter rejection and an adapted direct data domain (D3) method. This theoretical approach is confirmed by the detection of a boat by a bistatic radar using a digital video

broadcasting terrestrial (DVB-T) transmitter. [C997]

"DAB based passive radar: Performance calculations and trials"

This paper investigates the potential performance of an experimental passive bistatic radar that uses target illuminations by digital audio broadcasts. The work predicts that the current system has the potential to detect targets at distances of over 30 km and this has been verified by an experimental campaign using the radar. Possibilities for improvement of the system are identified. [C998]

"PaRaDe-PAssive RAdar DEmonstrator family development at Warsaw University of Technology"

The paper presents a family of passive coherent location (PCL) radar demonstrators, called PaRaDe (passive radar demonstrator), which were developed at Warsaw University of Technology. The systems exploit commercial FM radio transmitters as illuminators of opportunity in order to detect and track airborne targets. In the paper, the details of demonstrator systems are described and the results obtained in tests are presented. [C999]

"Target Detecting Based on Improved WVD-HT for Radio Frequency Interference to UWB-SAR"

Ultra-wideband synthetic aperture radar is interfered by ground clutter and artificial jamming. In many cases the targetpsilas scatter signal can be approximated as linear frequency modulated signals. Time-frequency Distribution, such as Winger-Ville distribution, provides a direct and effective analysis method of the time-frequency structures of linear frequency modulated signals. Meanwhile, the cross terms of the Winger-Ville distribution can be smoothed through the smoothed pseudo Winger-Ville distribution. Combine Hough transform the time-frequency concentration is improved and better precision of parameter estimation will be obtained. Target detecting and parameter estimation by the smoothed pseudo Winger-Ville distribution and Hough transform for frequency-modulated jamming are simulated in this paper. The method proved to be efficient for target detecting and parameter estimation of ultra-wideband synthetic aperture radar. [C1000]

"Target Detection Based on Sea Clutter Model Using Neural Network"

A novel method to detect small target embedded in sea clutter is presented for high frequency (HF) radar. The method is rooted in different characters between instantaneous radial velocity of sea current and moving target, and relies on the neural network for its implementation. By estimating the instantaneous velocity of sea current and target, we find that a spatial nonlinear model rather than deterministic chaos model is more appropriate to describe the relationship among radial velocities of neighbor sea areas. Then we built a neural network model to approach to a predictor for sea clutter. So an incoming target will be detected for its more predicted error than a certain threshold. The method performs well on ocean echo data acquired by the HF radar system OSMAR2003. [C1001]

"Feature Extraction and Recognition Based on SVM"

As a mature detection technique, ground penetrating radar (GPR) is applied into many fields. The GPR signal explanation and recognition is so important that it affects the result reliability and accuracy of the detection. The support vector machines can obtain the overall optimal solution in sample less situations. It has solved the inevitable partial minimum problem and overcome the disadvantage, which the traditional neural network cannot avoid. In this paper the GPR signal explanation model is established based on the support vector machine and the dyadic wavelet transform (DyWT) theory. It is applied in the counterfort of railway disease detection. The experiment result proved the method is valid, and it can enhance GPR explanation precision and efficiency. The recognition ratio can reach 91.2%. [C1002]

"Hardware realization of a novel Automatic Censored Cell Averaging CFAR detection algorithm using FPGA"

In this paper we present hardware realization of a novel Automatic Censored Cell Averaging (ACCA) Constant False Alarm Rate (CFAR) detection algorithm based on Ordered Data Variability (ODV) using Field Programmable Gate Array (FPGA). This algorithm has been recently proposed in the literature for radar target detection in non-homogeneous environments. The unknown background level can be estimated by dynamically selecting a suitable set of ranked reference window cells and by doing successive hypothesis tests. The ACCA-ODV based CFAR detector does not require any prior information about the background environment and uses the variability index statistic as a shape parameter to reject or accept the ordered cells under investigation. Recent advancements in modern FPGAs and availability of sophisticated electronic design tools have made it possible to realize the ACCA-ODV CFAR detector in a cost-effective way. The designed hardware is modular

and has been physically realized in Altera Stratix II FPGA device. [C1003]

"Multiple data association and tracking using millimeter wave radar"

In this paper, in order to support convenience and safety to drivers, we track out the moving vehicle. A target makes several sensor measurements and we have to cluster these several measurements. In order to cluster multiple sensor measurements, we use geometric information of sensor measurements. 24 GHz millimeter wave sensor is used in our proposed method. Real world experiments show the superiority our proposed method. [C1004]

"Bird flying track estimation based on single marine radar"

Avian radar surveillance system used to monitor bird movements can effectively prevent bird strikes. Due to most airport companies' demand of low-cost avian radar detection, here an avian radar system based on single marine radar is developed by tilting the antenna part. Meanwhile a scheme for bird flying track estimation is presented, using linear neutral regression method to extract three-dimensional (3D) information of birds. The method is verified by Monte-Carlo simulation and experimental results. [C1005]

"New Tracking Filter for Single Observer Passive Location and Tracking System"

With a set of merits such as self-hiding, far-distance detection, and easy deployment, the Single Observer Passive Location and Tracking (SOPLAT) system has broad applications in various areas. Owing to the serious nonlinear problems of SOPLAT, the traditional Extended Kalman Filter (EKF) is unfit for it. A new tracking filter for the highly non-linear SOPLAT system is proposed in this paper. The proposed filter uses the particle filter to locate the emitter, and then uses the EKF (Extended Kalman Filter) to track the emitter. By using this method, the convergence speed and the precision of the tracking filter can be improved, as well as the stability of the filter. And the computational cost is not out of the system ability. Experimental results indicate that the new filter has better convergence speed, tracking precision and other performances than EKF in SOPLAT. [C1006]

"Calculation of the frequency-shifted signal parameter based on the polynomial phase model"

In this paper, a polynomial model was used to describe the phase of a frequency-shifted signal and the harmonic wavelet. The sine function was applied to the signal as a window function. The coefficient of the modified harmonic wavelet transform was used as a target function. We use the anneal-simulation arithmetic in finding the global maximum value of the target function. Then the parameter of the signal, including the initial phase and different orders of the phase changing rate, such as the frequency, the first order of the frequency-changing rate, and higher order of the frequency-changing rate, can be calculated. Even when noise exists, the main parts of the changing-rate of the signal phase can be got precisely. Applying this method on short signal, we can expect much better resolution than ordinary arithmetic based on FFT. [C1007]

"The CLEAN type algorithms for radar signal processing"

A new class of signal processing algorithm based on CLEAN methods primary introduced in radio-astronomy is presented in the paper. The classical radar signal processing is based on match filtering concept, which is optimal in mean square sense in case, when single target echo is detected against white or colour Gaussian noise. Such approach was effective when pulse radar have been widely used. The introduction of pulse-compression technique changes significantly the signal model, but still the match filter have been widely. The introduction of continuous wave radars, and especially noise and passive radars changed dramatically the situation. In such radars all echoes are superimposed and interfere with each other and the simple model no longer fits to that case. The straightforward solution-use of inverse problem mathematical solutions such as solving the set of nonlinear equations to find all echoes in received signal-is usually computationally ineffective and often numerically not stable, so suboptimal methods are being developed to improve detections of weak signals in CW radars. One of possible solution is to use concept of CLEAN technique an remove all strong echoes from received signal. When only weak signals and white noise remains in is possible to use matched filter concept without significant loses of radar sensitivity. In the paper several techniques for radar signal processing utilizing CLEAN concept are shown. [C1008]

"Availability analysis of the multilateration surveillance system in Kiev (Boryspil) airport"

In this paper application of multilateration (MLAT) systems for vehicles localisation is considered. Deployments of such system require special algorithms to be developed and implemented. Analysis of multilateration system deployment is done for Boryspil airport in Kiev, Ukraine. With the help of calculation algorithms, different cases of target position inside the airport area are considered and brief analysis of detection is done. The simulation

scheme is developed in order to obtain maximum accuracy of target localization. [C1009]

"AIS Information Decoding and Fuzzy Fusion Processing with Marine Radar"

Both AIS (automatic identification system) and radar are the equipment to aid navigation for a ship at sea. It is very important to fuse the target's information from the two sensors so as to get mutual benefits. After AIS system was briefly described, the data format and the conversion of the encapsulated data from AIS output interface was discussed. The method of decoding was studied. A research was emphasized on an association judgment for the targets from the two sensors by adopting multi-factor fuzzy integration decision-making, utilizing the information of the target's distance, bearing, velocity and course. The mergence of the tracks was conducted with weighted-statistics method. The results of the simulation showed that the fusion methods are correct and effective. At last, the relation of the association probability with the association threshold was discussed and imitated. [C1010]

"Time Frequency Representations for Classification of Landmine Using UWB Impulse GPR"

In this paper, Time Frequency Representations (TFRs) for classification of landmine using Ultra Wideband (UWB) impulse Ground Penetrating Radar (GPR) is presented. GPR signal is composed of three parts: ground bounce, clutter and target echo signal, the target signal is seriously deteriorated by ground bounce and clutter. To extract intricate structures of target signal, wavelet packet transforms (WPT)-based algorithm is used to ground bounce removal and clutter reduction. Then the Fisher Dsicriminant Ratio (FDR) for feature subset selection method is used to select the suboptimal feature subset of target signal, thereby a Learning Vector Quantization (LVQ) classifier is designed. Experimental results based on GPR measured data are presented, showing that the feasibility and advantage of the presented algorithm. [C1011]

"A computational Model for bats' echolocation based on mammalian auditory system"

Bats can easily pick up an individual prey among multiple targets by using the echoes of the emission that overlapped in time. So far, the process produced by the batspsila echolocation system is not completely understood. A computational Model for batspsila echolocation based on mammalian auditory system is proposed and analyzed in this work. This model is a description for the signal processing mechanism that may play a role in batspsila echolocation system. In this model, a cochlear filter bank is used to divide an FM emission and the echoes into several bands. Then a half-wave rectification and a low-pass filter were added to each path just like what have been done in the mammalian inner hair cell (IHC). The smoothed envelope at the output of the low-pass filter is used to trigger event by pick-detection mechanism. Then an integration processing is taken out among band-pass filter channels to improve the precision of the echolocation. At the end of the model a cross-correlation function is presented to play the coincidence-detection cellpsilas role in the mammalian auditory system. Bats can detect distances of the targets from the output of the cross-correlation module. Simulation results imply that this model can distinguish two glints with highly overlapped echoes and get accurate ranges for each target in noisy environments. [C1012]

"Signal processing for through wall moving target tracking by M-sequence UWB radar"

In this paper, through wall moving target tracking by UWB radar is described as a complex process with all required phases of radar signal processing. For particular phases of that process, i.e. for raw radar data preprocessing, background subtraction, detection, trace estimation, localization and tracking itself, the phase significance and its corresponding representative methods are outlined. The complete process is illustrated by the results of processing of real data acquired by M-sequence UWB radar. [C1013]

"Study on the detection of coating stealth ground target by millimeter-wave radiometer"

The demand to detect coating stealth targets has presented serious challenges to the design of conventional detectors illuminating targets with electromagnetic waves, since the objective of the coating stealth technology is to reduce the radar cross section (RCS) of targets by absorbing the incident energy and reducing the reflected energy. The research of detecting coating stealth metal target on the ground by means of millimeter-wave (MMW) radiometer is carried out in this paper. The methodology is described in detail based on both the analysis to the operation principles of radiometer and the interpretation to radiation characteristics of coating stealth metal target which is under various conditions. And at the same time, some theoretical results are also given. Furthermore, a series of simulative detection experiments are conducted on the basis of the fabrication of a total-power radiometer operating at 3 mm band. Ultimately, the experiment results are presented and analyzed to demonstrate the significance of this methodology. [C1014]

"Impact of signal bandwidth on airborne wideband radar echoes"

Model the output echo power from the matched filter of airborne radar receiver. Based on the same pulse time width, the same transmitted power and the same radar operation scene, signal-clutter-noise power ratio of the matched filter output is presented, and some new results different from the intuitionistic viewpoints is put forward. The impact of signal bandwidth on airborne radar echoes and target detector is discussed in detail. At last, computer simulations about typical airborne radar operation scene provide the verification and analysis. [C1015]

"Landmine detection utilizing an unmanned aerial vehicle"

Landmines pose a great danger to people in many areas. It is imperative to correctly identify the location of landmines for proper removal. Hence, there is a need to efficiently and accurately identify locations of landmines. The objective of this project is to conduct preliminary system analysis of three unmanned aerial vehicles (UAVs) utilizing ground penetrating synthetic aperture radar (GPSAR) aiding in the detection of landmines. Moreover, the effort will aid in assessing the overall effectiveness of landmine detection utilizing a UAV. Three design alternatives are modeled and tested. The first design alternative is a MQ-1 Predator; a long-endurance UAV primarily used for reconnaissance and surveillance missions. The second alternative is a Shadow 600. The Shadow 600 is capable of carrying various payloads. The third design alternative is the Shadow 200 which can be launched from the ground using a catapult. Each design alternative carries an unfocused GPSAR utilizing the length of the fuselage to increase aperture efficiency. Using satellite tool kit (STK) analysis software, design alternatives are assessed by their performance in scanning a one square kilometer area of interest (AOI). Critical figures of merit used to elicit system effectiveness include time on target (time that the radar pulses the landmine), area overlap percentage, area coverage, coverage speed, and energy consumption. Acquisition cost, operational cost, and maintenance cost of each design alternative are plotted against system effectiveness to identify the best alternative. [C1016]

"Experimental Verification of a Two-State Model for the Cumulative Distribution Function of GSM Passive Radar Clutter"

Modeling clutter signal is a major task in characterizing radar performances. Clutter distributions pertaining classical radar systems have been widely investigated, but in the past few years passive radars have raised interest among researchers for some specific features that make them very appealing in modern applications, thus bringing about the need for researching appropriate models for the noise signal received under no-target conditions. The paper proposes a new two- state model for the statistical distribution of clutter signal in a passive radar based on the GSM cellular system. A dedicated measurement station has been set up to carry out experiments in a real environment. Results give evidence of the suitability of the proposed model. [C1017]

"Incremental object part detection toward object classification in a sequence of noisy range images"

This paper presents an incremental object part detection algorithm using a particle filter. The method infers object parts from 3D data acquired with a range camera. The range information is quantized and enhanced by local structure to partially cope with considerable measurement noise and distortion. The augmented voxel representation allows the adaptation of known track-before-detect algorithms to infer multiple object parts in a range image sequence even when each single observation does not contain enough information to do the detection. The appropriateness of the method is successfully demonstrated by two experiments for chair legs. [C1018]

"Multi-component target detecting of SAR based on improved WVD-HT for frequency-modulation jamming"

Multi-component target detecting and parameter estimation of SAR are of most significance for military applications. In practice SAR is interfered by ground clutter and artificial jamming. The jamming can be restrained by multi-component target detecting that adopts the smoothed pseudo Winger-Ville distribution. Meanwhile, the cross terms of the Winger-Ville distribution can be smoothed. Combine Hough transform the time-frequency concentration is improved and better precision of parameter estimation will be obtained. Multi-component target detecting and parameter estimation by the smoothed pseudo Winger-Ville distribution and Hough transform for frequency-modulated jamming are simulated in this paper. The method proved to be efficient for target detecting and parameter estimation of SAR. [C1019]

"Clutter reduction and detection of landmine objects in ground penetrating radar data using likelihood method"

In this paper, an algorithm is proposed to reduce clutter signal due to the reflection from the ground surface in ground penetrating radar (GPR) measurements. The proposed technique has been applied to a GPR, which has been used to detect subsurface anti-personnel (AP) landmines. A very simple model is used to model the GPR clutter and the target signal. This model has been used to derive a detector based on a likelihood ratio test using some estimated parameters. A new threshold formula has been derived and has been applied to the data. The data sources include 1 GHz pulse GPR data and 1 GHz to 4 GHz stepped- frequency GPR data, from laboratory measurements. In all measurements, the reflections from the surface have been removed or at least reduced in great quantities. [C1020]

"Airport Perimeter Security: Where we've been, Where we are, and Where we're going"

Perimeter security at an airport requires disparate sensors to operate in concert to detect intruders; track them; assess threats; coordinate responses; (for example, human responders for investigation, or door and gate closings); gather evidence for law enforcement prosecution; and coordinate responses between law enforcement agencies. At present, no one system accomplishes all these tasks. Our work and development has evolved a system that meets these needs. In this paper we describe that evolution and show where we've been in system development, how that past has shaped our present deployment of systems and how our current work will lead to a complete solution. [C1021]

"UWB Radar Sensor Networks for Sense-Through-Foliage Target Detection"

In this paper, we propose a discrete-cosine-transform (DCT)-based approach for sense-through-foliage target detection when the echo signal quality is good, and a radar sensor network (RSN) and DCT-based approach when the echo signal quality is poor. A RAKE structure which can combine the echos from different cluster-members is proposed for clusterhead in the RSN. We compared our approach with the ideal case when both echos are available, i.e., echos with target and without target. We also compared our approach against the scheme in which 2-D image was created via adding voltages with the appropriate time offset. Simulation results show that our DCT-based scheme works much better than the existing approach, and our RSN and DCT-based approach can be used for target detection successfully while even the ideal case fails to do it. [C1022]

"Short-range MMW PRC-CW radar utilizing Doppler compensation"

A millimeter wave (MMW) pseudo random code continuous wave (PRC-CW) radar utilizing Doppler compensation is introduced. The novel hybrid transmitted waveform used in this radar combining single frequency pulse with pseudo random binary phase-coded signal is presented which makes consequent target detection through pulse compression independent of Doppler frequency. Doppler frequencies of targets are firstly estimated based on interpolated FFT in the time span of single frequency pulse and the Doppler compensated signal can be constructed. The effect of Doppler mismatch on the correlation detection can be eliminated by processing the compensated signal using conventional pulse compression-FFT, which makes the radar capable of short-range high-speed target detection. The theoretical analysis and simulation result demonstrate the validity of this technique. [C1023]

"Analysis of impulse response of electrically large targets"

The impulse response of electrically large targets is studied using the numerical techniques based on frequency-domain (FD) integral equations. The time-domain (TD) results are obtained through the transformation from the original frequency-domain utilizing the inverse Fourier transform. With the multilevel fast multipole algorithm (MLFMA) acceleration, the time-domain results of an F-117 airplane are presented, and compared with a rigorous method-of-moments (MoM) solution. [C1024]

"Systolic adaptive array with sidelobe control"

An approach to systolic adaptive array with sidelobe control is proposed in this paper. According to the structure of the QRDSMI (QR decomposition-sample matrix inverse), the QRDSMI algorithm is converted into systolic parallel pipeline structure to improve its real-time processing capability. Low sidelobe of the beam is obtained by constraining the static steering vector with Tschebyscheff coefficients. Simulation results verify the validity of the algorithm. [C1025]

"ISAR Imaging for Multiple Targets Based on Randomized Hough Transform"

Multiple targets imaging using inverse synthetic aperture technique is a key problem on radar imaging field. This paper proposes a new approach to perform the motion compensation for multiple targets using randomized Hough transform (RHT). The targets' amplitude distribution, i.e., corrugation image is transformed into frequency

domain, then The RHT processing is operated on the frequency image to estimate each target's Doppler frequencies respectively, and the multi-target ISAR images will be obtained after range alignment and phase compensation processing for each object respectively. [C1026]

"Segmentation of Spectrum Map for HFSWR Based on Feature Extraction"

When targets fall in different types of clutter and noise background in High Frequency Surface Wave Radar (HFSWR), uniform detection algorithms always result in poor detection and tracking performances. To solve the problem, two methods are proposed in this paper by extracting the background features according to the probability distribution and the image characteristic of the spectrum map. The first method uses Parzen window for estimating probability density function and Kullback-Leibler convergence for evaluating the difference between the Azimuth-Range-Doppler cells in spectrum map which can be used to distinguish the homogenous detection background from the non-homogenous. The second method is proposed based on the image edge feature in multi-scale space. The real data results about HFSWR show that the proposed methods can not only identify noise/clutter but also help choose appropriate detection/tracking algorithms to improve performances in such complex environments. [C1027]

"Detection Performance of MIMO Radar for Coherent Pulses"

The detection performance of spatial diversity multiple-input multiple-output (MIMO) radar for Swerling I and Swerling II target is analyzed based on coherent pulses. The detection method provides an unified frame for conventional radar and the MIMO radar. Simulation results demonstrate that MIMO radar can get better detection performance when more coherent pulses is used. In contrast with conventional radar, the detection performance of MIMO radar in Swerling I target outperforms Swerling II target. [C1028]

"Study on STAP Algorithm for Radar Target Detection in Heterogeneous Environments"

In heterogeneous environments, due to the lack of the independently and identically distributed (IID) samples, the performance of traditional STAP is degraded severely. The maximum likelihood amplitude and phase estimation of a sinusoid (APES) algorithm can operate directly on data of range cell-under-test. However, this algorithm is based on space domain adaptive processing, which is insensitive to weak target, and mistaking the interference as the true target for the identical Doppler frequency. In this paper, an improved algorithm is proposed, which applies space-time two-dimension APES algorithm to estimate the target’s amplitude, then detecting the moving target according to the output signal-to-noise ration, overcoming the original algorithm’s shortcoming effectively. Simulation results are presented to demonstrate the validity of this improved method. [C1029]

"Range-Dependence Compensation Method for Bistatic STAP Radar"

In this paper, we study the problem of detecting slow-moving targets using space-time adaptive processing (STAP). The construction of the optimum weights at each range implies the estimation of the interference-plus-noise covariance matrix. This is typically done by straight averaging of snapshots at neighboring ranges. However, in most bistatic configurations, snapshot statistics are range dependent. Straight averaging results thus in poor performance. This paper proposes a new method of obtaining an estimate of the covariance matrix using power spectrum registration based on nonuniform frequency sampling technique. Simulation results show a significant improvement in processor performance as compared to conventional STAP methods. [C1030]

"Estimation of Direction-of-Arrival by an Active Array"

Recently, MIMO techniques have been using in active radars,and become a hot topic in radar field, where they improve the performance of detection and parameters estimation greatly. On estimates of direction-of-arrival (DOA) in active radars, generally elements of the receive array were closely spaced to enable direction finding measurements. However, in order to obtain angular diversity, all elements of active radars need to be sufficiently separated, and so targets are in the near field of the array. Therefore, estimates of DOA in the active radars are near-field problems in fact. This paper tries to study direction finding of active radars from near-field principle, and establishes near-field estimates of DOA model of active array systems. The near-field model needs only 1-D searches, and decreases the burden of calculation in comparison with the traditional near-field estimates of DOA, which generally need 2-D searches. From the Cramer Rao bound (CRB) analysis, we find that there is great improvement on the performance of DOA estimates. [C1031]

"Colorization for Polarimetric SAR Image Based on Scattering Mechanisms"

Polarimetric synthetic aperture radar (POLSAR) images are widely used for aerial and spatial image applications,

such as terrain classification, target detection, etc. However, only monochrome gray images can be derived from SAR data due to the imaging mechanisms of SAR, which limits image presentation and visual appeal. In this paper, we proposed a new approach to colorization for POLSAR images. The basic principle is that pixels with the same scattering characteristics should have similar colors. To achieve this, the algorithm first utilizes the Cloude and Pottier's decomposition to separate pixels into eight scattering categories, and then unsupervised classification is applied for further iteration. Colorization is performed in Lab color space using the classification result, which assigns a color to each class according to the self-defined entropy-alpha color map. In this semiautomatic method, an operator only needs to define a color map, and then the indicated colors are automatically transferred to produce a fully colorized image. The effectiveness of this algorithm is demonstrated by a JPL/AIRSAR POLSAR image. [C1032]

"Phased array-Technology and trends"

This paper introduces the requirements of naval radar systems from past to present. It describes phased array technologies (digital and analog) that are presently available in the market. Power sources architectures, A/D evolutions, transceiver architecture and system on chip configurations are described as the main technologies at phased array system. The correlation between the various technologies and phased array architectures trends is also discussed. [C1033]

"Design and Implementation of Ground Peneration Radar System using Coded Sequences and Improved Target Detection using Golay Codes"

Ground penetration radar (GPR) is one of the non-destructive and non-intrusive data collecting technologies used in geophysical measurements. A GPR system operating at carrier frequency 500 MHz and a bandwidth of 250 MHz was designed and developed. The major problem in most of the existing Ground Penetration Radar systems is masking of the weaker returns by the strong sidelobes. This problem can be minimized to a great extent with the help of complementary Golay sequences. The performance of Golay sequences in terms of reduced sidelobe levels is considered better than that of pseudorandom (PN), Barker or other maximal length sequences. We have tested the performance of Golay and PRBS sequences using 4096 and 8192 length sequences, respectively. When the correlation obtained using two M length Golay sequence is compared with one 2M length PRBS sequence, sidelobe level for Golay sequence is almost eliminated. This results in better performance to detect weaker returns. However, this claim may not hold true at low SNR's. We have shown the results in anechoic chamber. Our tests indicate that Golay sequence has lower sidelobe level than PN sequences. [C1034]

"Three-dimensional Microwave Tomography: Waveform diversity and distributed sensors for detecting and imaging buried objects with suppressed electromagnetic interference"

Microwave tomographic techniques are described in this paper for developing high-resolution images of buried targets using 3D RF CAT Scans with frequency, angular, and polarization diversity and distributed sensors. Surface-contact sensors are used to collect the tomographic data for relay to a circling UAV and transmission to a remote control site (using layered sensing). 3D imaging algorithms have been developed to detect, image, and characterize buried targets. Distributed transmitters and receivers significantly increase unwanted mutual coupling and EM emissions (EMI) that interfere with signal reception, but also increase image resolution. For Ground Penetration (GPEN), reduced mutual coupling and EMI, and improved signal-to-noise ratios (SNR), can be achieved by embedding the transmitter/receiver sensors underground. Simple surface SAR experiments have been performed to detect deep mine shafts at the Zinc Corporation of America. 2D sensor data have been used to validate the 3D processing algorithms. Scale-model lab tests in the DETECT Chamber at AFRL have also been performed to optimize the tomographic images. In addition, WIPL-D models have been used to simulate the embedded and diverse/distributed sensors and to verify the significant enhancement in the received SNR for GPEN obtained by burying the radiating ring under the surface. [C1035]

"A Novel Technique for Preventing Signal Cancellation in Space-Time Adaptive Processing"

This paper addresses the issue of space-time adaptive processing (STAP) when the target signal is present in the training data. Target cancellation will occur in the STAP processing when the target signal leaks into the neighbouring range-gates for estimating clutter covariance matrix. In this paper, some linear constraints are added both on target signal and clutter to prevent target signal from being cancelled when the target signal is in the estimated covariance matrix. Computer simulation results verified the efficiency of the proposed algorithm. [C1036]

"Detection of buried objects using GPR change detection in polarimetric Huynen spaces"

Change detection is a useful method for detecting new events in a scene such as the placement of mines, and/or the movement of people, vehicles and structures. The basis of the approach is to examine an area via radar several times. Once, before there were targets planted there, and the other (or others) after. The change detection algorithm will notice if there are any changes after the first view was made. False alarm, that is a critical issue in this approach, can be reduced in a number of ways: exploiting additional information such as phase and polarization, and 2) exploiting critical attributes by computing changes in focused sub-spaces. In this paper we present anew approach for polarimetric change detection, whereby the target is represented not in terms of the complex scattering elements but in terms of phenomenologically-based Huynen parameters. Each element of the Huynen parameter set conveys useful physical and geometrical attributes about the scatterers thus augmenting the potential for significant false alarm mitigation. Results of the application of this approach on fully polarimetric signatures of simulated buried targets are provided. These results indicate that Huynen parameters are more effective for change detection than the scattering matrix elements in generating higher unambiguous autocorrelation peaks and less prominent cross-correlation peaks. [C1037]

"Inter-pulse coding for ideal range response"

A different way to increase the energy within a coherent processing interval (CPI) is suggested-many short dense pulses with inter-pulse coding instead of few widely-spaced long pulses with intra-pulse coding. Long coded pulses result in masking targets at close range and suffer from poor Doppler tolerance. We overcome the range ambiguity, inherent to dense pulses (high PRF), by inter-pulse coding. Ideal range response (no ambiguity, no sidelobes) can be obtained, e.g., by using a binary periodic Ipatov sequence for inter-pulse coding. The periodic property is maintained as long as the number of transmitted periods exceeds the number of processed periods by at least two. [C1038]

"A Differential Based Approach for Sense-Through-Foliage Target Detection Using UWB Radar Sensor Networks"

In this paper, the foliage penetration measurement data is provided by Air Force Office of Scientific Research (AFOSR). When radar echoes are in good quality, the detection of target can be achieved by applying our differential based technology on received single UWB radar waveform. We compared our approach in case of no target as well as with target against the scheme in which 2-D image was created via adding voltages with the appropriate time offset. Results show that our approach can work much better. When radar echoes are in poor condition and single radar is unable to carry out the detection, we employ both radar sensor networks (RSN) and RAKE structure to combine the echoes from different radar members and successfully detect the target. [C1039]

"An information theoretic approach to processing management"

In region surveillance applications, sensors oftentimes accumulate an overwhelmingly large amount of data, making it infeasible to process all of the collected data in real-time. For example, a multi-channel synthetic aperture radar (SAR) flown on an airborne platform could receive on the order of 10 GBits of data per second. This data can be exploited in a number of ways (e.g., constructing a detected image, applying an ATR algorithm, or performing moving target processing) each of which requires significant computational resources. Given the enormous amount of data and the correspondingly large number of potential exploitation algorithms, there simply are not enough computational resources to process all of the data with all possible exploitation algorithms. The natural question then becomes one of how to most effectively utilize limited processing resources so as to facilitate real time exploitation of the collected data. This paper presents an information theoretic approach for processing action selection which is predicated on predicting the amount of information flow each potential processing action is expected to generate. The aim is to select those exploitation algorithms (and, in general, the physical region and algorithm parameter settings) that will be most useful in refining the underlying estimate of the surveillance region state. We show by simulation on a model problem that the information theoretic method is able to outperform other methods of processing selection. [C1040]

"Radar target doa estimation: Moving window VS AML estimator"

In this paper we compare two radar target direction-of-arrival (DOA) estimation algorithms, the classical moving window (MW) and the asymptotic maximum likelihood (AML) estimators. The first technique for azimuth DOA estimation exploits multiple detections in the same time-on-target and the second one exploits the fact that the radar antenna mechanical scanning impresses an amplitude modulation on the signals backscattered by the target. Performances of the estimators are numerically investigated through Monte Carlo simulation in terms of root-mean-square-error (RMSE), probability of detection for a fixed probability of false alarm, and probability of "splitting". The obtained results show that the asymptotic maximum likelihood estimator generally outperforms the

classical moving window estimator. [C1041]

"Application of Doppler resilient complementary waveforms to target tracking"

The use of complementary codes as a means of reducing radar range sidelobes is well-known, but lack of resilience to Doppler is often cited as a reason not to deploy them. This work describes techniques for providing Doppler resilience with an emphasis on tailoring Doppler performance to the specific aim of target tracking. The Doppler performance can be varied by suitably changing the order of transmission of multiple sets of complementary waveforms. We have developed a method that improves Doppler performance significantly by arranging the transmission of multiple copies of complementary waveforms according to the first order Reed-Muller codes. Here we demonstrate significant tracking gains in the context of accelerating targets by the use of adaptively chosen waveform sequences of this kind, compared to both a fixed sequence of similar waveforms, and an LFM waveform. [C1042]

"Analytical, numerical, and experimental methods for through-the-wall radar imaging"

In this paper a physics-based approach for image formation of targets behind complex wall structures is presented. Analytical and numerical techniques are used for the development of forward scattering models which are then exploited in construction of matched filters for ultra-wideband synthetic aperture radars operating over a wide rang of incidence angles. Special scattering models for different wall types including cinder block and reinforced concrete walls are presented using efficient numerical and approximate analytical techniques. These allow for construction of SAR images as well as development of a refocusing algorithm. An experimental ultra-wideband radar is set up in the laboratory environment for the evaluation of the models presented. Also, a radar measurement configuration is proposed that allows for elimination of direct reflection from the walls. [C1043]

"Transmit codes and receive filters for pulse compression radar systems"

Pulse compression radar systems make use of transmit code sequences and receive filters that are specially designed to achieve good range resolution and target detection capability at practically acceptable transmit peak power levels. The present paper is a contribution to the literature on the problem of designing transmit codes and receive filters for radar. In a nutshell: the main goal of this paper, which considers the cases of both negligible and non-negligible Doppler shifts, is to show how to design the receive filter (including its length) and the transmit code sequence via the optimization of a number of relevant metrics considered separately or in combination. The paper also contains several numerical studies whose aim is to illustrate the performance of the proposed designs. [C1044]

"Optimization of loading factor preventing target cancellation"

Adaptive algorithms based on sample matrix inversion belong to an important class of algorithms used in radar target detection to overcome prior uncertainty of interference covariance. Sample matrix inversion problem is generally ill conditioned. Moreover, the contamination of the empirical covariance matrix by the useful signal leads to significant degradation of performance of this class of adaptive algorithms. Regularization, also known in radar literature as sample covariance loading, can be used to combat both ill conditioning of the original problem and contamination of the empirical covariance by the desired signal. However, the optimum value of loading factor cannot be derived unless strong assumptions are made regarding the structure of covariance matrix and useful signal penetration model. In this paper an iterative algorithm for loading factor optimization based on the maximization of empirical signal to interference plus noise ratio (SINR) is proposed. The proposed solution does not rely on any assumptions regarding the structure of empirical covariance matrix and signal penetration model. The paper also presents simulation examples showing the effectiveness of the proposed solution. [C1045]

"An experimental millimetre wave imaging system"

MMW (millimetre wave) imaging is considered as an effective approach to CWD (concealed weapon detection). In this paper, an experimental millimetre wave imaging system based on an aperture synthesis approach is designed. The system is used to scan a metallic object and the resulting field distribution has been recorded. To reconstruct the image, a holographic processing algorithm is applied and a focused image is obtained. The system is active and works at a single frequency, 92.5 GHz. It can be used to investigate the optimized system parameters such as antenna beam width, operating range from the target and aperture array element spacing, etc. [C1046]

"Clutter Mapping for Airborne Pulse Doppler Radar"

This paper presents a quick and simple method to model the surface clutter map of an airborne radar operating

in a medium pulse repetition frequency (PRF) mode and in a look-down scenario. The basic model derives a clutter map in the range/velocity detection space of the radar specific to each PRF used within the radar schedule. Additional functionality may be introduced which permits regions of differing clutter statistics to be defined and which computes target detectability over the range/velocity detection space of the radar. The models described here have been used successfully in a variety of research tasks to optimise PRF selection and weighting functions of a phased array antenna. [C1047]

"Modelling of the Impact of Antenna Rotation on Clutter Improvement Factor in Naval Radars Operating in Littoral Environments"

Naval operations are increasingly conducted in the littoral environment, requiring extremely high clutter improvement factors (CIF) to be achieved to enable small target detection. This paper describes a littoral clutter model to support synthetic baseband radar data generation and examines the impact of antenna rotation on the clutter filtering required to achieve these high clutter improvement factors. The impact of this analysis on waveform and signal processing design for future naval radars is discussed. [C1048]

"Anti-Jamming Transmitter Independent Radar Networks"

A transmitter independent receiver network (TIRN) is a network of radar receivers that operates in an area without cooperating with a particular radar transmitter, but rather using transmitters of opportunity (TOA) in order to detect and track airborne, ballistic or surface targets. In this paper a brief vulnerability analysis is given in both the detection/tracking and the communication subsystems of such a network. Electronic Defense (ED) solutions and interference avoidance techniques are given. A TIRN is mostly based in silent (low emission) operation and redundancy techniques. It is briefly described in the introduction. In the following paragraphs dealing with jamming techniques and is discussed, for both the detection and communication subsystems, comparing the results with the classic radar equivalent where applicable. It is finally concluded that such a network less vulnerable than conventional radars in most cases and in some cases even detect possible jammer effectively, at a fraction of the cost of classic radar network. [C1049]

"A Maneuver Detection Method using Multiple Doppler Radars"

Maneuver detection is an important issue in many adaptive tracking algorithms. In radar tracking system, for the lack of target acceleration measurement, maneuver detection is a complicated problem. A new maneuver detection method using multiple Doppler radars is presented. When radars are at different location, their Doppler measurements can be used to estimate the target's tangential and centripetal acceleration, which are the indicator of the maneuver. Compared with the widely used chi-square maneuver detection method, simulation results show that the new method can detect the maneuver more rapidly and has better tracking performance. [C1050]

"Parameter Estimation for Censored Exponential Random Variables"

Estimating the parameter of a Swerling target's radar cross section (RCS) is of interest as it may provide a discriminating feature to aid measurement- to-track association in multi-target tracking problems. Proper estimation of this statistic requires the appropriate characterization of the probability distribution function of the target's signal to noise ratio (SNR) and, in particular, compensating for censoring due to detection thresholding and saturation. In this paper, the maximum likelihood estimator for the upper and lower censored pdf of an exponential random variable is derived, and a method for solving the resulting equation is given. Two computationally simpler approximations are also proposed, and the performance of the standard exponential estimator is compared to the derived estimator and approximations. [C1051]

"Clutter Modelling for Space-Time Adaptive Processing"

The presence of clutter can be highly detrimental to detection of targets. STAP attempts to alleviate the problem by exploiting angle-Doppler inter-relationships to suppress clutter. The simulation of clutter data that is suitable for the application of STAP is considered in this paper. Examples of clutter generated using the ELMBAARC program in bistatic applications and forward facing and sideways facing monostatic applications are provided. Modelling of internal clutter motion is considered, together with its effect on the clutter domain in angle-Doppler space. [C1052]

"Image Quality Measures for Predicting Automatic Target Recognition Performance"

One important issue for Automatic Target Recognition (ATR) systems is to learn how robust the performance is under different scenarios. The quality of the input image sequence is a major factor affecting the ATR algorithm's

ability to detect and recognize an object. If one can correlate the algorithm performance with different image quality measures, the recognition confidence can be predicted before applying ATR by predetermining the input image quality. In this paper, we address the utility of image quality measures and their correlations with performance failures of a principle component analysis (PCA) based ATR algorithm. Various image fusion approaches are examined to illustrate their abilities to improve ATR performance. Results show that the Shift Invariant Discrete Wavelet Transform (SiDWT) and Laplacian pyramid fusion schemes outperform other methods for improving the detection rate with the considered SAR images. Regression analysis is conducted to show that linear combinations of the selected image quality measures could explain about 60% of the variability in the non-detections of the ATR algorithm. [C1053]

"Optimized Bernoulli Trial Technique for M Out of N Binary Integration of Radar Signals"

Binary integration is used in radar systems where M successful events out of N trials represent the detection of a target where multiple pulse-repetition frequencies (PRFs) are used. If the probabilities of the single events are equal, the probability of M events occurring out of N can be represented by a binomial distribution. If, however, switching the PRF at each event causes differing clutter to interfere with the signal, the event probabilities are not binomially distributed but are represented by a more complicated polynomial. An optimization procedure is presented that minimizes the radar resources needed for the M out of N binary integration of detector outputs with unequal signal-to-interference noise ratios (SINRs). The amount of coherent integration for each PRF output is optimally adjusted to yield a minimum total integration time over the batch of PRFs. The optimized integration time is computed for a number of different sequences of detector output SINRs and compared to the results from a binomial distribution. [C1054]

"HRR Signature Classification using Syntactic Pattern Recognition"

An automatic target classification system contains a classifier that maps a vector of real numbered features characteristic to a specific target onto a class label. Other features can be a string of symbols or alphabets that may not involve real numbers at all. There are certain orderings of the symbols in the strings governed by syntax rules, thus, generating a language, (that is, a collection of strings). Thus, a classifier would map a string to a class label. Such a classifier is called a syntactical classifier and varies greatly from its vector space counter part. This paper will give an overview of the construction of a grammar that generates a language then shows how they fit into a syntactical classification system. The performances of two syntactical classification systems with two and ten labels respectively are presented via confusion matrices. Experiments performed on public release DCS database indicate this approach has sufficient power to perform target detection using HRR signatures. [C1055]

"Automatic recognition of ISAR Images: Target shapes features extraction"

This paper presents a part of research study dealing with the initialization of an information system on radar automatic target recognition (ATR) chain. In this framework, we propose a set of helpful information at different levels of the ATR chain for decision making. The methodology used is the knowledge discovery process from data (KDD process).we focused in this paper on the data preparation step, more precisely Speckle denoising, edge detection and computation of features vector. We present the results of a several speckle filters that are largely used by ISAR imaging scientists (Lee, Frost, Kuan...). Fourier Descriptors have been used as features of the objects. Various similarity measures have been used and compared for target recognition. [C1056]

"Bayesian Networks and Probabilistic Data Association Methods for Multi-Object Tracking: Application to Road Safety"

This paper presents a Bayesian network-based approach to multisensor multitarget detection and tracking problem. The aim here is to propose an improvement of the probabilistic data association approach that takes into account contextual information about the scene. This information is modeled by a Bayesian network that allows a dynamic estimation of the detection probability of the PDA. Our approach is then applied to synthetic data from scanning radar that is mounted on a moving vehicle. The aim is to detect the surrounding objects and track them through the sequence. [C1057]

"Detecting and Tracking Separating Objects Using Direct Monopulse Measurements"

A significant complication to the ballistic missile tracking problem is the tendency for target "spawn": one ballistic object becomes two, several or several hundred, of which only one or a few are of concern (warheads), while uninteresting objects such as chaff and boost-rockets comprise the rest. To discern which is which takes time; and during that time it remains vital to maintain surveillance on all objects. Unfortunately these objects are closely-spaced (CSOs), and detection/tracking for CSOs is notoriously difficult. One approach is to use radar

waveforms of such high resolution that all objects are "resolved" by a sharp ambiguity function peak. However, not all radar systems have the required bandwidth or operational modes, and inclusion of those modes in new radars would impact the cost. It appears that with unresolved targets there is little that can be done to improve tracking until the targets become resolved. Nonetheless, recent work with advanced statistical modeling of monopulse radar returns has questioned the need for such high resolution: signal processing techniques can "see" inside a previously-closed resolution cell in a similar way that a mis-formed Hubble mirror can be corrected to see clearly.In this presentation we proffer two approaches. In the first, we discuss the maximum-likelihood approach: it turns out that it can be shown that up to 5 targets can be resolved from between two matched filter samples, rather than the one-per- sample case that might otherwise be thought. We also will present an even more advanced statistical approach known as particle filtering. The standard tracking approach is to work with detection "hits"; that is, to separate the signal processing and tracking. The particle filter is a more natural integrated approach, and we have found tracking errors reduced by 50% or more by its use along with significant increase in speed of detection of multiple target spawn. [C1058]

"Adaptive Threshold Mapping Technique for Moving Target Detector in Modern Radar"

In this paper we propose a new adaptive threshold mapping (ATM) technique for moving target detector (MTD) in modern radar. This technique is proposed to reduce the false alarms resulting from weather clutter and interference with relatively high Doppler frequency shift and MTD is not able to suppress it. The technique is based on controlling the receiver sensitivity according to the status of the output signal at the post detection. Also the technique is to control the signal processing path with relatively high probability of detection. The Simulation results show that this technique is a powerful solution to keep the post detection output with high probability of detection and minimum probability of false alarm rate compared with traditional MTD without ATM technique. [C1059]

"Multi-scale Modeling Approach for Detecting Low Observable Targets within Sea Clutter"

Sea clutter refers to the radar backscatter from the ocean surface. Accurate modeling of sea clutter and rough sea surface is an important problem in radar signal processing and applications, as it facilitates robust detection of low observable targets within sea clutter, which has significant importance to coastal security, navigation safety and environmental monitoring. Great efforts have been made to model sea clutter. However, the nature of sea clutter is poorly understood and the important problem of target detection within sea clutter remains a tremendous challenge. We propose a systematic, multi-scale approach to model sea clutter. By extensively utilizing available real data, we (1) develop methods to better fit non-stationary and non-Gaussian sea clutter, (2) characterize correlation structure of sea clutter on multiple time scales, and (3) develop accurate and readily implementable methods to detect low observable targets within sea clutter. [C1060]

"Multi-location wideband through-the-wall beamforming"

Significant multipath propagation and heavy clutter in indoor environments renders through-the-wall radar imaging a difficult and complex proposition. It is highly desirable to properly interpret the radar images and determine the contents of the indoor scene with a high level of confidence. Data collected from multiple positions around a structure can be used to improve imaging visibility into the indoor scene, thereby enhancing indoor target detection and localization. In this paper, we consider multi-location radar imaging. Image fusion techniques for combining radar images acquired from multiple locations along two sides of an enclosed structure are presented. Supporting results, based on real-data, are also provided. [C1061]

"Through wall radar imaging using UWB noise waveforms"

This paper examines the results of our research on the use of ultra-wideband noise waveforms for imaging objects behind walls. The advantages of using thermally generated noise as a probing signal are introduced. The technique of heterodyne correlation, used to inject coherence in the random noise probing signal and to collapse the wideband reflected signal into a single frequency, is presented. We address issues related to locating, detection, and tracking humans behind walls using the Hilbert-Huang transform approach for human activity characterization. The results indicate that noise radar technology combined with modern signal processing approaches is indeed a viable technique for covert high-resolution imaging of obscured stationary and moving targets. [C1062]

"MIMO Phased-Array for SMTI Radar"

Waveform diversity techniques for radar have gained considerable interest over the past several years. Novel radar waveforms have been proposed to improve detection performance and metric accuracy (i.e., angle estimation performance). This paper explores the potential for using a waveform diversity technique known as

multiple input, multiple output (MIMO) radar to improve the detection performance of slow moving surface targets from a moving radar platform. The MIMO radar system achieves superior performance by transmitting unique uncorrelated waveforms from each antenna subaperture as opposed to the traditional approach of transmitting a single coherent waveform across the entire aperture. The results show that the radar system minimum detectable velocity (MDV) can be reduced by exploiting the ability of a MIMO system to effectively increase the radar antenna aperture. [C1063]

"Dual Channel Adaptive Antenna Nulling with Auxiliary Selection for Spaceborne Radar"

A doubly adaptive scheme is proposed for detection and jammer cancellation by spaceborne radar, characterized by a dual receiving channel scheme. Generally many auxiliary antenna elements are required to protect a radar with a high gain antenna without tapering, from a single jammer with generic direction of arrival. However, assuming a slowly changing jamming scenario, we show that it is possible to apply first an adaptive selection of the best auxiliary element, and then to apply an adaptive scheme for jammer cancellation and target detection using only two receiving channels, connected respectively to the main antenna beam, and to the best selected auxiliary antenna beam. This paper characterizes the performance of this approach, together with its limitations. [C1064]

"Performance Metric Issues for Space Time Adaptive Processing Methods"

Space time adaptive processing was introduced to the radar community in the 1970's as a multi-dimensional filtering method to discriminate moving targets from clutter when observed from an air-borne/space-borne multi-channel phased array radar. Numerous variants of this filtering technique have been developed and are often compared to some baseline performance with respect to output signal to interference plus noise ratio or minimum mean square error. Under clairvoyant conditions these metrics have a direct relation to probability of detection. However under non-clairvoyant conditions, such as with recorded data, probability of detection is not measured directly and secondary metrics, such as signal to interference plus noise ratio and minimum mean square error, are used to measure performance. This paper attempts to show a case where using a metric such as minimum mean square error can indicate erroneous favorable performance. [C1065]

"An MPSoC architecture for the Multiple Target Tracking application in driver assistant system"

This article discusses the design of an application specific MPSoC architecture dedicated to multiple target tracking (MTT). This application has its utility in driver assistant systems, more precisely in collision avoidance and warning systems. An automotive-radar is used as the front end sensor in our application. The article examines the tradeoffs that must be taken into consideration in the realization of the entire MTT application in an embedded system. In our implementation of MTT, several independent parallel tasks have been identified and mapped onto a multiprocessor architecture to ensure the deadlines imposed by the application. Our study demonstrates that the joint utilization of reconfigurable circuits (namely FPGA) and MPSoC, facilitates the development of a flexible and efficient MTT system. [C1066]

"Research on Optimum Deployment Problem of Radar"

The target detection joint probability of several radar sets is studied. The optimum deployment models of circle, line, and sector have been built up. The optimum deployment models of the circle, line and sector deployment can be solved by entire enumerate method, golden section method, and coordinate alternation method. On condition that the number of radar is less in the twice -lines deployment model it can be solved by combine entire enumerate method with coordinate alternation method. Contrarily, it can be solved by combining genetic algorithm with coordinate alternation method. [C1067]

"The target location study of multistatic radar base on non-cooperative emitter illuminating"

In this paper, a passive detection system composed by multistatic stations is studied. According to the basic principle of time difference location technology, an indirect measurement way of time difference of arrival (TDOA) is provided to avoid the difficulty of direct measurement. The theory derivation and simulation analysis show that the indirect way can achieve certain location precision to meet the requirement of target-tracking. [C1068]

"Polarization filtering enhancement of buried landmine"

Here the optimum polarization of antenna for buried landmines detection in soil surface clutter is investigated theoretically to enhance radar target back scattered power. An expression of the Mueller matrix from this fractal surface is obtained. The optimum polarization to reduce clutter is given. Then, the variations are found of power density of buried landmines with polarization state, and the optimum polarization is given to increase power

density. In the end, the paper researches the polarization filtering enhancement of buried landmines in soil surface clutter. [C1069]

"A UWB microwave imaging radar system for a small target detection"

An ultra-wide band (UWB) radar system to detect a small target is proposed. A three-dimensional target model is used in the investigations. A circular array with UWB coplanar waveguide (CPW)-fed bow-tie slot antennas is used in the radar system. The transmitting antenna is excited by the impulse waveform while the other antennas are used as the receivers, i.e., a single transmitter and multi- receivers. This system provides wide angular coverage in both elevation and azimuth plane at receiver side. By using a simple delay-and-sum (DAS) beamforming method, a synthetic focal point is created and a high resolution image can be reconstructed from the backscatter signals. From the simulation results, the position of image agrees with that of the target. [C1070]

"Experimental through-the-wall detection in cluttered environment using time reversal processing"

The detection and localization of persons through obstacles is becoming a great stake in both civil and military fields. One of the most important applications is certainly sensing through walls which can be very useful in safety, peace-keeping and law enforcement operations. Radar systems are likely to provide an adequate answer to this kind of problem and various processing methods are nowadays studied and considered to reach the final solution. In this paper, we focus on ultra-wideband radar techniques applied to human sensing. In particular, we assume that we have an antenna array on reception. Many signal processing methods can be considered for target localization. We choose to focus on an emerging method in electromagnetic detection field, especially in a cluttered environment: time-reversal [1] adapted here to through-the-wall localization. In this work time reversal processing is applied to experimental data to demonstrate the localization of dielectric objects behind a 10 cm thick brick wall. [C1071]

"High-resolution 3-D imaging algorithm without derivative operations for UWB through-the-wall radars"

We proposed a modified envelope as high-resolution 3D imaging algorithm for through-the-wall UWB radars. This algorithm utilizes the principle that the target boundary behind the wall can be expressed as an envelope of modified spheres, which are determined from the electric permittivity and thickness of the wall. In numerical simulation, we confirmed that the proposed method achieves higher-resolution 3-D imaging for advanced through-the-wall applications. It is our future task to develop the imaging algorithm with the wall permittivity and thickness estimation. [C1072]

"Fractional Fourier Transform for moving target detection and location in spaceborne SAR"

Doppler parameter estimation of Azimuth echo is the key for Synthetic Aperture Radar (SAR) ground moving target detection. This paper will apply Fractional Fourier Transform (FrFT) to moving target echo signals for Doppler parameter estimation in Spaceborne SAR. Itpsilas well known that within a synthetic aperture time, the relative motion between moving targets and SAR makes the slant range vary with time so that Doppler parameters will change accordingly. Compute the mean values of the gained Doppler centroid and frequency modulation rate along azimuth direction for each target, and this ensures that echoes of a moving target may be approximated by a linear frequency modulation (LFM) signal in theory. Simulation results prove that the parameter mean values can make imaging quality of moving targets better and achieve accurate real time processing within a synthetic aperture time. [C1073]

"Monte-Carlo-based partially observable Markov decision process approximations for adaptive sensing"

Adaptive sensing involves actively managing sensor resources to achieve a sensing task, such as object detection, classification, and tracking, and represents a promising direction for new applications of discrete event system methods. We describe an approach to adaptive sensing based on approximately solving a partially observable Markov decision process (POMDP) formulation of the problem. Such approximations are necessary because of the very large state space involved in practical adaptive sensing problems, precluding exact computation of optimal solutions. We review the theory of POMDPs and show how the theory applies to adaptive sensing problems. We then describe Monte-Carlo-based approximation methods, with an example to illustrate their application in adaptive sensing. The example also demonstrates the gains that are possible from nonmyopic methods relative to myopic methods. [C1074]

"Study and analysis of a new detector of radar targets using CFAR with Gabor transform"

In this paper, we consider the problem of radar detection using the Gabor transform in presence of unknownpsilas noise and clutter. We proposed a new constant false alarm rate (CFAR) detector in time frequency domain to locate the positions of the targets exactly. This method is efficient in measurement as the case of no homogeneity is dealt with thus the detection of the targets to weak radar cross section, as well as the detection of the targets flying tangentially to the circle of radius target-radar. To show the performance of this detector in presence of noise and clutter, we analyses the behavior of the clutter before and after Gabor transformer. [C1075]

"Road recognition in high resolution SAR image based on genetic algorithm"

Road recognition from SAR image is a very important problem. In this paper, a new method is proposed which can detect multiple roads in an image. Firstly binary edge image is gained by Canny operator and edge refining. Secondly, edge curves are encoded by reversible chained list, and fitness function is constructed based on SAR image road models, and optimal road boundary curves are linked by improved genetic algorithm. Thirdly, complete road boundaries are detected by curve fitting. At last, mated long road edge curves are found out and road surface are stuffed. The experiment shows that this algorithm can realize roads recognition and eliminate influence of other non-road. [C1076]

"Multiple targets' detection in terms of Keystone transform at the low SNR level"

In pulse Doppler (PD) radar, a novel motion compensation method based on keystone transform is proposed for handling with the data of a low signal-to-noise ratio (SNR). The keystone transform is used to correct the linear range migration which results from the radial velocity of targets. The SNR is improved through coherently accumulating all pulses. The simulation results show that the performance of the method based on keystone transform is better than that of the conventional coherent integration method using fast Fourier transform (FFT). [C1077]

"MIMO radar performance in clutter: Limitations imposed by bounds on the volume and height distributions for the MIMO radar ambiguity function"

In multiple-input multiple-output (MIMO) radar, the efficiency of target detection in clutter that is distributed over a certain range bin-Doppler frequency region depends on the sidelobe level of the waveformspsila auto- and cross-ambiguity functions within this region. We introduce the MIMO ambiguity function as the sum of all auto- and cross-ambiguity functions of the K MIMO radar waveforms, with the integral of this function over some range-Doppler region serving as a measure of the orthogonality (separability) of the waveforms within this region of interest. We derive an upper bound on the attainable ldquoclear areardquo for the MIMO ambiguity function, and show that, with respect to the conventional single-waveform ambiguity function, the maximum clear area is K times smaller for the MIMO system. [C1078]

"Using a clustering technique for detection of moving targets in clutter-cancelled QuickSAR images"

The ability to detect and track moving targets in synthetic aperture radar (SAR) images has become a topic of much current research. The authors have been reporting on a multi-channel phase interferometry technique for detecting moving targets in SAR images for some time. They have also shown that the phase interferometry between two channels can be utilized to cancel ground clutter from one channel by subtracting a phase-weighted version of the image from the other channel. This is analogous to, but not the same as, the well known DPCA (displaced phase center antenna) technique for clutter cancellation. This paper reports on a clustering technique we have successfully used to detect moving targets, which in almost all cases occupy many more than one or a few pixels in the clutter-cancelled SAR image. This technique greatly reduces false alarms. [C1079]

"Distance estimation algorithm for both long and short ranges based on stereo vision system"

We present a distance measurement method based on stereo vision system while guaranteeing accuracy and reliability. It has been considered as difficult problem to measure both long and short distance with a stereo vision system accurately due to sampling error and camera sensor error. To resolve these problems of the stereo vision system, we utilize an algorithm which is consisted of a modified sub-pixel displacement method to enhance the accuracy of disparity and strong tracking Kalman filter (STKF) to reduce the camera sensor errors. Our displacement method and the usefulness of STKF are verified as compared to other displacement methods and conventional Kalman filter (CKF) through simulating on the several distance ranges. The Monte-Carlo simulation results show that our algorithm is capable of measuring up to hundreds of meters while root mean

square error (RMSE) maintains about 0.04 at all ranges, even though the target vehicle maneuvers or moves nonlinearly. [C1080]

"IMMPDA vehicle tracking system using asynchronous sensor fusion of radar and vision"

This paper focuses on recognition and tracking of maneuvering vehicles in dense traffic situations. We present an asynchronous multi obstacle multi sensor tracking method that fuses information from radar and monocular vision. A low level fusion method is integrated into the framework of an IMMPDA Kalman filter. Real world experiments demonstrate that the system combines the complementary strengths of the employed sensors. [C1081]

"Collision sensing by stereo vision and radar sensor fusion"

To take the advantages of both stereo cameras and radar, this paper proposes a fusion approach to accurately estimate the location, size, pose and motion information of a threat vehicle with respect to the host from observations obtained by both sensors. To do that, we first fit the contour of a threat vehicle from stereo depth information, and find the closest point on the contour from the vision sensor. Then the fused closest point is obtained by fusing radar observations and the vision closest point. Next by translating the fitted contour to the fused closest point, the fused contour is obtained. Finally the fused contour is tracked by using the rigid body constraints to estimate the location, size, pose and motion of the threat vehicle. Experimental results from both the synthetic data and the real world road test data demonstrate the success of the proposed algorithm. [C1082]

"Grid-based localization and online mapping with moving objects detection and tracking: new results"

In this paper, we present a real-time algorithm for local simultaneous localization and mapping (SLAM) with detection and tracking of moving objects (DATMO) in dynamic outdoor environments from a moving vehicle equipped with a laser scanner. To correct vehicle location from odometry we introduce a new fast implementation of incremental scan matching method that can work reliably in dynamic outdoor environments. After a good vehicle location is estimated, the surrounding map is updated incrementally and moving objects are detected without a priori knowledge of the targets. Detected moving objects are finally tracked by a multiple hypothesis tracker (MHT) coupled with an adaptive IMM (interacting multiple models) filter. The experimental results on datasets collected from different scenarios such as: urban streets, country roads and highways demonstrate the efficiency of the proposed algorithm on a Daimler Mercedes demonstrator in the framework of the European Project PReVENT-ProFusion2. [C1083]

"Radar and vision based data fusion-Advanced filtering techniques for a multi object vehicle tracking system"

The robust and reliable detection of objects in the path of a vehicle is an important prerequisite for collision avoidance and collision mitigation systems. In this paper, an ego-motion compensated tracking approach is presented which combines radar observations with the results of a contour-based image processing algorithm. The approach is able to handle all uncertainties of the system in a unified way without analytical linearization by using the Unscented transform. By that, the covariances of the system can be estimated more accurately. The paper describes both the image processing and the state estimation algorithms. Furthermore, results of several practical tests are presented. [C1084]

"Laser-based vehicles tracking and classification using occlusion reasoning and confidence estimation"

In this paper, we present a robust approach for the detection, tracking and classification of multiple vehicles using a vehicle mounted laser scanner working independently in highways an urban centers. Our classification is based on different criteria: geometrical configuration, occlusion reasoning, sensor specifications and tracking information. The estimated confidence level is thus computed accounting the classification, the geometrical configuration and the tracking duration. Our system has been validated under various conditions (highways, urban centers) with three different laser scanners and proved is robustness on real data and with real time constraints. [C1085]

"Detection and tracking of a moving point target in infrared image sequence using auxiliary particle filter"

An appropriate measurement likelihood function is proposed from the measurement image model employed by

most of the track-before-detect (TBD) approaches. Based on the likelihood function and a target motion model, we design an auxiliary particle filter-based Bayes multiframe method for detection and tracking a moving point target in infrared (IR) image sequences. Experimental results show its effectiveness for the detection and tracking of a low signal-to-noise ratio (SNR) point target. [C1086]

"Multistatic ambiguity function-A tool for waveform selection in distributed radar systems"

Summary form only given. The desire to anticipate, find, fix, track, target, engage, and assess, anything, anytime, anywhere (A2F2TE4A) by the US Air Force will require changes to how we modify, build, and deploy monostatic and multistatic radar systems. The multistatic ambiguity function has been proposed as a tool for analyzing and designing multistatic radar systems. It was demonstrated through examples that multistatic radar system performances can be improved by shaping the multistatic ambiguity function through waveform selection, sensor positioning and adequate weighting of different receivers during pre-detection fusion. In this work we provide simulation results that illustrate how significant improvements in radar system performances can be achieved. [C1087]

"Use of resonance parameters of air-intakes for the identification of aircrafts"

Since the development of radar systems, extensive researches have been conducted on the detection and the identification of radar targets. In military context, these targets are often stealthy to assure their security. This can be provided by using composite materials, absorbing electromagnetic waves in usual radar frequency bands. Consequently, studies are involved in lower frequencies. These frequency bands correspond to the resonance region for object dimensions of the same order as electromagnetic wavelengths. Therefore, the fluctuation of the energy scattered by the target is significant and resonance phenomena clearly appear in this region. In this paper, we propose to show, with the example of a perfectly conducting (PC) rectangular cavity, how resonances of a target depend on its dimensions and that these resonances have two origins: external resonances corresponding to creeping waves on the surface of the target and internal resonances corresponding to possible cavity waves. Internal resonances are usually stronger than external resonances, then we propose to use internal resonance parameters of air-intakes for the identification of aircrafts. [C1088]

"Image feature-based space-time processing (IFSTP) for bistatic ground moving target detection and clutter rejection"

IFSTP has been proposed as an alternative approach to traditional STAP for bistatic radars to detect ground moving targets from clutter and jammers. The new approach can be implemented without resorting to the clutter estimation, which may be difficult to implement in inhomogeneous clutter environment. Target detection is carried out based on different features of target and interference signals in the Doppler-angle domain. The image features and a region-growing algorithm are specifically defined and developed for target feature extraction and detection. Simulation results validate that the developed IFSTP algorithm can effectively detect ground moving targets for airborne bistatic radar. [C1089]

"The research on selection of attack target for arm"

In this paper, the selection of attack target for ARM has be converted into the problem of shortest path. The Dijkstra arithmetic is used to solve the problem. The experimental results show that the efficiency of the ARM has been improved by this method. [C1090]

"Constructive neural network for landmine classification using ultra wideband GPR"

In this paper, constructive neural network for landmine classification using ultra wideband (UWB) ground penetrating radar (GPR) is presented. GPR echo signal is composed of three parts: ground bounce, clutter and target echo signal, the target echo signal is deteriorated by the clutter. Firstly WP-based preprocessing algorithm is used to ground bounce removal and clutter reduction and feature extraction of GPR echo signal. Then wrapper based approach is adopted to feature subset selection of GPR echo signal using genetic algorithm(GA) in conjunction with constructive neural network learning algorithm, and at the meanwhile, the result of classification of landmine is obtained. Experiment result based on GPR measured data shows that the feasibility and advantage of the presented algorithm. [C1091]

"Detecting ground deformation with Permanent scatterer of Suzhou region"

Permanent scatterer interferometry is one of the latest developments in radar interferometric processing. It is achieved by the analysis of the interferometric phase of the individual point targets that are discrete and temporarily stable natural reflectors or permanent scatterers in long temporal series of interferometric SAR

images with one master image. The wrapped phase of a point in differential interferogram can be decomposed to uncompensated topography, target motion in the time between the acquisitions, object scattering phase related to the path length traveled in the resolution cell, the atmospheric phase accounting for signal delays, the phase caused by imprecise orbit data and additive noise term. Based on this principle, it could bypass the problem of geometrical and temporal decorrelation. Furthermore, by using a large amount of data, atmospheric signal is estimated and corrected for. This paper addresses the how we use the PS-InSAR technology and Differential Interferogram procedure to estimate the velocity of deformation of Suzhou region in the time span 1992-2002. The main processing is done with the GAMMA software. [C1092]

"Simultaneous clustering and tracking unknown number of objects"

In this paper, we present a novel on-line probabilistic generative model that simultaneously deals with both the clustering and the tracking of an unknown number of moving objects. The proposed model assumes that i) time series data are composed of a time-varying number of objects and that ii) each object is governed by a mixture of an unknown number of different patterns of dynamics. The problem of learning patterns of dynamics is formulated as the clustering of tracked objects based on a nonparametric Bayesian model with conjugate priors, and this clustering in turn improves the tracking. We present a particle filter for posterior estimation of simultaneous clustering and tracking. Through experiments with synthetic and real movie data, we confirmed that the proposed model successfully learned the hidden cluster patterns and obtained better tracking results than conventional models without clustering. [C1093]

"Hough detector analysis by means of Monte Carlo simulation approach"

In the present paper, an algorithm for target detection that exploits the Hough transform is proposed. The target is detected by the Hough detector. The effectiveness of the algorithm proposed is formulated in terms of a quality parameter-the probability of detection. The quality parameter is estimated using the Monte Carlo simulation approach. We compare the results of detection achieved by both analytical and simulational approaches. The results are obtained for Swerling II target model in conditions of randomly arriving impulse interference. [C1094]

"Surveillance radar target detection with the Fourier-Hough transform"

In a typical surveillance radar, decision about the existence of a target in certain range-azimuth-elevation cell is made from the echo received in current scan, while still there is useful information in history of that range cell that is not considered in decision making. Based on the potential of the Hough transform to use history of both range and Doppler information, a new method to increase the probability of detection in surveillance radars is proposed. The new method uses a 3D data space and a special projection to detect targets and extract range, speed, and acceleration of maneuvering targets simultaneously. [C1095]

"Model based adaptive detector with low secondary data support"

In this paper the problem of adaptive target detection in structured Gaussian clutter is considered. The clutter is modeled as an auto-regressive process with known order but unknown parameters. Here a detection algorithm which can manage the cases with few secondary data is proposed. We have modified a well known adaptive detector in four different forms. First of all, we estimate the AR parameters based on secondary data and use the results in covariance matrix estimation. The performance of the proposed detectors have been evaluated using Monte-Carlo simulations and compared with each other. [C1096]

"Improvement in radar detection through window processing in the Hough space"

The subject of this paper is estimation of straight-line parameters noisy edge points using the Polar Hough transform. We propose a new detection algorithm in Hough space that will increase detection probability when the target coordinates are measured with errors. We compare the accuracy of the method with result from polar Hough transform when the target coordinates are measured with out errors. The influence of trajectory parameters accuracy on the quality of work of TBD multi-radar system is estimated. [C1097]

"The probability of target detection"

The paper deals with the most interesting problem of the probability of radar target detection. In this paper there are derived probability relations of radar target detection in a covered radar zone for a single-frequency and double-frequency radar sensors. The starting point of the analyses is fluctuations of radar cross section. The Swerling theory has been used. In this paper there is an execution and mutual comparison of two types of radar sensors from the point of view of target detection, which confirm advantages of usage of a double-frequency

radar sensor. The range detection of double-frequency radar sensor is doubled. [C1098]

"Polarimetric calibration-a comparison of different approaches"

Polarimetric calibration is performed by applying distortion matrices acting on transmit and receive. Two different approaches to determine these distortion matrices are compared to each other, a statistical one, and an approach that uses radar reflectors. The effect of polarimetric calibration is demonstrated by means of two examples pertaining to polarimetric detection, and to feature based target recognition. [C1099]

"A multi-scaled registration algorithm for radar image and electronic chart"

Radar detection is a useful technique in ship navigation and collision avoidance, especially in bad weather conditions. However, radar image cannot show the actual location of target in the electronic chart directly. In order to solve this problem and comprehensively utilize the information of both radar and electronic chart, the two images should be matched beforehand. In this paper, a multi-scaled registration algorithm for radar image and electronic chart is presented. Based on the scale-space theory, coastlines from the two images are matched in both phase domain and image domain with continuous scale level. [C1100]

"Smart beamforming and wideband signals for ground surveillance"

In this paper, dealing with long range ground surveillance radars, it is shown that the simultaneous requirement for wideband waveforms and multiple channels opens the way to new space-time signals and processing techniques, thus improving the detection and classification of multiple ground (and low-flying) targets. [C1101]

"Efficiency evaluation model on the damage of radiation source by Anti-Radiation UAV"

Establishing anti radiation UAV attack and locomotion model for addition radiation source to decoy anti radiation UAV. Making use of discrete and independency property of this mathematical model, it attained statistical sample, which can be used to making efficiency evaluation about UAV injures genuine emitter in the condition of energy unchanged. Giving the model of the most typically coherent dual and triplicate point source decoy anti radiation UAV, besides that carrying through simulation and experimentation of distributed spot, Definitude the main factor influence injures of enemy radar. [C1102]

"CFAR robust detection of moving target in presence of fluctuating background"

The paper describes the techniques for the autonomous detection of moving targets by processing a sequence of sensor imageries in remote sensing applications. Two detection algorithms, which do not need a matrix inversion, are developed by extension of Hotellingpsilas principal-component method showing excellent performance and robustness. The detection of small, barely discernible, moving objects in presence of correlated fluctuating background and unknown background intensity are presented and tested experimentally. [C1103]

"STAP/GMTI analysis using SAR data from simulated scenarios"

The surveillance of ground areas is one of the essential tasks for modern manned and autonomous flying platforms. Especially a SAR/GMTI sensor is essential because itpsilas all weather capability, but often demands large size antennas which must be designed under aerodynamic aspects with compromises regarding the ideal SAR processing need. The customerpsilas exigency for long-term observation capabilities requires furthermore the employment of automatic recognition systems. Both aspects require a SAR sensor design to platform, to performance and not at least to costs. This paper presents a performance assessment tool for both aspects, i.e. the influence of antenna imperfectnesspsilas to the (coherent & multi-channel) SAR data and also the impact to the target recognition capability. The tool combines the EADS SAR simulation program ldquoPIRDISrdquo which is able to deal with nearly arbitrary antenna patterns and produces coherent multi-channel signals in the range/Doppler domain, with a new ldquoground moving target indicationrdquo (GMTI) module working in the post-Doppler modus. The plot extractor regards only that information available also in an operational system and delivers (moving) target alarms (and also false alarm candidates, depending on scenarios and radar parameters). The results are compared with the ground truth known from the scenario generation in terms of accuracy of localisation, probability of detection and false alarm sensitivity. [C1104]

"Practical problems with covariance matrix estimation for adaptive MTI and space-time adaptive processing for target detection in HF surface wave radars"

Surface wave over the horizon radar systems have a potential to detect targets, that are hidden under optical horizon. This possibility is, however, difficult to implement as a result of first and second order clutter scattered

from the ocean surface in combination with interferences. In this paper we compare adaptive MTI and space-time adaptive processing algorithms applied to the surface wave high frequency radar system data. The aim of the experiments was to evaluate different techniques and their usefulness to detect targets at distances 50-200 km off shore. In the experiments authors used the data from an oceanographic, surface-wave, high frequency system WERA, designed to perform continuous monitoring of sea currents and waves. Data were collected at the west coast of France, in Brittany. [C1105]

"On the occurrence of ghost targets in linear FMCW radar: A worst case study"

In LFMCW (linear frequency modulated continuous wave) radar, there is a nonzero probability for mismatches to occur under certain conditions. We show that this probability strongly depends on the modulation employed as well as on the distribution of targets. Hence a good approach to reduce mismatches is to carefully design the modulation used. Instead of utilizing extensive simulations based on target statistics to accurately estimate the probability of mismatches, we characterize a modulation in terms of its worst case number of mismatches possible. The focus of this paper is to identify conditions for the worst case and to deduce general rules for the modulation design. [C1106]

"Performance analysis of a weighted max CFAR processor"

In this paper, we study the performances of a novel CFAR in homogeneous environment. This processor consists to take maximum power of cells in the reference windows and multiply it by a coefficient alpha (alpha < 1) to obtain the background level estimate. We assume that the target is embedded in a white Gaussian noise and fluctuate according to a Swirling I model. Closed form expressions of the probabilities of detection and false alarm are determined and the performance of the proposed detector is investigated. [C1107]

"DSP implementation of a Range Azimuth CFAR processor"

In this paper, we present DSP architecture for target detection based on range azimuth cell averaging constant false alarm rate (ARCA-CFAR) processor with non coherent integration. The proposed architecture has been designed to deal with parallel processing and to be configured for the RACA-CFAR algorithm implementation. The design has been implemented on a Texas Instruments TMS320C6711 digital signal processor board with a good performance improvement. The proposed system scheme and the real time implementation results are presented and discussed in this paper. [C1108]

"Post-processing phase noise mitigation performance comparison in a coherent distributed passive radar system"

Phase noise in a radar system propagates through processing algorithms and affects the quality of the output radar data products by making targets harder to detect from noise and potentially confounding multiple targets. Usually referred to as autofocus algorithms, techniques for mitigating the effects of phase noise in these images have been proposed and studied in other applications including terrestrial telescope imaging and synthetic-aperture radar. We examine the effectiveness of autofocus algorithms as they attempt to mitigate phase noise in a coherent distributed passive radar system. We also propose an alternate technique based on deconvolution of power spectral densities, which has produced better results as well as requiring far less computation since no optimization problem exists within this method. [C1109]

"Trajectory analysis and semantic region modeling using a nonparametric Bayesian model"

We propose a novel nonparametric Bayesian model, dual hierarchical Dirichlet processes (Dual-HDP), for trajectory analysis and semantic region modeling in surveillance settings, in an unsupervised way. In our approach, trajectories are treated as documents and observations of an object on a trajectory are treated as words in a document. Trajectories are clustered into different activities. Abnormal trajectories are detected as samples with low likelihoods. The semantic regions, which are intersections of paths commonly taken by objects, related to activities in the scene are also modeled. Dual-HDP advances the existing hierarchical Dirichlet processes (HDP) language model. HDP only clusters co-occurring words from documents into topics and automatically decides the number of topics. Dual-HDP co-clusters both words and documents. It learns both the numbers of word topics and document clusters from data. Under our problem settings, HDP only clusters observations of objects, while Dual-HDP clusters both observations and trajectories. Experiments are evaluated on two data sets, radar tracks collected from a maritime port and visual tracks collected from a parking lot. [C1110]

"Design and real time implementation of a radar data extractor"

In this paper, we propose a parallel processing architecture, based on two TMS320C44 VME-bus DSP boards, for real time implementation of Cell Averaging and Clutter Map Constant False Alarm Rate (CFAR) detectors, and a data extractor based on a centroidal interpolation of the position of the detected target. The optimal processing speed has been achieved by fully exploiting the capacities of the dasiaC44 processor. The implemented system is well adapted for two dimension radars. The overall processing scheme interconnections and the real time implementation results are presented and discussed. [C1111]

"Detecting targets of variable acceleration with High Frequency Surface Wave Radar"

According to the conventional hypothesis, the velocity of target in the coherent integration time (CIT) is invariable in the application of utilizing high frequency surface wave radar to detect target. First, this paper proposes a more proper hypothesis in which the velocity and acceleration of target are treated as time-varying. However the acceleration of target can be regarded as invariable within the small fraction of coherent integration time. Then the model of echo signal in the hypothesis is analyzed. Considering the disadvangtages of some conventional methods of time-frequency analysis such as short-time Fourier transform (STFT) and Wigner-Ville distribution (WVD), the paper proposes the method of time-frequency analysis based on chirplets signal decomposition which can improve the time and frequency resolution simultaneously and solve the cross-term problem in WVD method. Firstly, we process the small fraction of coherent integration time with the chirplets signal decomposition. Then according to the differences between target signal and ocean clutter echo, the BP neural network classifier can be exploited to suppress ocean clutter. The different fractions of coherent integration time are composed together with the method of the nearest correlation. Lastly, the feasibility of the method for detecting targets of variable acceleration is proved by its processing the actual data. [C1112]

"A Bayesian algorithm for object detection in GPR data"

An algorithm for underground object detection in GPR data is presented in this paper. It combines the advantages of Kalman filtering approach, suggested by Carevic (1999) with the robustness of hybrid Bayesian estimation technique. The objective is to increase the reliability of target detection and target-background separation while keeping a small false alarm rate. In addition, sequential change detection (CUSUM) test is studied for the purposes of ground layers segmentation and object recognition. [C1113]

"Comparison of the EKF and the IMM estimator for HFSWR tracking applications"

In many applications, the interacting multiple model (IMM) estimator provides better performance over the single model Kalman filter (KF). However, there are two high frequency surface wave radar (HFSWR) factors which seem to make the IMM estimator less attractive: Firstly, the radar has a very long integration time, up to a few hundred seconds for ship detection; Secondly, the radar has very limited detection capability of maneuvering targets. It is unknown whether the IMM estimator will perform better over an EKF for real time HFSWR. The purpose of this paper is to compare the EKF with the IMM estimator. An optimal noise level and critical value have been found for HFSWR EKF design. The results demonstrated that the IMM estimator does not yield improved performance. [C1114]

"Determining manoeuvre detection threshold of GRNN filter in the process of tracking in marine navigational radars"

The article presents the results of simulation research aimed at determining the manoeuvre detection threshold of a neuron filter, based on GRNN artificial neural network. The structure of a filter has been presented, from which the necessity of manoeuvre detection results and a detector has been described able to be used in this case; it is based on an analysis of course and speed increase in particular estimation steps. The research was performed by the Monte Carlo method for 100 independent simulations. [C1115]

"Subaperture processing in SAR: Choice of the synthesizing interval length and moving target detection"

The aim of this paper is to provide recommendation for choosing of the subaperture synthesizing interval length and to design moving target detection algorithm which is economical in terms of computational load. [C1116]

"Comparative analysis of dimension estimation methods of fractal surfases and fractal target detection"

The aim of this paper is comparative analysis of different fractal dimension estimation methods according estimation accuracy point of view and differentiation fractal and "non-fractal" objects conditions at the image depending on observation window size and target area to window area proportion.The analysis of fractal

dimension estimation of real SAR images for validation obtained during the simulation results was executed. [C1117]

"Extended object detection and extraction in a high resolution polarimetric surveillance radar"

Detection in most surveillance radars is based on assumptions on point targets against a more or less homogeneous background. Currently, the resolution of many new types of radar is increasing, at least in the range dimension. Therefore many objects no longer can be considered as points. Also, the background is getting more diverse, in statistical terms, since many individual objects in the background are no longer mixed coherently. The current paper proposes as staged approach to detection and parameter assessment of extended objects and adds classification based on the polarimetric features. The evaluation of the approach is based on recordings with a polarimetric radar of real natural scenes and both real and artificially inserted extended objects. It has been observed that a multi-stage detection outperforms a classical method, in terms of the ratio between wanted and unwanted alarms. [C1118]

"The GLR failure detection algorithm for a class of nonlinear dynamic models with application to radar tracking problems"

The paper describes a failure detection algorithm adapted to the target maneuver detection. It is supposed that the target dynamics is non-linear and the maneuver is described by the Gaussian-Markov additive models. [C1119]

"Dismount modeling and detection from small aperture moving radar platforms"

Future advanced radar systems must detect targets of diminishing radar cross section (RCS) at low radial velocity, in demanding clutter and interference environments. Presently, a deficiency in radar detection performance exists between the capabilities of synthetic aperture radar (SAR) for fixed target indication and space-time adaptive processing (STAP) for ground moving target indication (GMTI) of targets with low ground track velocity. Dismounts, individuals or groups running, walking, or crawling, constitute a class of targets that falls into this netherworld between SAR and STAP. While possessing low RCS levels and radial velocities, dismount detection is rendered even more challenging due to their complicated non-linear phase histories that give rise to significant micro-Doppler energies. In this paper we develop a physiological human-gait model for multi-channel moving radar platforms. We characterize the dismount detection performance of a notational UAV system using linear phase, quadratic phase and sinusoidal phase filters. Finally, we summarize our results and present areas of future work. [C1120]

"NRD Guide Pulse Radar Front-End for Range Estimation at 60 GHz"

A pulse radar front-end using an NRD-guide technology was fabricated as an level sensor at millimeter wavelengths, and range finding was performed by using it. Multi-reflection however occurred between a target and a planar antenna due to a pencil beam pattern of our-developing planar antenna, so that precise distance estimation could not be performed for short range detection. To overcome such difficulty, we developed an FPGA-based signal processor to eliminate such multi-reflection and to detect distances of multi layered-targets. [C1121]

"The Time-Domain Scattering Characteristics Analysis of the Typical Satellites in Different Space Attitudes"

A method to study the time-domain/wide-band scattering characteristics variety with satellite attitude change is proposed in this paper, and the time-domain and wide-band electromagnetic scattering characteristics of typical spin-stabilized and triaxis-stabilized satellites in different space attitude conditions (rolling, pitch and yaw) are investigated by using the proposed methods and the parallel finite-difference time-domain (FDTD) code. The results show the change of rolling attitude more easily arouses the variety of scattering characteristic of satellite target than pitch attitude change does. The calculation results may be helpful to the wide band radar for detecting, identifying and tracking of the satellite targets. [C1122]

"Optimizing Estimation of Target's Direction of Arrival after Disturbance Suppression by Exploiting Far Distance Cell's Data"

The paper proposes one processing method of optimizing estimation of direction of arrival (DOA) by utilizing long distance cell's data to suppress radio frequency interference (RFI). After exploiting long distance cell's data to acquire the eigenvector of RFI signal and construct the subspace of RFI signal, we can project the data of

distance cell to be tested onto the subspace of RFI signal. Then the result of projection is subtracted from the data of distance cell to be tested. So RFI signal can be suppressed. We utilize the method of DOA estimation based on MUSIC algorithm to process the data in two cases, i.e. one without suppressed RFI and the other with suppressed RFI, and compare the results of the DOA estimation in the two cases. The feasibility of the processing method is proved by the results of simulation. [C1123]

"Performance of excision switching-CFAR in K distributed sea clutter"

In this paper a new CFAR detector which is composed of an excision processor and a switching-CFAR detector, in an environment with K distribution, has been introduced. The new detector is named an excision switching CFAR Performance of EXS-CFAR is derived and compared with the some other detectors like CA-CFAR, GO-CFAR and SO-CFAR for Swerling I target model in homogeneous and non-homogenous noise environments such as those with multiple interferes and clutter edges. The results show that EXS-CFAR detectors considerably reduce the problem of excessive false alarm probability near clutter edges while maintaining good performance in other environments. [C1124]

"Optimum detection of multiple targets by improved switching CFAR processor"

In radar signal processing, distinction of false targets from real targets and fixing their rate in different radar environments is desirable. In this paper, performance of improved switching constant false alarm rate (ISCFAR) in homogenous and non-homogenous environments consisting clutter and multiple targets in comparison of conventional CFAR processors is derived. The results of detection and false alarm relations of ISCFAR in all radar environments, homogenous and non-homogenous, shows the higher probability of detection with less detection loss in comparison with conventional CFAR processors. Also, simulation results confirm the achievement to an optimum detection threshold in homogenous and non-homogenous radar environment by the mentioned processor. The equations have been achieved by assuming the targets in the Swerling I and closed form. [C1125]

"The Re-Radiation Characteristics Of Nonlinear Target in Harmonic Radar Detection"

The formula of nonlinear junction's re-radiation is expressed by a Taylor series, and the nonlinear network model of the metallic junction is further studied. A relationship between the power, the voltage of the 3rd harmonic wave and the incident frequencies is calculated, and the function curves are obtained after the simulation of MATLAB. [C1126]

"Detection and tracking of marine vehicles in video"

This work presents a novel technique for automatic detection and tracking of marine vehicles in video of open sea. The source of video is a video camera mounted on a buoy platform in open sea. Such system is intended to work autonomously, taking video of the surrounding ocean surface and analyzing them on presence of marine vehicles. The proposed technique is based on detection of marine vehicles in individual video frames and tracking the detected targets through the video sequence with the help of a tracking algorithm. Several performance metrics are utilized for performance evaluation of the proposed approach. Accuracy of detection in 90% range is shown on a dataset of 30 short video sequences taken by a prototype of the system. [C1127]

"Traffic intensity estimation via PHD filtering"

The paper will address the estimation of road traffic intensity from available measurements of mobile vehiclespsila coordinates. To this end, the work will jointly exploit PHD (probability hypothesis density) filtering techniques based on the so called particle filter approach and road-map information. [C1128]

"Maritime target cross section estimation for an ultra-wideband forward scatter radar network"

Preliminary investigation has shown that a chain of buoy based ultra-wideband (UWB) forward scattering radar (FSR) transceivers could potentially be used to overcome clutter problems for the detection of small marine targets on the sea surface. As one stage of a more in depth system investigation, it was deemed that a thorough analysis of the forward scatter radar cross section (RCS) of typical small maritime targets is required for full understanding of the radar system performance. This paper describes the preliminary results of this study, through use of numerically simulated 3-D FS RCSpsilas of complex target models and comparisons with a proposed simplified analytical FS RCS description. [C1129]

"Simulation of GPR returns from finite-length dielectric cylinders"

An approximate analytical solution for time-domain impulse response of low-contrast dielectric targets is derived. The Born approximation is used to calculate the scattered field. The detailed analysis is performed for a finite-length circular cylinder. The way of application of the obtained results to buried dielectric targets is proposed. [C1130]

"Detection and tracking of moving or trapped people hidden by obstacles using ultra-wideband pseudo-noise radar"

Efficient detection of people hidden by walls or rubble is of interest for rescue, surveillance and security operations. A useful method applies an ultra-wideband radar approach for this purpose since electromagnetic waves in the lower GHz-range penetrate most non-metallic materials. The paper gives a short overview of the particular radar conception and shows some experimental results for the tracking of people, detection of breathing people and reconstruction of room interiors. [C1131]

"Signal processing to eliminate multi-reflected pulses for NRD guide pulse radar at 60 GHz"

A pulse radar front-end using an NRD-guide technology was fabricated as an level sensor at millimeter wavelengths, and range finding was performed by using it. Multi-reflection however occurred between a target and a planar antenna due to a pencil beam pattern of our-developing planar antenna, so that precise distance estimation could not be performed for short range detection. To overcome such difficulty, we developed an FPGA-based signal processor to eliminate such multi-reflection and to detect distances of multi layered-targets. [C1132]

"Range resolution improvement for FMCW radars"

Frequency modulated continuous wave (FMCW) radars have been widely used in many on-chip system applications. Compared to the traditional pulse radars, the most attractive features of FMCW radars are power saving and low peak-to-average power ratio. However, due to the sampling rate constrain of the FMCW radar, there is a bottle-neck on the target range resolution if peak detection on the spectrum is used. This paper analyzes the spectrum of the received signal and proposes a curve-fitting based method that improves the range resolution of FMCW radars. With the proposed method, the range resolution can be improved by 20 times. For robustness, our algorithm still works even when signal-to-noise-ratio (SNR) is as low as -10 dB. [C1133]

"Enhancement of Along-Track Interferometry for Ground Moving Target Indication"

Along-Track Interferometry (ATI) for the indication of moving targets with two channel Synthetic Aperture Radar (SAR) shows a low detection probability for a small number of looks. This paper proposes an enhancement called Better ATI (BATI). It is characterized by a constant parameter added to the interferometric SAR image before determining its phase. Statistical analysis shows that the new technique significantly outperforms ATI, is comparable to Displaced Phase Center Antenna (DPCA) for homogeneous terrain and may outperform DPCA in heterogeneous terrain. The theoretical results are confirmed successfully with experimental data. [C1134]

"Subsurface Sensing of Near Surface Object Using Cavity Backed Slot (CBS) Antenna"

This paper presents a novel cavity backed slot (CBS) antenna for subsurface sensing applications. The CBS antenna is designed to be "matched" in the two-half-space configuration (one half space air; and the other ground) over a relatively wide frequency band. As a result, when attached onto ground surface, it is able to efficiently couple microwave power into and out of the ground. In this study, CBS antennas with operating frequency range [8.5 GHz, 13.6 GHz] are designed to detect objects buried in sand. Data acquisition is carried out using a sandpit with size (125 cm times 100 cm times 80 cm) as the test bed. One transmitting CBS antenna is fixed at the center of the sandpit and one receiving antenna is physically moved along a rectangular grid (i.e., multi-static measurement). An inverse synthetic aperture radar (ISAR) algorithm is adopted for inverse processing. A 4-inch-diameter metallic sphere is used as calibration target; and three targets are tested, including a 3-inch-diameter metallic sphere, a T-shaped copper target, and a landmine simulant. Imaging results are presented and compared with those obtained using horn antennas (which are not "matched" to the air-ground interface). Better signal-to-clutter ratios are demonstrated by the proposed CBS antennas. [C1135]

"S-Method-Based Approach for Image Formation, Motion Compensation, and Image Enhancement of Moving Targerts in ISAR and SAR"

In this paper, we present the S-method-based approach to real-time motion compensation, image formation and image enhancement of moving targets in ISAR and SAR. This approach performs better than the Fourier transform by drastically improving images of fast, maneuvering targets. These advantages are a result of the S-

method's ability to automatically compensate for quadratic and all even higher-order terms in phase. Thus, targets with constant acceleration will undergo full motion compensation and their point-scatterers will each be localized. It should be noted that the source of the quadratic term can come from not only acceleration, but also non-uniform rotational motion and the cosine term in wide-angle imaging. The method is also computationally simple, requiring only slight modifications to the existing Fourier transform-based algorithm. [C1136]

"Automatic Point Target Detection for Interactive Visual Analysis of SAR Images"

Point target analysis is an important tool to analyze the quality of SAR images. To permit interactive visual analysis, visualization applications need to automatically detect point targets in a SAR image and estimate associated quality measurements such as the peak sidelobe ratio (PSLR). This task is computationally expensive. In this paper, we propose methods for automatic point target detection that work on hierarchical data structures and process the image data on the graphics processing unit (GPU) to allow interactive use. For each detected point target in the currently visualized area of the image, the visualization application can then display color-coded quality measurements, thus providing the user with an overview of the point targets in the scene as well as an immediate impression of the SAR image quality. Detailed point target analysis results can be displayed on demand. [C1137]

"SAR Remote Sensing Data for Subsurface Targets Detection and Lop Nur Lake Evolution and Extinction Study"

This paper presents the observation from SAR images of the dried Lop Nur Lake in Xinjiang of west China. Lop Nur Lake is one of the driest places in the world and finally lost its last drop of water in 1972. It is well known for its "human ear shape" feature in optical remote sensing images. Likewise, the "ear" feature is shown in synthetic aperture radar (SAR) images, and is even larger because of the penetration effect. The universal existence of lacustrine deposit with high water content and salinity are undetectable by previous remote sensing images in Lop Nur Lake. We have made some laboratory experiments about subsurface soils and developed an improved dielectric model for moist saline soil at microwave bands. A field trip was conducted from October 25 to November 8, 2006 to validate the image interpretation results. As an important indicator for environment degradation and climate change study in arid region, Lop Nur does need long-term and overall research to answer many scientific questions. [C1138]

"Combining Time-Domain Back-Projection and Capon Beamforming for Tomographic SAR Processing"

Various tomographic processing methods have been investigated in recent years. The quality of the focused tomographic image is usually limited by several factors. In particular, Fourier-based focusing methods are susceptible to irregular and sparse sampling, two problems that are unavoidable in case of multi-pass, multi-baseline SAR data acquired by an airborne system. Neither time-domain back-projection (TDBP) processing, although providing a very accurate processing framework, is able to overcome the problem of ambiguous target detection in the tomographic image. In this paper, a possible extension of the TDBP approach to multi-looking based tomographic focusing methods like standard beamforming and Capon beamforming is discussed. Preliminary results obtained with a simulated and a real airborne tomographic P-band data set are shown. [C1139]

"SAR Traffic Monitoring Using Time-Frequency Analysis for Detection and Parameter Estimation"

In the paper a ground moving target indication (GMTI) algorithm operating on preprocessed range-compressed SAR data is presented. For preprocessing range cell migration correction for stationary targets in most practical cases is sufficient. Moving target signal detection and extraction, adaptive range cell migration correction, position and across as well as along-track velocity estimation is then performed without a priori knowledge by using matched filter banks and the fractional Fourier transform. The proposed algorithm is able to cope with multi-component linear frequency modulated signals as they arise in real traffic scenarios containing a number of moving road vehicles. [C1140]

"Radarsat-2 Moving Object Detection Experiment (MODEX)"

This paper presents an overview of various detection and estimation algorithms that have been implemented in the RADARSAT-2 MODEX Processor as well as experimental plans for the validation and demonstration of the space-based GMTI mode. Preliminary RADARSAT-2 GMTI results are also presented. [C1141]

"Effect of band limited filter on receiver performance"

The basic function of the radar receiver is detection and ranging of a target. In receiver, various operations are carried out, to get the baseband signal for signal processing. The components in the receiver cause signal distortion and correlated noise. This paper investigates the effect of receiver bandpass filter on the received signal in radar applications. Signal is barker coded pulse, emphasis is how the signal gets distorted and its effect on the receiver performance. For baseband signal processing, continuous passband communication system is modeled as an equivalent lowpass (ELP) system. Then the autocorrelation function (ACF) invariant discrete equivalent of a continuous system is used to model the complete radar receiver in digital domain. [C1142]

"Data fusion of infrared and radar for target tracking"

A target tracking method based on data fusion of infrared and radar is proposed to improve tracking precision. Unscented Kalman filter (UKF) is applied to process data on distributed fusion architectures. The method combines the advantages of UKF and track-to-track algorithms. The cross-covariances of the two sensors are used to estimate overall covariance and states. The overall estimation is obtained by the track-to-track fusion algorithm for the optimal combination of two correlated estimates. The proposed method is applied to simulating target tracking of infrared and radar. The simulation results show the proposed method has advantages in higher precision, and probability of detection is increased. [C1143]

"Monitoring of Coastal Vessels Using Surface Wave HF Radars: Multiple Frequency, Multiple Site and Multiple Antenna Considerations"

Marine situational awareness is a key factor in coastal activities, e.g. national security (terrorism, drug smuggling, etc.) and environmental protection (marine protected areas, fishery monitoring and regulation, oil spills, etc.). HF surface wave radar is a strong candidate to become a component of any large area, vessel-monitoring network. We discuss estimating the primary metrics for assessing performance for ship tracking radars (probabilities of detection Pdand false alarm Pfa) and their variation with parameters, such as range, azimuth and frequency, and number of observing modes. We discuss several design options for an HF radar, ship monitoring system, such as multiple or single frequency, multiple or single sites or method of target bearing determination (MUSIC or real aperture antenna) and present a model of the SNR for ship detection by HF radar and as well as observational examples of ship detection with single and multifrequency HF radars. Finally we suggest future experiments and draw conclusions. [C1144]

"Target Detection in Multiple-Viewing Through-the-Wall Radar Imaging"

We present a constant-false alarm rate detection scheme for use in Through-the-Wall Radar Imaging. We consider multiple-viewing scenarios with an arbitrary number of vantage points. Classical detection theory is used to fuse the obtained radar images to one reference image. By doing so, clutter and noise artifacts which are strongly represented in the individual images are reduced and targets of interest are more clearly visible. [C1145]

"Moving Target Detection by Forcusing for Frequency Domain Algorithms in UWB Low Frequency SAR"

Moving target detection at low radar frequencies is associated with long integration time and has to handle azimuth focusing for reliable detection. The detection by focusing in which time-domain is the basis for the focusing approach has been proposed and successfully experimented in reality. The main objective of this paper is to apply and evaluate the detection method for frequency-domain algorithms. Range Migration Algorithm (RM) is chosen as a candidate for this study due to the accuracy of the algorithm with very wide integration angles. The simulated SAR data, which is used in this study, is based on the parameters of a airborne UWB low frequency system such as CARABASII. [C1146]

"A statistical model of the effects of angular fluctuations of multi-point scatterer targets on radar detection and tracking performances"

A theoretical model of the effects of angular fluctuations of a complex target on radar tracking performance is described in this paper. By the model the probability that the tracking error (or angle noise) due to the angular fluctuations of the target exceeds a certain value specified by the radar designer can be calculated. The novelty of the model consists in the derivation of an analytical formulation of the radar tracking error probability as a function of experimental radar cross section (RCS) statistics of fluctuating Swerling targets [1], of the space distribution of the scatterers in the target area [2], of the probability of target detection, and the radar parameters. The model is used to investigate radar performances in automotive applications. [C1147]

"Using vertical and horizontal multipath models in radar simulations"

This paper describes models for vertical and horizontal multipath effects, for use with radar simulations. The multipath effect takes place in radar scenarios close to the ground, when the direct ray waveform is interfered with forward reflections from surfaces near the radar or the target. The simplest and well known case is the ground multipath. Here the effect of buildings and walls perpendicular to the ground is also considered, and the total effect of both ground and walls multipath is accounted for. The models here use the image method, well known in mirror optics as well as in radar reflections, for computations. The use of this method is straight forward and well explained for the use of multipath phenomena, both vertical and horizontal, in simulations of radar scenarios. It is shown how to use multipath effects in the analysis of radar performance such as detection (received power) and monopulse angle measurement errors. [C1148]

"Analysis of improved switching CFAR in the presence of clutter and multiple targets"

In radar signal processing distinction of false targets from real targets and fixing their rate in different radar environments is desirable. In this paper, the Switching Constant False Alarm Rate (SCFAR) processor has been improved in order to fix the false alarm rate not only in a homogenous environment only with thermal noise but also in a non-homogenous environment, consisting clutter edge and multiple targets. The equations have been achieved by assuming the targets in Swerling I and closed form. The simulation results confirm that the introduced processor can fix the false alarm rate in both homogenous and non-homogenous environment with less detection loss. In addition, this method is simpler in implementation compared with other samples ordering processors. [C1149]

"Radar signal detection using fractal analysis in K-distributed clutter"

Fractal theory has already been used in radar detection (Le et al., 1993). In this paper, a novel effective approach to detect target from K square clutter has been developed. The approach is based on the use of the fractal dimension estimated by box counting method. Based on this approach, the performance of fractal detector is compared with CA-CFAR detector. It is shown that it is possible to detect the presence of target by observing the fractal dimension of the radar returns especially when the signal-to-noise ration SNR is small. [C1150]

"Time reversal: Algorithms for M-ARY target classification using array signal processing"

An M-ary time reversal (TR) maximum likelihood classifier for a single pair of transmitting and receiving transducer element was derived in for underwater acoustic target detection applications. This paper considers a more general TR setup consisting of a P-element transmitting array and an N element receiving array and derives the M-ary conventional and TR classifiers for the multielement case in an electromagnetic communication environment. We show that the TR algorithm provides a classification gain of over 3 dB at low signal to noise ratios as compared to the conventional classifiers. [C1151]

"Angle-of-arrival assisted Radio Interferometry (ARI) target localization"

In this work, we propose a new technique that makes use of Angle-of-Arrival (AoA) information in conjunction with local interferometry to improve target location estimation. We call this process Angle-of-arrival-assisted Radio Interferometry (ARI). It has a number of desirable attributes including the ability to reduce the synchronization, network, and hardware requirements when operating as the sole RADAR modality and its ability to augment existing pulsed and CW RADAR algorithms. The proposed approach is described and analyzed. [C1152]

"Spectral target classification with SOSTAR-X"

The SOSTAR-X project has developed a demonstrator dedicated to the surveillance of both fixed and moving targets on large coverage areas, target activity analysis on dedicated areas and classification on designated targets. In this project, The Netherlands contribution has been in the areas of Spectral Classification (SPC mode), SAR SPOT mode autofocus, antenna harness, and ground target coordination during the flight campaign in the Netherlands. This paper focuses on the topic of Spectral Classification. The so-called SPC mode is a dedicated mode activated on a designated target, which classifies the target as wheeled, tracked (treaded), rotary wing, or rotating antenna. This is achieved by producing a high resolution Doppler profile, containing modulations caused by moving parts of the vehicle, and classifying on the basis of this profile. The SPC mode has been designed, implemented in the sensor and the Radar Processing Unit, and validated during extensive flight trials, in the Netherlands, Germany, and France. [C1153]

"Optimal signals for MIMO RADAR in the presence of clutter"

Waveform design for target identification and classification in MIMO radar systems has been studied in several recent works. While the previous works considered signal independent noise and found optimal signals, here we extend the results to the case where clutter is also present and then we will find the optimum waveform for MMSE estimator. Choosing optimal waveform for MMSE estimator leads to the Semi-definite programming (SDP)problem, a convex optimization problem which can be efficiently solved through numerical methods. Explicit solution is developed for this SDP problem in two cases. In the first case, target and clutter covariance matrices are jointly diagonalizable and in the second one, signal to noise ratio (SNR)is sufficiently high. [C1154]

"Waveform design for MIMO radar using Kronecker structured matrix estimation"

The multiple-input multiple-output (MIMO) radar system is a new kind of radar technology. It can choose flexibly the probing signals transmitted via its antennas or increase the inter-element distance to reduce the cross-correlation of the signals, so that the spatial diversity gain can be obtained. Waveform design is one of the important topics of the MIMO radar. We discuss here the waveform design method for extended radar targets using Kronecker structured matrix estimation. Simulation results are provided to validate the proposed solutions. [C1155]

"Embedded Sensor Fusion System for Unmanned Vehicle Navigation"

This paper presents the hardware design as well as the implemented sensor fusion algorithms used for navigation purposes in unmanned systems. A design concept is illustrated that has advantages when limited space and changing demands of different unmanned systems are of particular interest. The embedded system demonstrated in this work consists of a Field Programmable gate array (FPGA) board in conjunction with a digital signal processor (DSP) board. By exploiting the individual properties of FPGAs and DSPs, a highly efficient system can be achieved, which is able to process more computationally complex sensor fusion algorithms like iterative sigma point Kalman filters in real time as well as more complex sensor signal processing algorithms used for pulse radar target detection. To validate the system's performance, experimental results are presented by using an unmanned aerial vehicle (UAV). [C1156]

"Target identification and signal processing of millimeter-wave active/passive detecting system based on TMS320LF2812"

This paper conducts the research to the 3 mm wave band millimeter-wave active passive compound detection system signal examination and processing, major study on the design and methods of the system based on TMS320LF2812 signal processor, including the signal analysis and processing of millimeter-wave radar and radiometer. Some practical ways has been improved on hardware and software in AD sampling, and has been confirmed the validity of the proposed scheme by experiment. [C1157]

"Convex optimization and MIMO RADAR waveform design in the presence of clutter"

Waveform design for target identification and classification in MIMO radar systems has been studied in several recent works. While the previous works considered signal independent noise and found optimal signals for an estimation algorithm, here we extend the results to the case where clutter is also present and then we will find the optimum waveform for several estimators differing in the assumptions on the given statistics. Several different approaches to the optimal waveform design are proposed, including minimizing the error of MMSE estimator, minimizing the maximum error of the covariance shaping least square (CSLS) estimator and minimizing the MSE error of scaled least square (SLS) estimator. Choosing optimal waveform for MMSE estimator leads to the semi-definite programming (SDP) problem. Finding the optimal transmit signals for CSLS estimator results in a minimax eigenvalue problem. Finally it is shown that equal power waveforms are the best transmit signals for the SLS estimator. [C1158]

"Novel variable spreading sequence length system for improving the processing speed of DS-UWB radar"

A vehicular radar is an essential device to reduce traffic accidents. As such a radar, direct sequence-ultra wideband (DS-UWB) radar has been studied in recent years. It could detect the target at a high resolution. In order to apply the DS-UWB scheme to the vehicular radar system, we need to measure the distance between vehicles at high speed and control the vehicles with enough time margin. However, we have to enlarge the spreading sequence length very much to extend maximum detectable distance because the DS-UWB scheme use extremely short pulses that is 1ns. Therefore, we need to speed up correlation processing time in the case of measuring long distance. Research done to answer this needs has been scarce until now. In this paper, we

propose a variable spreading sequence length system in order to improve accuracy and reliability by increasing the update rate of data of distance between vehicles. Some simulation results show that ranging time and accuracy could be improved by the proposed system. [C1159]

"Architecture of vision enhancement system for maritime search and rescue"

Because of the limitation of physiological characteristics of human eyes, it is necessary to develop vision enhancement system for maritime search and rescue (SAR-VES), which is intended to improve the poor searching performance of human vision at sea. A system with its framework architecture, which integrate the imaging systems of visible light, infrared, radar and satellite remote sensing, is proposed in this paper to compensate the weakness of the human observation in the maritime search and rescue environment. The system will promote the sensitivity and the detection rate of targets, especially small ones, at sea. It will help improve the safety of life at sea and reduce economical losses in marine accidents. [C1160]

"Investigation of time-reversal processing for surface-penetrating radar detection in a multiple-target configuration"

This paper presents detection and imaging capabilities of a simple time-reversal focusing algorithm, applied to experimental data that are obtained under various radar scene configurations (single- or multiple-target in free-space or through-the-wall). Data are collected with the ultra-wideband surface penetrating radar SIMIS (synthetic-impulse microwave imaging system, designed in LEAT) which operates almost from dc up to 18 GHz. The algorithm propagates time-reversed received signals in a supposedly known medium (either free-space or through a wall with known parameters) using a simple dipole model for the antennas. At each time step, an image of the scene is obtained, corresponding to the instantaneous electric-field energy in each pixel. A focusing criterion, looking for a minimum of entropy combined with a maximum of energy in the image, automatically selects the optimum frame, shown here. Two free-space (dielectric target, dielectric and metallic target) and one through-the-wall (dielectric target) configurations are investigated, showing the efficiency of the method. [C1161]

"Comparison of basic inversion techniques for through-wall imaging using UWB radar"

In this paper, we consider the problem of detecting and localizing static objects in a room using thoughwall ultra-wideband (UWB) radar SAR measurements. This paper investigates basic inversion (imaging) techniques which are used for interpreting the raw radar data in an understandable way. We also introduce a fast method for estimating the travel time between the antennas and the targets. The accuracy and computational complexity of the imaging techniques are analyzed and compared. [C1162]

"Performance of reiterated LMMSE filtering and coded radar waveforms"

OFDM waveforms offer strong advantages for integrated communication and radar systems. Nevertheless they require filtering at the receiver that can serve for sidelobe suppression in order to avoid target masking. However unmasking is not the only concern, it is crucial to evaluate the filtering scheme both in terms of sidelobe suppression capability but also in terms of output signal to noise ratio. This last criterion is essential when aiming at detecting also weaker reflections. In this paper the theoretical performance of the reiterated filtering technique based on LMMSE is derived and compared to the matched filter. The unmasking capabilities are relevant, but also output power figures. Moreover the performance of reiterated LMMSE is evaluated for OFDM communication-encoded radar waveforms. [C1163]

"The concept of simple MIMO PCL radar"

The paper present a concept of a simple MIMO (multiple input multiple output) PCL (passive coherent location) radar relying on FM radio transmitters of opportunity. The use of MIMO approach instead the classical phased antenna results in significant increase in surveillance volume without changing requirements for computational power. [C1164]

"Robustness of polarimetric detection algorithms against steering mismatches"

We analyze robustness of several multichannel radar detection algorithms to mismatches in the steering vector. In particular, we address the scenario of a staged detection, where a history of measurements provides the region of interest and a-priori polarimetric target signatures for a target. The four second stage detection approaches-optimally weighed span, Kellypsilas and Robeypsilas detectors, and Gerlachpsilas secondary data free detector-are considered using these polarimetric features. The evaluation based on recordings of real natural scenes and both real and artificially inserted extended objects concerns robustness of these algorithms to mismatches in the steering vector. It has been observed-for different ground clutter environments into which

extended target is placed-that Kellypsilas detector provides the best detection but may suffer severely from the mismatch, Gerlachpsilas detector while allowing higher probability of false alarms, produces the most stable performance and Robeypsilas matched filter gives a suitable trade-off. [C1165]

"Indirect holographic imaging at 310 GHz"

We present an indirect holographic imaging technique, which can be used, e.g., in airport check-in security. In this method, only amplitude detection is required-easing the challenges often encountered in active imagers requiring complex field measurement. The imaging is based on back-propagation of complex electric field reconstructed at a rectangular aperture of the imager. The complex field at the aperture is retrieved by applying a reference wave, which creates an interference pattern, a hologram, with the wave reflected from the target. The method presented also allows for use of reference wave other than a plane wave. We present a setup, with which details of size of 2 mm are discernable at a distance of 1.5 m from the aperture, indicating reasonably high cross-range resolution. [C1166]

"Strong complex echo removal in noise radar"

A continuous wave noise radar receives all the echoes simultaneously. Thus, strong echoes of nearby targets mask the weak echoes of far targets. Even if the echoes are separated in Doppler and in range, the strong echo produces relatively high sidelobes at the output of the correlation receiver. The sidelobes may prevent the detection of a weaker echo. Classical methods of strong echo removal, based on point scatterer model and successive subtraction of modelled strong echoes, may fail if the strong echo is not a single reflecting point. In the paper, a new method of handling a complex strong echo is introduced, along with computer simulation results. The proposed method is based on a joint modelling of a multipoint target echo. [C1167]

"Combined neural networks for radar target recognition from radar range profiles"

This article proposes a new architecture of combined neural networks, which is used to recognize the radar targets from radar range profiles. Combined neural network consists of an invariant neural network and a neural network classifier. The efficiency of these networks is proved by the experimental results. Proposed combined neural networks can be applied to divergent areas of pattern recognition, such as recognition systems of periodic signals, images, numerical series.... [C1168]

"An approach for passive radar using a smart antenna system"

An antenna without phase center system used for DOA estimation and beam steering was introduced in. In the radar problem, the antenna can receive the signals scattered from a moving target. In this paper, an approach for passive radar using a smart antenna system is introduced. We assume that the primary transmitted signal comes from a known fix voice broadcasting station. The principle of the passive radar are presented. [C1169]

"Edge Detection in Speckled SAR Images with Improved ROEWA"

Automatic detection of sustained intensity changes (edges) in SAR images for applications requiring localization and identification of objects is complicated by the nature of the speckle. The speckle is characterized by a high degree of correlation and multiplicative signal dependence. Ratio based detectors like MRoA and RGoA edge detector use predefined thresholds. The modified RGoA detector defines an automatic threshold determining method. But all these edge detectors, apart from detecting the object edges, detect a number of false edges. In this paper, a new ROEWA based algorithm that automatically discriminates the object boundaries and the false edges is proposed. Otsupsilas nonparametric and unsupervised principle for automatic threshold selection is introduced in this classification process. An optimal threshold is selected by maximizing the seperability of the classes in gray level. Real SAR images are used to verify our method and the results are compared with the existing methods for edge detection. Experimental results show that the proposed method is robust and efficient. [C1170]

"Automatic target detection using wavelet technique in forward scattering radar"

This paper describes aspects of ground target detection in forward scattering radar (FSR). The problem of extracting the Doppler signature in different interference environments is addressed. Hilbert transform and wavelet technique have been used to predict the existence of target. The paper begins with a brief description of the system, followed by a more detailed analytical study of predicting the presence of target in FSR. Two sets of practical experimentation have been realised to evaluate the proposed algorithm. [C1171]

"Automatic target classification in a low frequency FSR network"

This paper presents the evaluation of a low-frequency forward scattering radar (FSR) network for the classification of ground targets. The experimental results of automatic targets classification for different operational frequencies are presented and discussed. The possibility of target recognition is shown for system operating frequencies in the VHF band. [C1172]

"Target resolution enhancement in UWB radar for security system"

Detection of body-worn hidden weapons requires improved target resolution. Human being with attached hidden weapon represents multi-target system where weapon as a target in question is masked by human body response. Before application of identification methods it is necessary to resolve composing responses belonging to human and target of interest. Both true time-domain (TD) and frequency domain (FD) representation of responses suffer an ambiguity of signal interpretation when targets are placed close to each other with masking effect. Method of multiple target resolution is suggested based on both TD and FD analysis of equalized signal. UWB short pulse is utilized as an interrogating signal and time-domain responses are measured. Results of TD measurements are presented and signal equalizing calibration procedure is described. Signal processing is based on adaptive filtering algorithms to provide equalization by a reference channel in order to remove any RF system distortion of the received signal. It is shown that combined utilization of calibrated and equalized signals in terms of both power spectrum density (PSD) and TD impulse response enables multi target resolution. [C1173]

"Super-Resolution of Polarimetric SAR Images Based on Target Decomposition and Polarimetric Spatial Correlation"

Polarimetric SAR (PolSAR) is becoming more and more popular in remote sensing research area. Super-resolution processing of PolSAR image is usually desired for PolSAR image applications, such as image interpretation and target detection. Usually in a PolSAR image, each resolution contains several different scattering mechanisms. If these mechanisms can be allocated to different parts in one resolution cell, the details of the images can be enhanced, which means the resolution of the images is improved. In this paper, a new super-resolution algorithm for PolSAR image processing is proposed, in which target decomposition and polarimetric spatial correlation are both taken into consideration. Results of ESAR L-band full polarized images have validated the effectiveness of the proposed method. [C1174]

"Resonance based radar target identification using principal component analysis"

In this paper, a novel technique, based on principal component analysis (PCA), is used to enhance the resonance based target identification process. PCA is used to combine the backscattered signatures of the target from different incident aspect angles. The dominant CNRs of the target are then extracted from the fused signature. [C1175]

"Range finding for multi-layered targets using NRD guide pulse radar system at 60 GHz"

From the viewpoint of range findings of multi layers in a tank, pulse radar systems using millimeter-wave frequencies are preferable for such multi-reflection environment because pencil beam patterns can be easily obtained. With this in mind, pulse radar front-ends using an NRD-guide technology were fabricated. And moreover, an FPGA-based digital signal processor including high-speed counting, memorizing, and averaging was developed to remove range-finding error due to multi-reflection between the radar and the target. Based on this technique, a simple range finding test was performed. This signal processor however could not detect distances to multi-layered targets. This paper presents improvement of the signal processor to recognize reflected pulses from the multi-layered targets and to precisely detect the measurement distance by using the sequential sampling. [C1176]

"An improved STAP algorithm by applying APES"

Over the past few decades, GMTI techniques have played an important role in the war. Recently, space-time adaptive processing, as one of GMTI techniques has shown the potential to adaptively cancel the clutter and has been widely used for GMTI radar. For advanced airborne radar system, it must be able to suppress undesired clutter, jamming, and thermal noise so as to detect targets. The problem is complicated due to the motion of the platform, as the ground clutter received by the radar is spread out in range, spatial angle, and also over Doppler. Traditional one-dimensional (1-D) processing strategy is insufficient for separating the moving target from ground clutter. In 1973, Brennan and Reed proposed space-time adaptive processing (STAP) method, which adaptively processes returns from multiple pulses and multiple channels (2-D) to attenuate interference power while

preserving target power. Although STAP has good performance in clutter suppression, however usually large number of pulses and channels are required, it means that high computational load is unavoidable. This paper proposed a method by using Amplitude and Phase Estimation (APES) approach to improve the STAP performance without increasing the number of pulses and the number of channels, and in hence, without introducing high computational complexity. Simulations are presented to show the effectiveness of the method. [C1177]

"Optimal waveform design for cognitive radar"

A key component of a cognitive radar system is the method by which the transmitted waveform is adapted in response to information regarding the radar environment. The goal of such adaptation methods is to provide a flexible framework that can synthesize waveforms that provide different tradeoffs between a variety of performance objectives, and can do so efficiently. In this paper, we propose a waveform design method that efficiently synthesizes waveforms that provide a trade-off between estimation performance for a Gaussian ensemble of targets and detection performance for a specific target. In particular, the method synthesizes (finite length) waveforms that achieve an inherent trade-off between the (Gaussian) mutual information and the signal-to-noise ratio (SNR) for a particular target. In addition, the method can accommodate a variety of constraints on the transmitted spectrum. We show that the waveform design problem can be formulated as a convex optimization problem in the autocorrelation of the waveform, and we develop a customized interior point method for efficiently obtaining a globally optimal waveform. [C1178]

"Performance Analysis and Improved Method for Airborne Three-Channel SAR/GMTI System"

A new antenna arrange scheme and moving target detection method is presented after analyzing the shortcoming of conventional three-channel synthetic aperture radar (SAR) ground moving target indication (GMTI) methods. The shortcoming of conventional three-channel SAR/GMTI methods is that you cannot improve the performance of minimum detectable velocity, ambiguous speed and blind-velocities simultaneously to meet the requirements of the system. The improved method proposed in this paper solves the problem by rearranging the transmitting and receiving antennae without increasing the number of receiving channels. Theoretical analysis and simulation results show the validity of this scheme. [C1179]

"Small targets detection in low resolution sea clutter"

A kind of EWNI method is proposed in this paper. It can decrease the detectable SCR of small targets contrasted with normal noncoherent integration. To suppress false alarms, MHT method is adopted to reach the le-6 Pfa. The scheme proposed in this paper is suitable for S band marine surveillance radar to detect small targets in sea clutter. [C1180]

"Difference-time processing characteristics in systems with pulse noise censoring"

Systems of LFM radar signals coherent packet processing with pulsed noise (PN) censoring at the input of matched filter (MF) and frequency threshold (FT), provided low level of false alarm probability from signals, reflected from point moving clutter (PMC), are considered. Characteristics of moving target signals detection are obtained and values of false alarm rate from PMC in conditions of simultaneously influencing PN are determined. [C1181]

"Ranging error of ultra-wideband vehicle radar"

High range-resolution radar using ultra wideband radio attracts considerable attention as short range vehicle radar. Since it provides high range-resolution to the multiple scatters that constitute a vehicle target, range glint is improved and the ranging accuracy will be improved as compared with that of a low-resolution radar system. However there is no paper regarding the ranging error. In this paper we conducted the measurements and discussed the ranging errors for various bandwidths. [C1182]

"Vision based flying vehicle tracking"

In this paper, we have proposed an efficient vision based method for the tracking of flying vehicles via a moving video camera. The suggested approach is based on the combination of the feature extraction and matching algorithm as well as the 2D deformable mesh surfaces. We have developed a new set of energy functions for mesh to improve the performance and quality of the tracking algorithm. The proposed method is capable of estimating both the kernel and contour of the flying vehicle. To evaluate the suggested system, we have defined a criterion to measure the tracking error percentage (TEP) during video frames. The proposed method tested with several flying vehicles videos in different atmospheric conditions and maneuvering motions and experimental

results showed high accuracy, stability, and convergence in noisy and noiseless video sequences. [C1183]

"A Novel Adaptive Ground Clutter Removal Algorithm for High Range Resolution MMW Radar"

In this paper we present a novel adaptive ground clutter removal algorithm for high range resolution MMW-radar application where the dielectric contrast between the air and the ground material is close to or even higher than that between the target and the surrounding medium. Most of the ground clutter removal algorithms used nowadays, show weak performances in the case of a rough ground surface or suffer from high computation complexity. The algorithm presented in this contribution is capable to remove the ground clutter resulting from undulated surfaces by estimating not only the position but also the varying signal shape and enables a near optimal ground clutter reduction with a moderate computation complexity. [C1184]

"In a period compensation characteristics in the pulsed noise censoring system"

The system of radar LFM signals coherent packet processing with pulsed noise (PN) censoring at the input of matched filter (MF) and signals, reflected from local subjects (LS), in a period compensation IPC are considered. Characteristics of LS, PN signals suppression in IPC, target signals detection and permission are obtained. For PN, which power lower than LS signals power, censoring reliability increase, it's offered to produce IPC of uncompressed LFM signals before PN censor. [C1185]

"Difference-time processing characteristics in systems with pulsed noise censoring"

Systems of LFM radar signals coherent packet processing with pulsed noise (PN) censoring at the input of matched filter (MF) and frequency threshold (FT), provided low level of false alarm probability from signals, reflected from point moving clutter (PMC), are considered. Characteristics of moving target signals detection are obtained and values of false alarm rate from PMC in conditions of simultaneously influencing PN are determined. [C1186]

"In a period compensation characteristics in the pulsed noise censoring systems"

The systems of radar LFM signals coherent packet processing with pulsed noise (PN) censoring at the input, of matched filter (MF) and signals, reflected from local subjects (LS), in a period compensation (IPC) are considered. Characteristics of LS, PN signals suppression in IPC, target signals detection and permission are obtained. For PN, which power lower than LS signals power, censoring reliability increase, it's offered to produce IPC of uncompressed LFM signals before PN censor. [C1187]

"Buried underwater target classification using frequency subband coherence analysis"

This study introduces a new feature extraction method for detection and classification of buried underwater mine-like objects. Multiple sonar returns off an object are used, where each sonar return is characterized by its specific frequency subbands, which contain valuable discriminatory information that can be used to correctly determine the type of object encountered. Features are extracted from the data using canonical correlation analysis (CCA) between the selected frequency subbands of two sonar returns and are subsequently used to classify mine-like and non-mine-like objects using a simple classifier. This method offers a more rigorous way of performing acoustic color processing where ping-to-ping coherence between sonar returns is also exploited in extracting acoustic color features. This method will be tested against a previously developed time domain multiple aspect feature extraction method on a database that contains sonar returns from various buried or proud mine-like and non-mine-like objects in different operating and environmental conditions. Results will be presented in terms of the receiver operating characteristic (ROC) curve for each system and overall detection and classification performance in different operating and environmental conditions. [C1188]

"Study of High-Precision Altimetry Arithmetic in LFMCW Radar System"

Introducing a LFMCW (linear frequency modulated continuous wave) radar altimeter system, which is modulating by the triangular wave, is a continuous wave modulation system of access to distance information through modulating the continuous wave. Comparing with the pulse radar, LFMCW radar has many advantages. It is based on the principle of electromagnetic wave propagation delay time in space to determine the height of the Earth's surface craft. a new arithmetic of processing the echo signal is put forward, in order to achieve the high precision altimetry and target detection and ensure the steady false alarm. The arithmetic adopts the manner of accumulating average through the sliding window, making use of the Doppler frequency shift. Through the echo signal is demodulated and collected and processed, the information of speed and distance is picked up and the false and lose alarm are eliminated when the altitude and the speed are measured in the radar altimetry system. [C1189]

"Complex point target models for multistatic radar"

A mathematical and statistical model for complex point targets is proposed that may be applicable to statistical inference problems in multistatic or MIMO radar systems. Such targets are not resolved in space, but exhibit varying complex reflectivity across different bistatic view angles. The complex reflectivity can be modeled as a complex stochastic process whose index set is the set of all bistatic view angles, and the parameters of this stochastic process follow from an analysis of a target model comprising a number of ideal point scatterers randomly located within some radius of the target's center of mass. Six different models are proposed, with different assumed distributions on the locations of the point scatterers within the target. [C1190]

"Difference patterns from continuous line sources"

Sum and difference patterns are produced from two arrays or from one array with dual excitations. Sum patterns are useful for range detection of moving targets and the difference patterns are useful to determine angular tracking accuracy. Some works are available in literature on such patterns from different arrays .In the present work, an attempt is made to produce difference patterns from continuous line source of different lengths. The patterns are presented in sin-thetas domain. [C1191]

"Removing ping timing ambiguity via data association"

This paper considers the use of a multiple ping active sonar approach in order to track multiple targets. In most underwater target tracking applications that rely on active sonar observations, the sonar sends out a single ping at each scan interval and receives returns that might either be from target(s) or due to clutter. We propose to use a multi-ping paradigm, with the idea that the better detectability of more pings can, assuming a high clutter density, lead to better localization of targets. However, this introduces a timing ambiguity in the ping returns adding a new level of complexity in the data association. In this paper we propose a multi-ping data association (MPDA) algorithm as a solution. MPDA formulates the assignment problem as a linear program, which could then be solved using a primal-dual interior point approach. A comparison is made between three different scenarios: (a) the sonar sends out a single ping in each scan interval; there is no timing ambiguity (which return is due to which ping), (b) the sonar sends out multiple pings within a scan interval and the timing ambiguity is avoided by using orthogonal waveforms for each ping, (c) when the sonar sends out multiple pings, each ping being an identical waveform, within each scan, leading to a timing ambiguity. A well known multiple target tracking technique such as the JPDA is used in cases (a) and (b), while the MPDA algorithm is used to solve the assignment problem in case (c), and is shown to perform better than case (a) in high clutter densities. Case (b), the unrealizable bogey, performs best. [C1192]

"Morphological operator and Empirical Mode Decomposition for clutter mitigation"

Maritime surveillance of the Exclusive Economic Zone (EEZ) is a present military and civilian challenge. The High Frequency Surface Wave Radar, as its coverage range is not limited by the radio horizon, is well-suited to fulfil this task. Effect of ionospheric clutter can, however, strongly limits target detection. Ionospheric clutter results from disturbance in ionization. In previous works we proposed using wavelets to remove the clutter. We are now considering another multi-scale analysis. Indeed, we wondered if an evolving basis could overcome the issue. Empirical Mode Decomposition (EMD) might offer such a possibility. The initial idea is still using multi-scale analysis to turn to good account the differences in variation scales of targets and ionospheric clutter. Apart from the fact that basis functions is self-determined by the EMD. We have also tried to associate morphological operators and EMD. We are presenting here the first results of our investigations. [C1193]

"Nonlinear decision rules for robust noncoherent integration"

New nonlinear decision rules for performing noncoherent integration (NCI) of multiple radar dwells are determined. Conventional noncoherent integration followed by CFAR can be greatly desensitized when the noise energy varies from dwell to dwell. The new rules are robust to dwell to dwell variations in noise energy, providing CFAR and minimizing detection loss. For slow fluctuation target models the locally most powerful decision rule outperforms conventional NCI even in stationary noise conditions. In addition, a composite test is provided that outperforms all individual binary integration (BI) M out of N tests independent of target fluctuation model and is suitable for distributed detection. [C1194]

"Communication-inspired sensing"

Information theory, and particularly the mutual information (MI) has provided fundamental guidance for communications research. In, the MI was first applied to radar waveform design. However, the practical meaning

of MI in the sensing context remains unclear. Recently, shows that under the white noise assumption, the water-filling scheme simultaneously maximizes the MI and minimizes the minimum MSE (MMSE). Such an equivalence disappears when the target parameter statistics are not perfectly known. To further the understanding of the practical meaning of MI and to establish a connection between MI and commonly adopted MSE measures for sensing, this paper takes a fresh look at the target estimation problem, by considering the general colored noise, incorporating the normalized MSE (NMSE), and establishing joint robust designs for both the transmitter (waveforms) and the receiver (estimator) under various target and noise uncertainty levels. Our results show that: i) the optimum waveform designs resulted from the MI, MMSE and NMSE criteria are all different; and ii) compared to MMSE, the NMSE-based designs share more similarities with the MI-based ones, especially when the target and noise statistics are not perfectly known. [C1195]

"Compressed sensing in MIMO radar"

Compressed sensing is a technique for efficiently sampling signals which are sparse in some transform domain. Recently, the idea of compressed sensing has been used in the radar system. When the number of targets on the range-Doppler plane is small, the target scene can be reconstructed by employing the compressed sensing techniques. In this paper, we extend this idea to the MIMO radar. In the MIMO radar, the compressed sensing technique can be used to reconstruct the target scene when the signals are sparse in the range-Doppler-angle space. To effectively reconstruct the target scene, it is required that the correlation between the target responses be small. In this paper, a waveform design method is introduced to reduce the correlations between target responses. Because of the increased dimensionality in MIMO radars as compared to phased array radars, the impact of compressed sensing will be very significant there. [C1196]

"Dynamic waveform design for target tracking using MIMO radar"

In this paper, we investigate waveform design for dynamic target tracking using a multiple-input, multiple-output (MIMO) radar system. The agile tracking application is based on our recently derived Cramer-Rao lower bound (CRLB) for estimating target position and velocity, that is represented in terms of the transmitted waveform parameters. Using the CRLB at high signal-to-noise ratio (SNR), we adaptively select the waveform parameters that minimize the predicted mean-squared error (MSE) at each time step. We demonstrate the improvement in agile tracking using numerical simulations. [C1197]

"Preprocessing by eigenbeams and Doppler filters to improve performance of detection of signal number"

In this paper, a preprocessing by spatial eigenbeamforming and coherent Doppler filtering for improving detection performance of signal number for highly-correlated signals in low SNR condition is proposed for radar system with digital beamformer. The proposed method utilizes that all of highly-correlated target signals exist in one specific Doppler bin with different Doppler frequency. In this method, eigenbeams from target covariance matrix are formed followed by coherent Doppler filtering with DFT for SNR improvement prior to signal number detection such as MDL. Evaluation of proposed preprocessing with MDL by computer simulation showed higher performance compared with conventional MDL. Quantitatively required SNR is reduced by approximately 7 dB compared with conventional MDL when 50% of probability of correct signal number detection is specified for two closely-spaced targets scenario. [C1198]

"Compressed sensing for OFDM/MIMO radar"

In passive radar, two main challenges are: mitigating the direct blast, since the illuminators broadcast continuously, and achieving a large enough integration gain to detect targets. While the first has to be solved in part in the analog part of the processing chain, due to the huge difference of signal strength between the direct blast and weak target reflections, the second is about combining enough signal efficiently, while not sacrificing too much performance. When combining this setup with digital multicarrier waveforms like orthogonal frequency division multiplex (OFDM) in digital audio/video broadcast (DAB/DVB), this problem can be seen to be a version of multiple-input multiple-output (MIMO) radar. We start with an existing approach, based on efficient fast Fourier transform (FFT) operation to detect target signatures, and show how this approach is related to a standard matched filter approach based on a piece-wise constant approximation of the phase rotation caused by Doppler shift. We then suggest two more applicable algorithms, one based on subspace processing and one based on sparse estimation. We compare these various approaches based on a detailed simulation scenario with two closing targets and experimental data recorded from a DAB network in Germany. [C1199]

"MIMO radar detection of targets in compound-Gaussian clutter"

Multiple-input multiple-output (MIMO) radars with widely-separated transmitters and receivers are useful to

discriminate a target from clutter using the spatial diversity of the scatterers in the illuminated scene. We consider the detection of targets in compound-Gaussian clutter fitting for example scatterers with heavy-tailed distributions for high-resolution and/or low-grazing-angle radars in the presence of sea or foliage clutter. First, we introduce a data model using the inverse gamma distribution to represent the clutter texture. Then, we apply the parameter-expanded expectation-maximization (PX-EM) algorithm to estimate the clutter texture and speckle, as well as the target parameters.We develop a generalized likelihood ratio (GLR) test target detector using the estimates and show the advantages of MIMO using Monte Carlo simulations. [C1200]

"Networked Multi-target Detection Using Electromagnetic Modeling and Neural Network"

Multi-target detection is crucial in modern warfare. It is challenging to distinguish radar returns of multiple, separate targets from those of multiple reflection points on a single target. Methods developed so far use straightforward discrimination, which is computationally complex. In this paper, we propose ideas to detect multi-targets by using electromagnetic modeling and neural networks (NNs). Preliminary result for missile identification through NN is presented for indicating the efficiency of NN for multi-target detection. [C1201]

"Polarimetric Scattering Analysis for Simplified Man-Made Structure Model on Rough and/or Inclined Ground Plane"

This paper analytically examines polarimetric scattering for a simplified man-made structure model, by utilizing the finite-difference time-domain (FDTD) method. The model considered here simulates a building in mountainous environment and is composed of a dielectric rectangular parallelepiped on finite rough and/or inclined plate. The statistical FDTD analysis on two polarimetric indices, the scattered power decomposition and the polarimetric correlation coefficient, with respect to squint angle change is carried out. It is found from the detailed analysis that the considered polarimetric indices are valid even when the surface of the ground plate has small roughness and gentle slope. This result contributes to the development of Polarimetric Synthetic Aperture Radar (POL-SAR) image analysis for detecting or classifying man-made residential houses in mountainous region. [C1202]

"Identification of Coherent Scatterers: Spectral Correlation vs. Multi-Chromatic Phase Analysis"

In recent years, attention has been devoted to the possibility of retrieving accurate phase information from stable targets in long SAR data series through Permanent Scatterers Interferometry (PSI), SBAS approach or equivalent methods. Recently, alternative methods for detecting stable targets on single images have been investigated. In particular, the availability of new SAR sensors provided with innovative features, including a wider transmitted bandwidth, allows to explore backscatter stability in the new dimension given by spectral diversity. The Multi-Chromatic Phase (MCP) approach, introduced in [2], uses images processed at range sub-bands and explores the phase trend of each pixel as a function of the different central carrier frequencies. In this paper we present the results of the application of this technique to point target detection. We compare the results with an alternative method proposed in [5] which identifies scatterers with stable spectral behavior. [C1203]

"A New Method of SAR Image Target Recognition based on AdaBoost Algorithm"

We propose a novel target recognition algorithm for classification of three types of ground vehicles in the moving and stationary target acquisition and recognition public release database. Algorithms that produce classifiers with large margins, such as support vector machines (SVMs), AdaBoost, etc. are receiving more and more attention in the literature. A real application of AdaBoost for synthetic aperture radar automatic target recognition is presented and the result is compared with conventional classifiers. And we also describe how AdaBoost algorithm can be used as a multiclass classification method as well as a feature fusion method. Results are presented to verify that, the performance of the recognition system is improved significantly, and the method presented in this paper is an effective method for SAR images feature fusion and target recognition. [C1204]

"Very High Resolution Interferogram Acquisition Campaign and Analysis"

The ONERA RAMSES system is a flexible SAR system in constant evolution, developed mainly as a test bench for new technologies and to provide specific data for TDRI (Target Detection, Recognition and Identification) algorithm evaluation. It is flown on a Transall C160 platform operated by the CEV (Centre d'Essais en Vol). This paper presents the multi-pass interferometric acquisitions in very high resolution acquired over Salon de Provence, in south of France. The interferometric and coherence information capabilities are analyzed for this resolution. [C1205]

"Integration of RADARSAT-2 Dual and Quad Polarization Data into Pipeline Third Party Encroachment Monitoring"

Mechanical damage incurred from unauthorized third-party activities remains a leading cause of oil and gas pipeline failure, indicating the need for effective strategies to monitor encroachment over extensive sections of pipeline right-of-ways (ROWs). The purposes of the work discussed in this paper are to evaluate the use of polarimetric spaceborne synthetic aperture radar (SAR) for detecting vehicle targets and discriminating them from false alarms and to lay the foundation for integrating RADARSAT-2 products into the existing encroachment management system (EMS). RADARSAT-2 simulated products were created from Convair-580 imagery collected over Calgary, Canada. Results show that target detection is better for higher resolution data, but discrimination of targets from false alarms is better for dual and quad polarization data due to the increased feature set available that captures more of the scattering behavior. Overall, the Ultra Fine HH and dualpolarization Fine HH/HV or quad-polarization Fine are the recommended modes for an EMS using RADARSAT-2. [C1206]

"Change Detection with Multi-Polarization SAR Imagery"

In this paper, change detection with multi-polarization SAR imagery is focused. Based on the polarimetric statistic distribution, a polarimetric test statistic is applied to evaluate the equality of two areas in two pass polarimetric SAR images. And then, in order to find out the `real' changed area, a constant false alarms rate (Pfa) is given to determine a threshold for change detection. Moreover, a majority processing considering the context information of a given target is preferred to improving the final accuracy of the change detection. Finally, the proposed method was tested with the multitemporal Envisat-ASAR's alternative polarization SAR data. Experiments are performed to validate efficiency of the method presented in the paper. [C1207]

"Moving Targets Detection and Analysis on Multi-Look Polarimetric SAR Images using PWF Method"

The motion of moving targets causes distortions in SAR image, which present a challenge on image interpretation. Comparing to stationary targets' signatures, signatures of moving target are distorted from azimuth displacement to smearing beyond detectability. In this paper, a moving target detection algorithm is proposed based on polarimetric whitening filter (PWF) as well as time-frequency (TF) analysis. An experiment is implemented using multi-look X-band PolSAR image acquired by PiSAR. Both moving target and stationary target are included in the image. Results shows PWF method and time-frequency analysis could be used detect moving targets as respected. [C1208]

"Dual Polarization Detection of Ships and Icebergs-Recent Results with ENVISAT ASAR and Data Simulations of RADARSAT-2"

The RADARSAT-2 satellite is an advanced C-band synthetic aperture radar (SAR) with a variety of new modes including options for polarization combinations, resolution, and swath width. This paper examines the potential of multi polarization data for detecting and discriminating ship and iceberg targets Data used in this study consist of well validated airborne Convair-580 SAR and spaceborne ASAR HH/HV and HH/VV. In total, the data set used for evaluating detection and discrimination consists of 901 validated iceberg and ship targets. Optimizing target detection is accomplished using receiver operator curves (ROC) as proposed by [6] and discrimination is conducted using a quadratic discriminant (QD) with feature selection based on sequential forward selection (SFS). In general it was found that detection and discrimination improve with more polarimetric information; however, HH/HV and VV/VH only had nominally less discrimination performance than the quad polarization modes evaluated. [C1209]

"A DCT-based Change Detection Method for Multi-Temporal SAR Images"

This paper aims at effectively detecting the changes in multi-temporal synthetic aperture radar (SAR) images. Since pixel-based method does not sufficiently utilize the correlation between pixels, it usually may only be used in some specific applications. We propose a change detection method that is based upon discrete cosine transform (DCT) classification. It can utilize the correlation between pixels and eliminate unimportant or nuisance forms of changes. It generates a threshold automatically in DCT classification according to the relationship between DCT coefficient and pixel's gray level. In order to eliminate the block effect, we check pixels not only within the target block, but also inside the neighborhood window around the target block. Experimental results show that the proposed method outperforms some recently published pixel-based methods. [C1210]

"CR-Based SAR-Interferometry for Landslide Monitoring"

To monitor and detect the events of landslide, rock-fall along the banks of the Yangtze River in the Three

Gorges area, the differential INSAR technique with corner reflectors (CR-INSAR) might be more effective than the conventional geological, and discrete GPS measurement techniques, conventional D-INSAR, as well as nature persistent scatteres method. Unfortunately, in most parts of the world, the correlation between radar acquisitions degrades with time due to vegetation, climatic condition, or other surface property changes. In those areas only a few persistent point scatterers or even no any one can be found out. The corner reflectors, duo to their design, provide a very clear and stable target response (both amplitude and phase) to the radar at any acquisition time. They don't suffer from de-correlation effects of conventional InSAR. Aside from the millimeter-lever measurement accuracy, the great benefit of this technique is the regular and remote monitoring and measuring without the need for repeated ground field visits and their associated costs. [C1211]

"Computation of Optimum Azimuth Sampling Time for Dual-Channel DPCA System based on Signal-to-Noise Ratio"

This paper starts on the flow of moving target detection in dual channel DPCA system. Firstly the output power density spectrum of moving target and noise in DPCA system is analyzed, and the output SNR is obtained. Then the effect of synthetic aperture time of moving target's echo and azimuth antenna pattern on output SNR in DPCA is discussed in detail. Based on this effect, the paper deduces the expression which describes the variation of output SNR against synthetic aperture time in Dual-Channel DPCA system, where azimuth pattern is Sinc function, and the synthetic aperture time for optimizing the ability of detecting the moving target is obtained. Further more, this method of acquiring the aperture time can be applied for other antenna patterns. It is testified by processed result of simulated data that the relationship between output SNR and synthetic aperture time fits the above conclusion in Dual-Channel DPCA system. [C1212]

"Moving Target Detection in along Track SAR Interferometry from In-Phase and Quadrature Components Data"

We show that using the in-phase and quadrature components of the two acquired images in AT-InSAR systems produces an increasing of the detection probability of ground moving targets for constant false alarm rates respect to the detection performance obtained with AT-InSAR conventional systems using only phase information. In this paper, we consider a Gaussian model for the moving target response. The improved performances of the proposed method respect to the interferometric phase approach are showed with numerical experiments on simulated data, and varying the signal to clutter ratio (SCR) and the target radial velocity. [C1213]

"Region Feature Extraction Based on Improved Regularization Method in SAR Image"

The noise existed in Synthetic Aperture Radar (SAR) image weakens the detailed features of region of interest (ROI) such as target and shadow. It also leads to the serious performance reduction of subsequent target detection, classification and recognition. The conventional regularization method could enhance target features in SAR image; however, the high computation complexity limits the real-time application of it. An improved regularization method is introduced in this paper, which increases processing speed of region feature extraction for SAR image significantly. It is theoretically proved that, by optimizing SAR projection operator, computation complexity could be reduced from O(M3N3) to O(MN) without ability losing of the region-based feature enhancement. MSTAR SAR image data is employed for algorithm experiment. The result shows that our method can increase target-to-clutter ratio significantly while restraining the noise in ROI, and then extract target and shadow from background clutters in SAR image more accurately. [C1214]

"HF passive bistatic radar potential and applications for remote sensing"

Passive radar is briefly discussed before the concept of HF passive bistatic radar is introduced using a sky-wave illumination path and surface-wave reception path. The HF passive radar under construction at UCL is described briefly. The signal processing required to reveal targets is presented followed by a comparison of analogue and digital illuminators of opportunity and their potential to detect targets. Finally the signal to interference ratio for the HF specific case is presented and conclusions are drawn on the need for interference cancellation. [C1215]

"Passive Bistatic Radar (PBR) using FM radio illuminators of opportunity"

We present a system characterisation of a passive bistatic radar (PBR). The system under investigation exploits dasiailluminators of opportunitypsila, which in this case are commercial, non-cooperative, VHF FM broadcast transmissions. The PBR under investigation demonstrates the detection of large passenger-jet aircraft in the airspace over greater London. FM based PBRs such as the type examined here have been shown to be effective at remote sensing of auroral turbulence, density irregularities in the E-region and F-region of the

ionosphere and meteor trails. Detection of aircraft is an important step in attempting to remotely sense outer-atmospheric phenomena as aircraft scattered power is of a comparable magnitude and similar Doppler frequency to the natural phenomena described. This paper also analyses the merits of FM broadcast transmissions for use as radar signals. A system characterisation with performance predictions is presented. The results show that target detections have been achieved to ranges in excess of 70 km (bistatic range). Multiple broadcast channels from two different transmitters of opportunity enhance the case for deciding whether or not targets are present. Air-truth data provided by a mode S/ADS-B IFF receiver is used for comparison with the 2-D bistatic results. [C1216]

"MMSE based waveform design for MIMO radars"

Waveform design problem for MIcircldquoMO radars has been studied in several recent works. Although signal dependent noise (clutter) is considered in some works aiming to design waveform to improve target detection in MIMO radars, there are less works on waveform design problem for target classification and estimation in the presence of clutter. Thus, here, we investigate this problem In contrast with previous works, our design leads to the convex optimization problem which can be efficiently solved through numerical methods and it can be guaranteed to converge to optimal solution. Optimal waveforms are found for two scenarios. In the first scenario it is assumed that different transmission antennas see uncorrelated aspects of the target and we consider the correlated target aspects (owing to the closed space anttenas) in the second scenario. Due to the interdependence of signal and clutter, target estimation error of the first scenario will not zero even if the transmit power tends to infinity, i.e., clutter power also increases by increasing the transmission power. This is the major problem in target detection and estimation in the presence of clutter in radars. We show that in the second scenario the MIcircldquoMO radar receiver can nullify the clutter subspace. Thus by increasing the transmission power, estimation error becomes zero in the second scenario. Waveform design for MMSE estimator under both scenarios, leads to the Semi-definite programming (SDP) problems. [C1217]

"Improved support vectors machine for signal detection in non-reverberation"

Active sonar system have developed using large arrays and broadband transmitted signals for improving the signal to reverberation power ratio after beam forming and matched filter. While the size of the range bearing resolution cell is reduced resulting in the reverberation becomes non-Gaussian distribution. The performance of matched filter is reduced. We proposed two methods to modify the kernel function of SVM for improving the performance of detection in non-Gaussian reverberation. The first method is to use mixture kernel function. And the experiment results show the performance is as good as SVM with Gaussian kernel and better than RBF and matched filter in non-Gaussian reverberation. The second method is to use the kurtosises of reverberation and targets echo to drive the kernel. The experiment results show the performance is better than matched filter and SVM with Gaussian kernel in non-Gaussian reverberation. When detection probability is 0.5, the input signal to reverberation power ratio is respectively reduced 1.5 dB and 7 dB than conventional SVM and matched filter. [C1218]

"Modeling and Implementation Of Wireless Embedded System For Intelligent Transport System Application"

Intelligent transport system (ITS) deals with the remote sensing as well as access to the Internet and multimedia on the move. There is a need for a system that supports both remote sensing and communication aspects with simple and reconfigurable hardware. In the present work MATLAB/SIMULINK based modeling of such a system is done based on DSSS. Hardware realization of this model is achieved through the signal wave software defined radio (SDR). From the simulation results two empirical formulae are developed for target detection. [C1219]

"ROEWA based detector for SAR automatic target recognition"

Edge detection is a fundamental issue in automatic target detection using synthetic aperture radar (SAR) images. Edges are associated with intensity changes in the image and are efficient descriptors of the image structure. Due to the presence of speckle, edge detection in SAR images is extremely difficult. Several detectors have been developed for the detection of isolated step edges in speckled images like MRoA and RGoA edge detectors which use predefined thresholds. The modified RGoA detector defines an automatic threshold determining method. But all these edge detectors, apart from detecting the target edges, detect a number of false edges. In this paper we have proposed a new ROEWA based algorithm that automatically discriminates the object boundaries and the false edges. The principle of entropy is introduced in this classification process. Real SAR images are used to verify our method and the results are compared with the modified RGoA and entropy based MRGoA edge detectors. Experimental results show that the proposed method is robust and efficient.

[C1220]

"Applications for remote laser vibration sensing"

Laser vibrometry based on coherent detection techniques allows to measure vibration characteristics of objects due to the high Doppler resolution. Examples for applications in the field of defense and security such as target classification and identification including camouflaged or partly concealed targets as well as the detection of buried land mines are presented. [C1221]

"Synthetic Aperture Radar Image Processing using the Supervised Textural-Neural Network Classification Algorithm"

Synthetic Aperture Radar (SAR) satellite images have proven to be a successful tool for identifying oil slicks. Natural oil seeps can be detected as elongated, radar-dark slicks in SAR images. Use of SAR images for seep detection is enhanced by a Texture Classifying Neural Network Algorithm (TCNNA), which delineates areas where layers of floating oil suppress Bragg scattering. The effect is strongly influenced by wind strength and sea state. A multi orientation Leung-Malik filter bank [1] is used to identify slick shapes under projection of edges. By integrating ancillary data consisting of the incidence angle, descriptors of texture and environmental variables, considerable accuracy were added to the classification ability to discriminate false targets from oil slicks and look-alike pixels. The reliability of the TCNNA is measured after processing 71 images containing oil slicks. [C1222]

"Surface Subsidence Monitoring with Coherent Point Target SAR Ineterferometry"

In this paper, an improved approach for surface subsidence monitoring with SAR interferometry by using coherent point target is presented. A joint criterion of amplitude dispersion index and high spectral correlation criterion are proposed for coherent point target identification, which enable a flexible target selection in case of small or large volume of SAR data. Further more, in order to avid the decorelation caused by long temporal or spatial baseline, interferogram stack are generated from the combination of those images with a small baseline. For subsidence rate calculation, a spatial and temporal regression is exploited to unwrap the differential phase of each coherent point target and a linear model is adopted for the estimation of deformation parameters. Case studies in two different test sites demonstrate the advantage and limitations of the algorithm. [C1223]

"Polarimetric Characterization of Magnetic Flat Dipole Embedded in Multilayer Structures"

The scattering properties of an embedded planar magnetic dipole are addressed in this paper. In order to obtain the scattered fields the method of moments in spectral domain is applied. The dipole scattering is characterized by the radar cross section (RCS), the polarimetric response and the alpha-angle from Cloude-Pottier's target decomposition theorem. The results point out that alpha-angle is the most sensible parameter to variations on incident angles. The RCS is influenced by the incident angles and by the geometrical dipole area. The incident angles have also influence over polarimetric response, showing its use and interpretation must be done with extremely care. [C1224]

"A Markov Chain CFAR Detector for Polarimetric Data using Adaptive Linear Discriminant Analysis"

The paper proposes a new Markov chain based CFAR detector for polarimetric data using adaptive linear discriminant analysis. The Markov Chain based CFAR detector extends traditional PDF based CFAR detection to first-order Markov chain model by considering both correlation between neighboring pixels and PDF information in CFAR detection. With the additional correlation information, the proposed approach results in advancing the performance of conventional CFAR detectors. Moreover, to take advantage of full polarizations of polarimetric data, the new polarimetric detector utilizes complementary features from full polarizations for target detection using adaptive Fisher linear discriminant analysis. Our experimental results both show the superiority of the new Markov chain polarimetric CFAR detector over conventional CFAR detectors. [C1225]

"Enhanced Military Target Discrimination using Active and Passive Polarimetric Imagery"

Surveillance operations often make use of electro-optic (EO) imaging systems to detect civilian and military targets. To increase the overall target detection performance, such active/passive EO sensors could exploit the polarization of light as additional information to discriminate man made objects against different backgrounds. The target contrast enhancement obtained by analyzing the polarization of the reflected light from either a direct polarized laser source as encountered in active imagers, or from natural ambient illumination, can be used for such target discrimination scheme. This paper reports results from field experiments exploiting polarization-based imaging sensors to enhance the detection of man made objects. Active and passive polarimetric signatures of

objects have been acquired at wavelengths in the near and long-wave infrared bands. Results demonstrate to what extent and under which illumination and environmental conditions the exploitation of active/passive polarimetric images is suitable to enable target discrimination. [C1226]

"SAR Image Simulation of Man-Made Scenes based on Computer Graphics"

To enhance the computational efficiency and authenticity of Synthetic Aperture Radar (SAR) image simulation of man-made scenes, computer graphics (CG) method was introduced into imaging geometry simulation, graphical electromagnetic computing (GRECO) was used for the interested target scattering calculation. With these two methods, the targets' characteristics will be visualized in simulated image, such as shadow, foreshortening, layover and simple scattering property. The simulated SAR images can be used for target recognition, target detection, system verification and other researches. [C1227]

"A false discovery rate based detector for detection of targets in clutter and noise"

This paper presents a new framework for detection of targets in clutter and noise. Conventional radar detection techniques involve testing each range cell separately at a predefined probability of false alarm. In this paper, we propose a novel surveillance paradigm that controls the false discovery rate (FDR) for a specified surveillance area (SA), which consists of a number of range cells. This approach is adaptive to the number of targets in the surveillance area, and improved detection performance may be achieved at the cost of slightly higher false alarms over the surveillance area. [C1228]

"A robust CFAR detection with ML estimation"

Any clutter edge in the reference window of a radar CFAR detection, produces an error in the clutter power estimation which reduces the detectability of the cell under test (CUT). In processors such as OS-CFAR, the designers have attempted to improve the detection performance, nevertheless, none of these processors applies an intelligent method of clutter edge recognition and destroyer data elimination. Therefore any of these processors are effective in some especial cases of non-homogeneous environment, but are deficient in other cases. In this paper an intelligent method is proposed for clutter edge recognition. This method determines the borders in which the clutter statistics are changing and then sets the decision threshold according to the appropriate clutter statistics. It is shown that the new processor improves the radar detection intensively in nonhomogeneous environment. [C1229]

"Adaptive subspace detection of range distributed targets in compound-Gaussian clutter"

This paper addresses adaptive high resolution radar detection of range-distributed target embedded in compound-Gaussian clutter modeled as a spherically invariant random process (SIRP). Echoes backscattered from range-distributed target are modeled as a subspace random signal by using multiple dominant scattering models. At the design stage we resort to the so-called two-step GLRT-based design procedure and assume that a set of secondary data is available. A sub-optimal adaptive detector for range-distributed target is devised. More over, the analytical closed-form expression for the probability of false alarm of the proposed detector is derived. The proposed adaptive detector ensures fully constant false alarm rate (CFAR) property in SIRP clutter. Performance of the proposed CFAR adaptive detector is assessed through Monte Carlo simulations and is shown to have better detection performance compared with existing similar detector. [C1230]

"Stepped-frequency range profiling of multiple overlapped targets"

It is a challenging task all along for modern radar systems to detect and recognize multiple targets in heavy clutter. Stepped-frequency radar (SFR) can acquire high range resolution profiles (HRRP) to improve the performance of target recognition greatly. Moreover, SFR can suppress clutter by increasing the pulse repetition frequency (PRF) as well as decreasing the product of the pulse width and the frequency step. However, as PRF increases, range measurement becomes ambiguous, so multiple targets in the same formation will probably overlap each other along the range axis. Accordingly, this paper puts emphasis on solving this overlap problem, namely, estimating HRRP of each overlapped target. It firstly analyzes the special characteristics of the SFR echoes received under the condition of range ambiguity. Then, considering envelop-weighting modification and non-modification to each HRR cell, it proposes two estimation methods, the first of which is based on maximum likelihood estimation (MLE) and reaches the Cramer-Rao low bound (CRLB). Monte Carlo simulation results have verified the validity of the theoretical analysis. [C1231]

"ATR performance assessment of target type number for HRR radar"

Automatic target recognition (ATR) performance evaluation has become an important subject in ATR theory

community since the last two decades. The extended operation condition (EOC) and system cost are two key aspects in ATR performance evaluation. For the situation of air-to-ground (A-G) ATR using high range resolution (HRR) data, this paper analyzes the influence of target type number on ATR system performance. The system cost is also considered in evaluation process. An experiential performance model of typical ATR systems is given. The performance model and the corresponding conclusions have useful reference to ATR system performance prediction and assessment in the similar A-G applications. [C1232]

"Multiple moving targets real-time detection in single-channel SAR using median filter"

With the development of hardware, the detection of ground moving targets with single-channel synthetic aperture radar (SAR) can be achieved by a relatively higher pulse repetition frequency (PRF). This high PRF can bring adequate amount of information, but it also expands the non-clutter spectrum which affects the precision of the real-time detection by the Doppler spectrum shifting methods. In order to make sure that the single-channel SAR can achieve real-time imaging and detection of moving targets, a new method based on former Doppler shifting methods is presented in this paper. First, we calculate the azimuth spectrum by Fourier transform in segments. Then, the median filter is introduced to eliminate the high-energy, narrow-spread spikes in the real data, which makes the whole procedure to be realistic and improves the location precision of moving targets significantly. In the end, we confirm the estimated Doppler centroids for the latter imaging and detection of moving targets. The corresponding flow of the whole system is also given in this paper. The effectiveness of this method is illustrated with the simulation results based on the real data. [C1233]

"3-D Hough transform for surveillance radar target detection"

A 3D Hough transform is introduced for detection of linear trajectories in a 3D data space. Data space is constructed from returned radar data using range, bearing, and time information. This information is then mapped into a 3D Cartesian data space. The constant velocity target trajectories appear as straight lines in this space, and are detected by the usage of 3D Hough transform. The efficacy of the 3D Hough transform is verified by simulation. In comparison with the 2D case, when only the range-time information is used, the 3D Hough transform has a better performance. [C1234]

"The operation and performance of a multi-frequency HF Surfacewave Radar"

The challenge to achieve robust operational performance for a HFSWR in a complex environment requires the combination of an effective operator interface with automated radar control processes. The development of a radar system that simultaneously transmits and processes signals on multiple frequency channels provides the basic detection capability that is necessary to counter severe natural and man-made electrical interference in the HF band. Mission based radar control profiles can be defined for specific combinations of environmental conditions and targets of interest. The radar operator is able to select from these profiles allowing automated radar control functions to manage the real time aspects of the radar including the optimal selection of frequencies using a wideband Frequency Monitoring System. This paper details the operational aspects of this production standard HF Surfacewave radar and provides examples of air and surface track performance and characterisation of target RCS variation with aspect angle and frequency. These examples are taken from data recordings for selected durations of the radar operating at its test site. [C1235]

"Performance of low-rank STAP detectors"

In this paper the STAP detector based on the low-rank approximation of the normalized adaptive matched filter (LRNAMF) is investigated for its false alarm probability (FAP) performance. An exact formula for the FAP of the LRNAMF detector is derived using the g-method estimator [4]. The non-CFAR behavior of this detector is shown via simulations using different models for the clutter-plus-noise covariance matrix. The detection probability is also evaluated, and the LRNAMF detector exhibits robustness in the presence of inhomogeneities consisting of interferers in the training data, for both non-fluctuating as well as fluctuating target models. [C1236]

"Heterogeneity detection for hybrid STAP algorithm"

Traditional STAP detectors require a secondary training data set that is target free and homogeneous with the cell under test (CUT). Hybrid detectors have been proposed for heterogeneous environments where the secondary data suffers from a statistical mismatch with respect to the interference in the CUT. These algorithms employ the generalised inner product (GIP) as a heterogeneity measure and eliminate the training data snapshots that are deemed heterogeneous. The GIP, however, does not take the presence of discretes or targets in the secondary data into account. If a target, or discrete, is present but sufficiently displaced from the signal of interest in the angle-Doppler plane, then it will not lead to any significant losses in the detection. Its presence, however, biases the GIP and leads to an undesirable rejection of the training data snapshot. This

problem is examined in this paper where we propose the use of a projection-based statistic for heterogeneity detection. We show that this addresses the high target density problem. [C1237]

"Combinational Hough transform for surveillance radar target detection in a 3-D data map"

A new method based on Hough transform is introduced for detection of linear trajectories in a 3-D data space. Data space is constructed from returned radar data using range, bearing, and time information. This information is then mapped into a 3-D Cartesian data space. The near constant velocity target trajectories appear as straight lines in this space, and are detected by the usage of the new method which is based on two 2-D Hough transforms in the bearing-time and range-time data spaces. The efficacy of this combinational Hough transform method is verified by simulation and shown that it has a better performance, as compared with one 2-D data map case, where only uses the range-time information. [C1238]

"Passive radar in the high frequency band"

Passive radar systems using emitters of opportunity for target detection and tracking have received significant interest recently, especially those which exploit frequency modulated (FM) radio stations and TV transmitters as signal sources. This paper is concerned with passive radar systems that utilize signal sources in the high frequency (HF) band (3-30 MHz), where due to long-distance ionospheric propagation, the transmitter may be located beyond the line-of-sight (i.e. over-the-horizon). To investigate this application, a two-dimensional (L-shaped) antenna array with a digital receiver per element was tuned to simultaneously record cooperative and non-cooperative HF signal sources within the receiver bandwidth. This data was processed by conventional and adaptive methods to determine the detection performance of the system for a dedicated aircraft target. GPS data from the cooperative aircraft provided accurate ground truth of the target flight path and velocity, enabling its bi-static range/Doppler and direction of arrival (azimuth/elevation) versus time profiles to be calculated and compared with radar measurements. The experimental system and data processed in the paper is exclusively from the DSTO HF radar program. [C1239]

"Limits on the detection of low-Doppler targets by a High Frequency hybrid sky-surface wave radar system"

A high frequency (HF) radar system comprising a skywave transmit channel and surface wave receive channel is studied. Simple analytic expressions for the resolution of this radar system are determined by considering the spreading of radar signals in Doppler and angle during the ionospheric propagation. The detection of ocean surface targets within the patch of ocean surface illuminated by the radar beam is then determined by comparing the radar cross section of the ocean patch with typical vessel radar cross sections. It is shown that a hybrid sky-surface wave radar can detect low-Doppler ships down to 30 dBm2cross section during the day and down to 40 dBm2at night, during calm ionospheric conditions. During periods of spread F ionospheric turbulence, where the temporal correlation time decreases by an order of magnitude, the corresponding vessel detection capability decreases by two orders of magnitude. [C1240]

"Efficient wideband processing without subbanding"

A new method for wideband spatio-temporal processing in the context of clutter mitigation and target detection is addressed in this paper. The frequency dependent, spatio-temporal steering vectors, are separated using a series expansion that depends on a sequence of Bessel function terms, and this is used to focus data vectors corresponding to various frequency components to a single frequency component. As a result, narrowband space-time adaptive processing (STAP) can be carried out on the focused data vector for clutter mitigation and target detection. [C1241]

"Innovative tools for radar signal processing Based on Cartan's geometry of SPD matrices & Information Geometry"

New operational requirements for stealth targets detection in dense & inhomogeneous clutter are emerging (littoral warfare, low altitude asymmetric threats, battlefield in urban area...). Classical radar approaches for Doppler & array signal processing have reached their limits. We propose new improvements based on advanced mathematical studies on geometry of SPD matrix (symmetric positive definite matrix) and information geometry, using that radar data covariance matrices include all information of the sensor signal. First, information geometry allows to take into account statistics of radar covariance matrix (by mean of Fisher information matrix used in Cramer-Rao bound) to built a robust distance, called Jensen, Siegel or Bruhat-Tits metric. Geometry on ldquosymmetric conesrdquo, developed in frameworks of Lie group and Jordan algebra, provides new algorithms to compute matrix geometric means that could be used for ldquomatrix CFARrdquo. This innovative approach

avoids classical drawbacks of Doppler processing by filter banks or FFT in case of bursts with very few pulses. [C1242]

"Space-Time Adaptive Processing for noise-radar"

This paper presents a comparative study of space-time adaptive processing (STAP) methods, adapted to noise-like signals in general and digital video broadcasting-terrestrial (DVB-T) in particular. The advantages and disadvantages of each method are highlighted through the possibility of a multi-target detection among the various kinds of interferences, either homogeneous or not. This study emphasizes the efficiency of the hybridization of both the joint domain localized (JDL) and the direct data domain (D3) STAP methods in the conception of a passive DVB-T-based multi-target bistatic radar. [C1243]

"Low SNR radar signal detection using the continuous wavelet transform (CWT) and a Morlet wavelet"

A continuous wavelet transform (CWT) system for low SNR radar target detection is proposed in this paper. The radar transmission signal is a pulsed complex exponential. The proposed method automatically determines the optimal scale parameter for CWT analysis by finding the peak in the return signal CWT power computed across translations. The contributions of this paper are an algorithm for determining the optimal scale range for integration of CWT data, a denoising algorithm based on analysis in a small neighborhood around the optimal scale, and analysis of computational and memory requirements. Results are analyzed for simulated radar targets corrupted by white Gaussian noise and compared to a more traditional matched filter (MF). Theoretical and simulation results show that the average CWT and MF process gain (PG) is 23.4 dB and 21.2 dB, respectively, with no Doppler shift, where the theoretical CWT PG is 24.1 dB. For Doppler shifted signals, the mean PG was 23.53 and 13.84 dB for CWT and MF, respectively. The proposed method achieves 3 to 10 dB on average higher PG than the MF method. [C1244]

"Estimation of the parameters of the K-distribution using Fuzzy Neural Networks"

This paper addresses a novel approach based on neuro-fuzzy inference system to solve the estimation problem of the K-distributed parameters. The method is based on a network implementation with real weights and the real genetic algorithm (GA) tool is applied for an off-line training of the fuzzy-neural network (FNN) shape parameter estimator. The proposed FNN estimator is based on the arithmetic and geometric means computed from the data in a manner which significantly reduces the computational requirements when compared to Raghavanpsilas and the maximum likelihood methods. The simulation results are presented to demonstrate the validity of the approach as well as the successfulness of the FNN estimator for low variances of parameter estimates when compared with existing MOFM (method of fractional moments) and ML/MOM (maximum-likelihood and method of moments) approaches. In addition, the method yields parameter estimates with lower computational complexity compared with standard techniques. [C1245]

"High Range Resolution (HRR) profiling within low elevation search mode"

In this paper, we describe the high range resolution (HRR) profiling technique for generating the target range profile while the radar is in the low elevation search mode. The major advantage of this concept is reuse of the moving target detection (MTD) radar data for formulating the target range profile to provide the early target classification, discrimination, and identification (CDI) decision for all targets. This technique is developed for air missile defense pulse Doppler radar in which transmitting frequency is changing within the transmit pulse width. Here, we also discuss the effects of phase variation introduced by radial target motion and address how to compensate those effects. [C1246]

"Robust target localization with multiple sensors using time difference of arrivals"

When an unknown target emits a radio signal, its position can be localized by a network of sensors (or radar receivers) using the time difference of arrival (TDOA) information. In this paper, we consider the maximum likelihood formulation of this target localization problem and provide efficient convex relaxations for this nonconvex optimization problem. In addition, we propose a robust target localization method based on semidefinite programming when the sensor locations are not exactly known. Simulation results confirm the efficiency and superior performance of the convex relaxation approach as compared to the existing least squares based approach. [C1247]

"A radar target for calibration and for codes validation"

The electromagnetic scattering of a plane wave by a penetrable (e.g., dielectric) or impenetrable (e.g., metallic)

sphere concentric with a thin metallic disk is considered, in the frequency domain. At low and intermediate frequencies, either separation of variables and mode matching with matrix truncation or a direct numerical approach such as the MoM is adopted, while at high frequencies a combination of GTD and physical optics is employed. The analytical and numerical results are compared to measurements made in an anechoic chamber. [C1248]

"Adaptive calibration in UWB radar"

The progress of the late time response (LTR) method applied to the detection and identification of body-worn hidden weapons has been discussed in [1] and [2]. Efficiency of the target signature extraction and its correct interpretation depend on the system subcomponent characteristics as well as the processing algorithms used. Peculiarities in frequency domain (FD) measurements based on a stepped frequency radar technique introduce an ambiguity in the received signal interpretation. In this paper the real time domain (TD) experimentation system and new instant signal calibration procedure are described. Measurements were made in an anechoic chamber to provide complete signal control. Signal processing is based on adaptive filtering algorithms to provide equalization by a reference channel in order to remove any radio frequency (RF) system distortion of the received signal. A generalized matrix pencil-of-function (MPoF) approach is then applied to retrieve the parameters of LTR. [C1249]

"Real-time signal processing system for high resolution CWLFM millimeter-wave radars"

An FPGA-based real-time signal processing unit has been developed to perform Doppler processing in a high resolution CWLFM (continuous wave linear frequency modulated) millimeter-wave radar demonstrator. The article focuses on the strategies followed in order to achieve the required throughput as well as on the measures taken to guarantee coherency. Doppler processing is accomplished to output Range-Doppler radar images and transfer them to a PC application for display. Two different experimental setups have been used to verify the correct operation of the processing flow. The system has been designed so as to allow for future addition of complex target detection-classification schemes. [C1250]

"Target localization techniques and tools for MIMO radar"

MIMO (multiple-input multiple-output) radar refers to an architecture that employs multiple, spatially distributed or colocated transmitters and receivers. The widely spaced antenna structure suggests unique features that set MIMO radar apart from other radar systems, making it strongly related to MIMO communications. The widely separated transmit/receive antennas capture different aspects of the target cross section that can be exploited to obtain diversity gain for detection and estimation of the targetpsilas various parameters, such as angle of arrival, and Doppler. The use of coherent processing can provide localization accuracy gains well beyond that supported by the radarpsilas waveform. This paper provides a review of some recent work on computing the Cramer-Rao lower bound (CRLB) on the achievable localization accuracy. The geometric dilution of precision (GDOP) is used as a tool for assessing and illustrating the localization accuracy of the best linear unbiased estimator (BLUE). [C1251]

"Switched order statistics CFAR test for target detection"

In this paper we introduce a new switched order statistics CFAR test (SW-OS) for detecting a radar target in the presence of nonhomogeneous clutter and/or multiple interfering targets situation. Whereas a switching CFAR test (S-CFAR) was recently proposed in the literature for addressing a similar background scenario, unlike the S-CFAR test, the test proposed here does not utilize the test cell statistic in classifying the cells surrounding the test cell as homogeneous or not. The SW-OS test has some similarity to the selection and estimation (SE) test, which was co-authored by the second author of this paper, but is simpler to design. Probability of detection performance results obtained for Rayleigh clutter and Rayleigh target indicate that the SW-OS performs nearly as good as an order statistic test (OS) in the homogeneous background condition and performs much better than OS under the presence of many interfering targets. When compared to S-CFAR, SW-OS performs slightly worse in the homogeneous background, but performs better under the condition of many interfering targets. [C1252]

"Auxiliary-vector detection on measured radar data"

Derived from statistical conditional optimization criteria, the auxiliary-vector (AV) detection algorithm starts from the target vector and adding non-orthogonal auxiliary vector components generates an infinite sequence of tests that converges to the ideal matched filter (MF) processor for any positive definite input autocorrelation matrix. When the input autocorrelation matrix is replaced by a conventional sample-average estimate, the algorithm effectively generates a sequence of estimators of the ideal matched filter that offer exceptional bias/covariance balance for any given finite-size observation data record. In this work, the AV algorithm is evaluated on collected

airborne phased-array radar data from the MCARM program and is seen to outperform in probability of detection (for any given false alarm rate) all known and tested adaptive detectors (for example AMF, generalized likelihood ratio test, the multistage Wiener filter algorithm, etc.). [C1253]

"Amplitude/phase approach for target velocity estimation in AT-InSAR systems"

Along track SAR interferometry (AT-InSAR) systems use more than one SAR antennas (typically two), mounted on the same platform and displaced along the platform moving direction. They are used to detect ground moving target. The information about the radial velocity of the moving target is estimated from the interferometric phase of the images. In this paper we show that exploiting not only the interferometric phase but both amplitude and phase of the two SAR images acquired with the AT-InSAR system the estimation accuracy can be sensitively improved. Moreover a closed form for the target radial velocity estimator and for the Cramer Rao lower bound has been derived. [C1254]

"A MAP estimator for target position estimation in high resolution radars"

In this paper a MAP estimator is derived for target position estimation in high resolution radars where the events of backscatters, i.e., reflections, from extended targets and clutter are modeled as non-homogenous Poisson process. Performance of the proposed MAP estimator has been compared to that of the maximum likelihood estimator for the same model and also to that of the most commonly used peak picking estimators, namely, the maximum point and interpolation. Through simulations, it has been demonstrated that, in the case of having prior distribution information about real target range, MAP estimator significantly reduces target position estimation errors. [C1255]

"Impact of measurement model mismatch on nonlinear Track-Before-Detect performance"

The sensitivity of track before detect processing to the choice of clutter model in the measurement correction stage was examined through processing of real and simulated data containing radar echo returns of a small maritime target in sea clutter. The potential for achieving significant detection performance improvements by utilizing K and KA distributed clutter models in place of the simpler Rayleigh distribution was demonstrated through analysis of simulated data representing spiky sea clutter. In contrast, additional analysis using real data revealed that a more accurate clutter model does not imply better performance. Specifically, significantly degraded performance is observed when K and KA based processing is used in place of a Rayleigh based processor utilizing a simple likelihood limiting step to compensate for model mismatches due to sea clutter spikes. [C1256]

"Sensor placement for improved target resolution in distributed radar systems"

In this work we investigate rules for sensor placement as a way of improving multistatic radar system performances. We follow the approach of shaping the multistatic ambiguity function, but instead of different weighting rules and different waveforms, as studied in recent works, we consider different system geometries. We concentrate our attention on target resolution as a performance measure and present simulation results that illustrate the significance of adequate sensor placement in multistatic radar systems. [C1257]

"Orthogonal pulse compression code design for waveform iversity in multistatic radar systems"

This paper deals with an orthogonal pulse compression code set design problem in multistatic radar systems. Multistatic radar systems can improve radar performance by using a set of orthogonal waveforms with the same operating frequency. We provide the signal model for multistatic radar system using a set of orthogonal pulse compression codes. Moreover, a novel algorithm is proposed to obtain the set of orthogonal pulse compression codes. This algorithm minimizes the sidelobe peak of sum of autocorrelation and crosscorrelation function while maintaining the orthogonality of each code. Some of the designed results are presented by evaluating the characteristics of autocorrelation and crosscorrelation functions. In addition, the waveform diversity system and non-waveform diversity system are compared in terms of the probability of detection performance. [C1258]

"OFDM radar signal design with optimized Ambiguity Function"

According to the important role of the ambiguity function of a signal in performance of match filter bank for detection of targets and estimation of their ranges and velocities, in this paper the thumbtack shape is considered as a desired ambiguity function shape and method of least-squares for synthesis of the ambiguity function is introduced, and then an iterative method for allocation of proper phase to the desired ambiguity function, to obtain better results, is proposed. Then this method is applied to select proper codes for synthesis of OFDM signals. Also it will be shown how this method can reduce side lobes almost uniformly through the entire

of ambiguity plane. [C1259]

"Along track interferometry for foliage penetration Moving Target Indication"

Moving target indication radars for detection and tracking ground vehicles has received significant interest in the radar literature. However, when the vehicles are moving slowly and in foliage, microwave frequency radars such as X-band are not effective. Foliage penetration (FOPEN) radars using ultra high frequency (UHF) synthetic aperture waveforms have demonstrated consistent detection of stationary ground vehicles. In most applications, the vehicles are stationary to support wide angle, high resolution SAR processing. Along track interferometry (ATI) has been proposed for space based radars to detect moving targets due to the high velocity of the radar. This study will examine the target and processing requirements to detect slowly moving ground vehicles using ATI approaches. A detailed simulation of the target and clutter phenomenology is carried out to illustrate the effects of internal clutter motion and signal decorrelation effects on minimum discernable velocity. [C1260]

"Precision GMTI tracking using road constraints with visibility information and a refined sensor model"

For detecting targets moving on ground, airborne ground moving target indicator (GMTI) radar is well-suited due to its wide-area, all-weather, day/night, and real time capabilities. The generation of GMTI tracks from these data is the backbone for target identification, ground surveillance as well as traffic flow analysis. The generation of precise and continuous tracks from GMTI radar plots often is a demanding task due to terrain and technical obscuration and clutter. The exploitation of non-standard background information such as road maps and terrain information is therefore highly desirable for the enhancement of track quality and track continuity. The present paper presents a Bayesian tracking scheme that incorporates digital road-map information and a model for the clutter notch of the GMTI sensor. The significant gain in track quality and track continuity is demonstrated in a number of simulation scenarios involving Doppler blindness and terrain obscuration. [C1261]

"Inter-pulese coding for ideal range response"

A different way to increase the energy within a coherent processing interval (CPI) is suggested-many short dense pulses with inter-pulse coding instead of few widely-spaced long pulses with intra-pulse coding. Long coded pulses result in masking targets at close range and suffer from poor Doppler tolerance. We overcome the range ambiguity, inherent to dense pulses (high PRF), by inter-pulse coding. Ideal range response (no ambiguity, no sidelobes) can be obtained, e.g., by using a binary periodic Ipatov sequence for inter-pulse coding. The periodic property is maintained as long as the number of transmitted periods exceeds the number of processed periods by at least two. [C1262]

"ECM counteracting SLB: Analysis and effectiveness evaluation"

Sidelobe blanking (SLB) devices are used within radar systems to reduce the number of false alarms due to impulsive interference incoming through the sidelobes. The aim of this paper is to study the effects of different jamming techniques on a phased array radar equipped with a SLB device. The entire system is modeled accounting for the mutual coupling among the antenna array elements, and two different configurations for the position of the SLB element are considered. The cases of co-polarized and cross-polarized jamming signals are investigated. The analysis is focused on both the jammer capability to produce false targets and on its ability to mask the useful echo. [C1263]

"Radar detection and angle estimation of over-resolved ground vehicles"

Traditionally, moving target indication (MTI) modes tailored to wide-area surveillance (WAS) have employed waveforms with bandwidths matched to the range extent of targets of interest. Matching range resolution to expected vehicle lengths serves to minimize interfering clutter returns while preserving available target power, thereby maximizing target probability-of-detection. Recent advances in waveform generator technology and high-speed digital signal processors for matched filtering have encouraged radar designers to consider wideband waveforms for WAS MTI needs. While providing information for identification and imaging, wideband waveforms complicate the detection process, as an extended target will be over-resolved; that is, returns from a vehicle will be distributed over multiple, fine-resolution range bins. Algorithms for combining these signal contributions are required for detection and angle estimation. Given such algorithms, one wonders whether over-resolving targets leads to detection and angle estimation performance losses as compared to narrowband operation. In this paper we evaluate methods for collecting energy from an over-resolved target for detection and angle estimation processing. We bound the performance of these techniques on typical ground targets and show that the probability-of-detection and angle accuracy is improved through the use of wideband waveforms at high signal-to-noise levels. [C1264]

"PodSAR: A versatile real-time SAR GMTI surveillance and targeting system"

Synthetic aperture radar (SAR) and ground moving target indication (GMTI) systems from an airborne platform are in principle based on very simple concepts. The latter combines radar pulses over a short interval to extract Doppler information in order to detect ground moving targets against a clutter background. The former combines pulses over much longer intervals in a coherent manner to achieve very fine azimuth resolution. However, the many demands that are placed on such systems in terms of resolution, geolocation accuracy and coverage have led to the development of highly sophisticated algorithms. The ability to perform such complex processing in real-time on board the airborne radar platform presents significant computational challenges. This paper describes how a successful implementation of a real-time SAR GMTI system has been achieved with the QinetiQ PodSAR system. It describes the radar system that is mounted on a wide-bodied Andover aircraft. It discusses the design challenges that had to be overcome in order to achieve real-time processing for SAR and GMTI along with showing a number of examples of image exploitation techniques being developed using data from the PodSAR system. [C1265]

"Detection and localization of high speed moving targets using a short-range UWB impulse radar"

This paper describes a detection and localization method for high speed moving targets using a short-range ultra-wideband (UWB) impulse radar. Equivalent time sampling impulse radar with an antenna array is used to transmit ultra short-pulse and receive the signal reflected from moving targets. A time domain multi-threshold detection method is proposed to detect the useful weak signal buried in noise while eliminating clutter resulting from stationary objects. Then a time difference of arrival (TDOA) based algorithm can be used to localize high speed moving targets. Simulation results show that a reliable detection using such UWB impulse radar can be achieved. [C1266]

"Hough transform based automatic pipe detection for array GPR: Algorithm development and on-site tests"

GPR is one of the most reliable instrument to obtain information on underground assets. Since its diffusion, many efforts have been made in order to overcome one the main limitations of this technology: the ldquohuman factorrdquo in data interpretation. Actually, operators have to look and interpret a huge number of radargrams. This requires an enormous effort, about 2 days are usually needed for analyzing radar data gathered from a 3000 m2wide site Some useful tools like tomography has been developed, but their quality and reliability is related to the migration algorithm which is heavily depending on knowledge of the propagation velocity of EM wave in the soil. Hyperbolas automatic detection algorithm reduces human factor in radar data interpretation and aims to strongly lower the amount of time needed for data analysis. The algorithm works on each radargram, recognizes the presence of target by looking for the hyperbolic patterns and marks them. Then the operator can correlate those results from different radar maps and extract the position of the underground assets. The algorithm also gives an accurate evaluation of the propagation velocity of EM waves in the soil, so this estimate can be used by migration algorithm in order to obtain an improved tomography. Using both Hyperbolas Automatic Detection and tomography, time needed to analyze a 3000 m2wide area can be reduced up to less than 4 hours. [C1267]

"Tracking of ground targets with bistatic airborne radar"

Detection of moving targets in stationary clutter can be accomplished by STAP radar. In contrast to monostatic radar the performance of bistatic STAP depends strongly on the actual radar-target geometry. Even for sidelooking radar the clutter Doppler is generally range dependent which causes special problems in estimating the space-time clutter covariance matrix. For certain bistatic constellations clutter notches as appearing during track (i.e. areas of low probability of detection) may be considerably wider than in monostatic radar. The bistatic transmitter-receiver constellation has strong implications on ground moving target tracking, which is basic for producing a recognized ground picture as well as for analyzing traffic flows, identifying sources and sinks of traffic, or detecting lines of communication. Aspects of a bistatic GMTI tracking algorithm are described and some typical tracking results are given. Special emphasis is placed on a suitable modeling of the bistatic radar characteristics within the tracker. [C1268]

"Subspace methods and spatial diversity in radars"

The utilization of diversity in radar systems has shown improvements over conventional beamforming phased array radars in many aspects of the system performance including target detection probability, the number of identifiable targets, and beam-pattern synthesis. When linearly independent signals are transmitted, the signals

received from targets at different locations are also linearly independent. In using subspace methods such as MUSIC, this presents an advantage as spatial smoothing is no longer required. We present here a comparison of the performance of a MIMO radar system, with that of a phased array requiring spatial smoothing. The behaviour of the eigenvalues of the received data covariance matrix for radars with and without spatial diversity is presented, and the characteristics of the MUSIC spectrum of the two systems is compared. [C1269]

"A reduced order jammer cancellation scheme based on double adaptivity"

In this paper a doubly adaptive scheme is presented for detection and jammer cancellation by airborne monopulse radar, equipped with three receiving channels. An adaptive auxiliary selection technique is proposed to decide which is the most effective couple of auxiliary antennas in each condition, assuming a slowly changing jamming environment. This leads to a doubly adaptive jammer cancellation scheme: we first perform an adaptive selection of the best set of auxiliary beams, and then apply an adaptive scheme for jammer cancellation and target detection using only the best set of three receiving channels. This can be used also to obtain an adaptive ECCM as a retrofit on an existing 2D monopulse radar. This paper characterizes the performance of this approach, together with its limitations. [C1270]

"Direct, channel-to-channel clutter cancellation (DC4) with phase-interferometry in multi-channel SAR for detecting surface moving targets"

In a synthetic aperture radar (SAR) image of the ground, moving targets appear at locations different from their true instantaneous locations on the ground. In a corresponding interferometric phase image, all points on the ground nominally appear as a continuum of phase differences while the moving targets appear as discontinuities. By threshold comparisons within the intensity and the phase images, we (and others) have shown that it is possible to detect moving targets in the SAR. In this paper we show that the detectability of moving targets in multi-channel SAR is further enhanced by a direct, channel-to-channel cancellation of the fixed ground image, which acts as the clutter. [C1271]

"Multiple scattering of HF skywave radar signals: Physics, interpretation and exploitation"

HF radar signals rely on the ionosphere to achieve over-the-horizon surveillance, but this is obtained at the expense of subjecting the signals to a diverse range of scattering and modulation phenomena. Many of these effects are associated with multiple scattering, both in the ionosphere and near the earthpsilas surface. This paper reviews a variety of multiple scattering phenomena and shows how an understanding of the physics enables the radar echoes to be interpreted so as to extract information about targets and the environment. Particular attention is focussed on (i) scattering from small scale plasma irregularities, which can be used to classify propagation modes and thus improve target tracking, and (ii) scattering from the sea surface, which can be exploited for optimising radar ship detection performance as well as a range of remote sensing applications. [C1272]

"The development of over-the-horizon radar at the Naval Research Laboratory"

In 1956, the Naval Research Laboratory completed a set of experiments that showed 1) that VHF and HF radar echoes could be coherently processed, and 2) that the ionosphere is often sufficiently stable for a radar operating in the high-frequency band (3 MHz to 30 MHz) to be capable of detecting and tracking targets beyond the normal microwave radar horizon. Later in 1961, the Naval Research Laboratory began operation of their single-site, over-the-horizon radar located on the shores of the Chesapeake Bay. This radar was called MADRE, for magnetic drum radar equipment, and demonstrated many of the basic capabilities of high-frequency, over-the-horizon radar. This paper chronicles the development of the hardware and software that comprised the MADRE radar and identify the people that participated in its development. [C1273]

"Radar tracking of a move-stop-move maneuvering target in clutter"

In this paper we compare three different sequential estimation algorithms for tracking a single move-stop-move radar target in clutter. We consider optimal and suboptimal Bayesian estimation algorithms, with a special focus on particle filters (PF). The target is modeled using Markov Chains switching theory. Target maneuvers are defined by four different motion models: a stopped target model, a constant velocity model, an acceleration and a deceleration model. We analyze a realistic car traffic scenario by splitting the problem into two study cases. In the first case measurements are expressed in Cartesian coordinates, while in the second we address the problem of nonlinearity in the measurement model. Both cases are characterized by the presence of additive Gaussian noise and by a detection probability less than unity. In addition we are also interested in false measurements originated by high level clutter. The aim of this paper is to compare the so called IMM-PDA-ABF (interacting multiple model, probabilistic data association, auxiliary bootstrap filter) to the well-established

Kalman-based PDAF (probabilistic data association filter) and IMM-PDAF (interacting multiple model, probabilistic data association filter) tracking algorithms. Parametric and non-parametric sequential estimation procedures are also taken into account. Advantages and disadvantages of the proposed algorithms are illustrated and discussed through computer simulations. [C1274]

"Frequency diversity in multistatic radars"

This paper presents the model and analysis of a frequency-diverse radar system. Multistatic radar systems provide an inherent spatial diversity by processing signals from different platforms which view a potential target from different aspect angles. By using different frequencies at each platform, an additional diversity gain can be obtained on top of the advantages of spatial diversity. Here, since platforms are distributed spatially, true time delay is used at each platform to align the sample look point in time. The signal-to-interference-plus-noise ratio and probability of detection are derived for the case for the frequency diverse and the non-frequency diverse cases. Comparing these two cases illustrates the significant benefits of frequency diversity. In addition, performances of optimum and suboptimum decentralized algorithms are compared. [C1275]

"Study of the classification task into an integrated multisensor system for maritime border control"

This work focuses on the classification task performed into a multi-sensor system for the coastal surveillance. The system is composed of two platforms of sensors: a land based platform, equipped with a land based radar, an automatic identification system (AIS) and an infrared camera (IR); an airborne platform, carrying an airborne radar that can operate in a spotlight synthetic aperture radar (SAR) mode, a video camera, and a second IR camera. The tasks performed by the system are the detection, tracking, identification, and classification of multiple targets, the evaluation of their threat level, and the selection of an intervention on them. The classification algorithm implemented inside the system exploits an analytical approach based on the confusion matrix (CM) of the imaging sensors that belong to the system. Some measures of effectiveness (MoE) of the system are evaluated, considering both the cases where an ideal error free classification process and a non-ideal classification process are performed. [C1276]

"Performance analysis of a multi-frequency FM based Passive Bistatic Radar"

In this paper we evaluate the target detection performance improvement of a multi-frequency approach for FM radio based passive bistatic radar. Specifically, we consider the high diversity of the FM radio signals received over different carrier frequencies spanning the 88-108 MHz band since it represents the basis for the request of a multi-frequency operation. The joint exploitation of the waveforms of opportunity received on multiple FM radio channels is shown to yield better performance in terms of detection capability. To demonstrate the effectiveness of the proposed approach two experimental prototypes of FM radio based passive radar receivers have been developed and fielded at the INFOCOM Dept. of the University of Rome ldquoLa Sapienzardquo. The two prototypes are based on two different design approaches: direct RF sampling and signal down-conversion & baseband sampling. The acquisition campaigns that have been carried out with the two prototypes are described together with the collected data analysis and processing. Finally, the results obtained over the collected data set for the single FM channels and after the proposed multi-frequency integration procedure are reported and compared with live air traffic control registrations. [C1277]

"RF interference suppression for bistatic HF surface wave SIAR"

Intense RF (radio frequency) interference is the one of the impediments in target detection for high frequency surface wave radar (HFSWR). A novel type of HFSWR, bistatic HF surface wave SIAR (synthesis impulse and aperture radar), has been presented recently. In this paper, the RF interference of this radar is analyzed. Combining with the theoretical analyses and experimental samples, the features of the interference in temporal and spatial domain are investigated; and then an orthogonal projection based method in time domain is presented for mitigating the RF interference. The experimental result proves the validity of the proposed method. [C1278]

"Moving target localization with multistatic radar systems"

In this paper we describe a method of processing data from a chosen area as surveyed by a multistatic system for the localization of a target. For this purpose data were acquired using the UCL netted radar and processed with two different incoherent approaches for localizing the target on a grid. The first is a centralized scheme and the second decentralized. Results are compared with two coherent approaches that for detection and coverage have been shown to provide the limits on the achievable performance. Numerical minimization of specific functions has to be applied when the estimated target location is used in a tracking algorithm, so we also report an easy and immediate method to localize one (or more) target which expands the domain of application.

[C1279]

"Evaluation of WiFi beacon transmissions for wireless based passive radar"

Wireless transmissions are a potentially powerful and widely available source of transmissions for passive radar detection. In this work we have carried out a detailed study on the use of IEEE 802.11 (WiFi) transmissions in a passive radar system. The WiFi transmission sequence has been found to be complex and dependent on the user environment but is dominated by direct sequence spread spectrum (DSSS) and orthogonal frequency division multiplexing (OFDM) signals. An ambiguity function analysis of the DSSS based WiFi beacon signal has been carried out followed by field measurements using a wireless based passive radar system. Range and Doppler characterization of this system is reported and compared with the theoretical predictions. Detection of moving human targets has been achieved for the first time using 802.11 transmissions. This work shows that this technique has considerable promise for a low cost and widely deployable detection and tracking system. [C1280]

"Analytical performance evaluation of an enhanced frequency domain radar detector"

Periodogram is a simple and efficient way to detect and estimate parameters of sinusoidal signals which is widely used in radar where we need to detect moving targets. In this paper, the detection performance of the periodogram and its variants such as Bartlett, Welch methods, and a proposed Bartlett-based method is evaluated. Performance evaluation through the receiver operating characteristics (ROCs) of the mentioned methods are presented and compared. Previous studies showed that, the standard periodogram used to give the best detection performance. In the present work, analytical derivation and simulation results showed that, the proposed method gives a better detection performance outperforming the standard periodogram at the expense of a tolerable reduction of the frequency resolution. [C1281]

"STAP I-Architectures and algorithms"

Space-Time-Adaptive Processing (STAP) is becoming an integral part of modern airborne and space-based radars for performing Airborne Moving Target Indicator (AMTI) and Ground Moving Target Indicator (GMTI) functions. STAP is an application of optimum and adaptive array processing algorithms to the radar problem of target detection in ground clutter and interference with pulse-Doppler waveforms and multi-channel antennas and receivers. Coupled space-time processing is required to optimally mitigate the Doppler spreading of ground clutter induced by radar platform motion. This tutorial will begin with the fundamentals of adaptive beamforming and radar pulse-Doppler processing, move through principles and application of STAP, and conclude with a brief overview of some advanced current research topics. Optimum STAP and a taxonomy of practical STAP architectures and algorithms will be described in depth. Key aspects of a practical STAP algorithm include the methods for estimating the background interference, proper subspace selection, and the technique for computing STAP filter weights. Algorithms for providing rapid convergence, robustness to clutter inhomogeneities, robustness to steering vector calibration errors, and reduced computational complexity will be described. The effect of STAP on subsequent detection and target parameter estimation algorithms will be discussed, with some emphasis placed on adaptive monopulse approaches for STAP radars. Simulation and experimental data will be used to illustrate STAP concepts and algorithmic issues. [C1282]

"New directions in bistatic radar"

It has been remarked that interest in the subject of bistatic radar has varied cyclically, with a period of about fifteen years. The very first radars were bistatic, until T/R switches were invented. Interest was revived in the 1950s/1960s, with semi-active homing missiles and the SPASUR system, then died away. The second resurgence was in the mid-1970s to mid-1980s, with systems such as SANCTUARY and the first experiments in Passive Bistatic Radar. And the third resurgence started in the mid-1990s, and is still continuing. There are good reasons to believe that this time it is for real. The consequences of Moore's law mean that digital processing power, which is essential to realise practical systems, increases inexorably. The advent of GPS solves many of the problems of timing and synchronization which were previously very difficult. Bistatic systems may be able to address new military and security operational requirements such as the detection and tracking of low-signature targets, and the increasing use of unmanned air vehicle (UAV) platforms is also well-suited to bistatic and multistatic configurations. There has been particular interest in bistatic radar exploiting broadcast, communications or radionavigation signals as illuminators-so-called passive bistatic radar (PBR). [C1283]

"Radar waveform for automotive radar systems and applications"

This paper describes three different continuous wave (CW) radar waveforms which are applied in automotive radar sensors. The radar sensor should be able to detect all objects inside the observation area and to estimate range, radial velocity and azimuth angle simultaneously even in multi target situations. A classical Linear

Frequency Modulation (LFM) waveform provides a very high range and velocity resolution. But in multiple target situations so-called ghost targets will occur. Alternatively, a Frequency Shift Keying (FSK) waveform delivers a very high velocity resolution and avoids any ghost target situation but will not resolve targets in range direction. Finally, a combination between LFM and FSK provides simultaneously a high range and velocity resolution, extremely short measurement time and avoids any ghost target situation. It combines the advantages of both FSK and LFM waveforms. In all three cases the azimuth angle estimation is based on two receive antennas and the monopulse technique. [C1284]

"Target recognition and polarimetric SAR"

This tutorial presents a state-of-the-art survey of advanced applications of Synthetic Aperture Radar (SAR). Applications include: the detection and recognition of targets in SAR imagery, and the detection of targets under trees (and in the open) using change detection (coherent change detection, full-polarization change detection, etc). A fully polarimetric SAR sensor is described. Models of clutter and targets are developed from analysis of full-polarization SAR imagery. Algorithms for optimum (GLRT) processing of full-polarization data are derived, including the polarimetric whitening filter (PWF) and the polarimetric matched filter (PMF). Polarization-based discrimination features (polarization entropy, anisotropy, etc.) are developed and applied to SAR image terrain classification. Model-based and template-based target recognition systems are described and classifier performance results versus resolution and polarization are summarized for 10-and 20-target classifiers. Super-resolution algorithms are applied to SAR imagery and target recognition performance improvements demonstrated. Multi-polarization and multi-pass change detection algorithms are developed and demonstrated using UHF SAR imagery of targets under trees; fusion of multi-polarization coherent and non-coherent change detection algorithms is demonstrated. The effect of SAR image compression on change detection performance is quantified. Change detection performance using multi-pass VHF SAR imagery of targets under trees is demonstrated using data gathered by the Swedish CARABAS SAR system. [C1285]

"Tracking systems"

The tutorial is an overview of tracking and data fusion for surveillance systems with applications both to defense and civilian systems. It is divided into four parts: Part 1-Filtering: Covers the topics related to state estimation for stochastic dynamic systems: optimal Bayesian estimator, Kalman filter, nonlinear filters (extended and unscented Kalman filter, Gaussian sum filter, particle filter); filters for maneuvering motion (Interactive multiple-model filter); Crame-Rao lower bounds for filtering. Part 2-Data association: Due to the imperfections of a detector, the input to a tracking system may lack the target originated detections and often contains false detections (due to clutter). The data association component of a tracking system determines the origin of each input detection. The tutorial will cover techniques such as: gating, (global) nearest neighbor algorithm, (joint) probabilistic data association, multiple hypotheses tracking. In addition, the idea of using random sets for multi-target tracking will be introduced with a review of the PHD filter. Part 3-Distributed multi-sensor tracking: Modern surveillance systems typically consist of multiple sensors connected by a communication network for a data exchange. While the network surveillance offers potentially more accurate and reliable performance, there are many practical issues that need to be resolved beforehand. The tutorial will provide answers to problems: how to choose the multi-sensor architecture, how to avoid a repeated use of the same information, how to perform distributed track association and track fusion, how to ensure proper multi-sensor alignment in time and space. Part 4-Selected applications: The last part of the tutorial will cover several practical applications: ballistic missile tracking, GMTI radar tracking, tracking with hard constraints, angle-only tracking, tracking using TDoA measurements, track-before-detect, video tracking, tracking using an acoustic sensor networ- k, etc. [C1286]

"STAP II-Advanced concepts"

Space-time adaptive processing (STAP) is an advanced signal processing methodology for the Ground Moving Target Indication (GMTI) mode of airborne and space borne surveillance radar systems. It is used to mitigate motion-induced spread-Doppler clutter that interferes with the echo from ground targets. The course will develop and clearly illustrate the GMTI problem from first principles, showing the need for STAP processing. Traditional STAP processing solutions will be derived from a detection probabilistic perspective-the most pertinent metric for radar. Additionally, the course covers state-of-the-art STAP techniques that address many of the limitations of traditional (ideal) STAP solutions, offering insight into future research trends. [C1287]

"Adaptive waveform diversity for cross-channel interference mitigation"

In this paper we investigate the impact of the presence of an interfering radar on the target direction of arrival (DOA) estimation performed by the reference radar. The DOA estimator is a modified version of the pseudo-monopulse technique that, using adaptive waveform diversity in transmission, can mitigate the dependence of

the estimation accuracy on the interfering signal. The importance of using proper coding in multi-user radar system is highlighted with reference to a simple scenario of two radars and the root-mean square error (RMSE) of the estimator is numerically evaluated in different operational conditions. [C1288]

"Multi-frame sequential procedures in early warning surveillance radar systems"

This paper concerns the joint multi-frame sequential target detection and track estimation in early-warning radar surveillance systems. The rationale for applying sequential procedures in such a scenario is that they promise a sensitivity increase of the sensor or, alternatively, a reduction in the time needed to take a decision. Unlike previous works on sequential radar detection, the attention is not restricted to stationary targets, namely position changes during the illumination period are allowed. Starting from previous sequential rules, different truncated sequential strategies are proposed and assessed: they are aimed at orienting the sensor resources towards either the detection or the track estimation or the position estimation. Bounds on the performances of the proposed procedures in terms of the system parameters are derived and computational complexity is examined. Also, numerical experiments are provided to elicit the interplay between sensor-target parameters and system performances and to quantify the gain with respect to other fixed-sample-size (FSS) procedures. [C1289]

"Multiscan association as a multi-commodity flow optimization problem"

Multiscan data association can significantly enhance tracking performance in critical radar surveillance scenarios involving multiple targets, low detection probability, high false alarm probability, evasive target maneuvers and finite radar resolution. Unfortunately, however, this approach is affected by the curse of dimensionality which hinders its real-time application for tracking problems with short scan periods and/or long association windows and/or many measurements. In this paper it is shown how the formulation of the multiscan association as a multi-commodity flow optimization problem allows a relaxation of the association problem which, on one hand, guarantees close-to-optimal association performance and, on the other hand, implies a significant reduction of the computational load. [C1290]

"Target and change detection in synthetic aperture radar sensing of urban structures"

Cross-correlation based image subtraction for detection of targets within an urban structure from synthetic aperture radar images is presented. In surveillance operations requiring re-imaging of the same scene, small displacements in array element locations may cause large phase and amplitude offsets. Subsequently, clutter will not cancel out, but will rather persist when subtracting two images, one without the target and the other with the target present. We propose a correlation-based robust technique that mitigates image offsets and rotations and is applicable to synthetic aperture radar urban sensing where the statistics are highly non-Gaussian. Simulation results demonstrating the effectiveness of the proposed technique are also presented. [C1291]

"Adaptive tomographic sensors for below ground imaging"

In this paper, ground penetrating radar and tomography are combined to detect and identify hidden targets, such as underground facilities and hard and deeply buried targets. Past experience in below-ground imaging is described, current measurement results are presented, and future plans are discussed. [C1292]

"Avian detection and identification with high-resolution radar"

Bird strike hazards take place frequently in the world without prediction, destroying the expensive aircrafts, killing the pilots and the passengers, and bringing people disaster and sorrow. The conventional visual techniques donpsilat work at night or on the foggy and rainy days; even the weather radars couldnpsilat identify the birds accurately for its low resolution. In this paper, a novel method of avian detection and identification based on ISAR feature extraction techniques is proposed. The paper mainly discussed some key problems in feature extraction of ISAR targets. The method of imaging and micro-Doppler feature extraction based on frequency-stepped chirp radar is discussed. Parameters of the radar for avian detection and identification are designed. Then, imaging and micro-Doppler feature extraction is applied in avian detection and identification. Finally, some problems to study later are also discussed. [C1293]

"TRES: Multiradar-multisensor data processing assessment using opportunity targets"

In this paper we describe a new tool being currently developed by Eurocontrol for air traffic control multiradar-multisensor data processing systems assessment. This tool, called TRES (trajectory reconstruction and evaluation suite), will become in a near future a replacement for some parts of current versions of SASS-C (Surveillance Analysis Support System for Centres) suite. The paper describes the overall architecture of the assessment system, and details the methods used in TRES for the calculation of reference trajectories, taking

into account sensor detection characteristics, available information, sensor accuracies, biases, ... The whole system has been tested with real traffic and simulated data, some illustrative examples are presented at the end. [C1294]

"Range sidelobes suppression for HF surface wave radar with discontinuous spectra"

In order to improve the anti-interference performance, the high-frequency surface wave radar uses several discontinuous clear frequency bands for transmission. Spectral discontinuity causes high range sidelobes which influence detecting and identifying the targets. A novel modified CLEAN algorithm is proposed to remove the sidelobes interferences of the equivalent matched processing result of the received signals. The simulation results show that the method can not only suppress the range sidelobes efficiently but also enhance the range resolution greatly. [C1295]

"Principle and experiment of air target detection based on Signal Power Disturbance"

This paper introduces an allocation method for air target detection based on GPS satellites and analyses its fundamental principle. Upon the plenitude study of the characteristic of target information acquisition and information processing of bistatic radar, this paper puts forward a kind of target information acquisition technique called SPD (Signal Power Disturbance) which is different from the typical bistatic radar system. A series of experiments have been done to verify the SPD method. [C1296]

"Data association of monostatic-bistatic composite HF radar network under ionospheric interference"

High frequency surface wave radar (HFSWR) is superior to detect and track beyond-the-horizon targets but susceptible to the ionosphere interference because of the specific wavelength. Seeking out the real target points from plenty of false ones is an obsessional problem for data association. This is commendably solved by establishing a new radar system, the monostatic-bistatic composite radar network, and providing a novel process data association with steps of space cursory association, time cursory association, etc. The validity of this method is substantiated by the simulation results. [C1297]

"Study on bistatic (multi) radar system using navigation satellites"

The operational principle of passive detection radar based on outer radiation source is introduced. Based on the in-depth research study on operational principle of non-cooperation bistatic(multi) radar and the requirement for air target detection especially stealth target detection, a space-ground bistatic(multi) radar system based on navigation satellite signal is presented. The paper has analyzed the feasibility of target detection using navigation satellite signal and the problems for system function realization. The system operational principle and detection performance has also been studied. [C1298]

"FMCW V-band radar nonlinear analysis and solutions"

The high atmospheric attenuation of V-band millimeter wave, make it only application in outer space and the short-range detection. The FMCW short-range radar systems in this band have more than one non-linear subsystems, some of whom will interfere the system with error, or even wrong. To this end, the first non-linear analysis of the system, focusing on the effect of mixer and VCO on difference frequency signal spectrum, and the interference on ranging. Based on an analysis of the actual collected signal spectrum, use a narrow-band filter to eliminate interference. In the test, the target can be correctly detected out, the difference frequency spectrum is correct, the result meet the design requirements. [C1299]

"Study on ship-formation detection by missile-borne radar using DBS imaging algorithm"

For moving ship-formation target, problems such as the appearance of virtual targets occurs if general DBS procedure was adopted for detection. This paper improves DBS realization method accordingly: to estimate the whole velocity of ship-formation target first, and then carve up azimuth direction Doppler basing on both this velocity and the velocity of the missile. Researches are made of ship target models, and the results prove the effectiveness of procedure. [C1300]

"Near range MMW synthetic aperture radiometer 3D passive imaging"

Millimeter wave synthetic aperture radiometer (MMW-SAR) technology can use phase information of electromagnetic wave radiating from target, and will be real-time imaging with less receiver elements. However MMW-SAR is limited to 2D imaging due to passive regime nowadays, lack of range information of target, which

is very unfavorable for target detection and identification, thus this paper presents novel principle and algorithm for MMW-SAR 3D passive imaging under near range conditions. In near range, it is spherical wave radiation and wave front curvature of spherical wave is inversely proportional to propagation distance, synthetic aperture technology can get the curvature of the wave front. Thus there is quadratic phase factor in imaging formula primarily. Regarding the factor as LFM, the 3D imaging algorithm calculates the slope of LFM so as to get wave front curvature, then calculated range distribution. MMW-SAR 3D passive imaging can get both range distribution and brightness temperature distribution, which could effectively overcome fuzzy problem caused by defocus. [C1301]

"Adaptive Localization through Transfer Learning in Indoor Wi-Fi Environment"

In a Wi-Fi based indoor localization system (WILS), mobile clients use received Wi-Fi signal strength to determine their locations. A major problem is the variation of signal distributions caused by multiple factors, which makes the old localization model inaccurate. Therefore, the transfer learning problem in a WILS aims to transfer the knowledge from an old model to a new one. In this paper, we study the characteristics of signal variation and conclude the chief factors as time and devices. An algorithm LuMA is proposed to handle the transfer learning problem caused by these two factors. LuMA is a dimensionality reduction method, which learns a mapping between a source data set and a target data set in a low-dimensional space. Then the knowledge can be transferred from source data to target data using the mapping relationship. We implement a WILS in our wireless environment and apply LuMA on it. The on-line performanceevaluation shows that our algorithm not only achieves better accuracy than the baselines, but also has ability for adaptive localization, regardless of time or device factors. As a result, the calibration efforts on new training data can be greatly reduced. [C1302]

"Automatic Detection and Tracking of Maneuverable Birds in Videos"

In this paper, we try to detect and track maneuverable birds in captured videos for further automatic research. To avoid abrupt scene change, videos are captured by pointing the camera upwards and making the image against the sky. Two levels (pixel level and frame level) background update algorithm is used to get the foreground in real time. In frame level, three thresholds are used to update the background to achieve fast background update under abrupt scene changing. Targets are detected from the binary foreground after retrieving contours, size filter and margin measure. The tracking of maneuverable birds is achieved by using a Markov chain Monte Carlo (MCMC) filter with no move types. The experiment results show that multiple maneuverable birds are detected and tracked accurately in real time, and the size of the tracking box adjust fast to cover the true area of birds. [C1303]

"High-Resolution Bayes Detection of Dim Moving Point Target in IR Image Sequence Using Probabilistic Data Association Filter"

Probabilistic data association (PDA) technique was found its broad applications in Radar target tracking. In this paper, based on the basic idea of PDA, a bayes-rule based high-resolution detection algorithm for dim moving point target in images sequence is presented: derived the formula for computing location-dependent Bayes threshold and posterior association probabilities for every measurement being a true target location. And the comparative performance analysis are also given in this paper. [C1304]

"A Novel Image Moving Sea Targets Detection Method Based on the Natural Measure Feature"

Limitations and disadvantages of available methods based on statistical analysis are pointed out and a novel image moving sea targets detection method based on the natural measure feature is proposed. The method analyses the characteristic of chaotic sea and sky background and extends the extraction of the natural measure feature from single dimensional signals to two dimensional image signals. The experiment results show that the natural measure features of sea, sky and moving sea targets have obvious difference. The proposed method not only can detect sea moving targets effectively, but also has high detection rate and low false alarm rate. Furthermore, the proposed method is superior to the statistical analysis method. [C1305]

"ADP-Based Optimal Adaptive Waveform Selection in Cognitive Radar"

The problem of adaptive waveform selection can be viewed as a problem of stochastic dynamic programming. However, the computational cost of solution of optimality equations is very high as a result of large state variable space. So far few suitable scheduling algorithms have been proposed. To account for the aboved shortcoming, we can use approximate dynamic programming (ADP) to solve adaptive waveform selection problem. The scheduling algorithm we proposed can minimize the time taken to detect new targets, detect these targets in accordance with importance, and minimize the use of radar resources. Meanwhile we have a lower computational cost compared with the traditional algorithms. Finally, the whole paper is summarized. [C1306]

"Cognitive detector: A new architecture for target detection and tracking in complex environment"

A new target detection architecture, designated as cognitive detector, is proposed. This method aims at solving the problems arising from simultaneous detecting and tracking targets in various non-stationary and time-variant clutter environment. Image character of detection background and the scene analysis result, which is the information that hasnГ‚Вït been exploited in any existing integrated detection and tracking system, can help adjust the detection algorithm adapting for the various background and add more information about the target/clutter for data association or tracking to enhance the systemГ‚Вїs performance. Cognitive detector partitions the radar detection scene using the statistical and image character of the detection background. Then, multipolicy detection algorithm and detection oriented data association method operate based on the former output. At last, feedback structure between detection and tracking algorithm is used to optimize the detection policy. As describing the definition of cognitive detection and its operation processes, the paper focuses on the specific application of high frequency surface wave radar, for which the cognitive detector is rather well suitable. [C1307]

"Effect of wind on space-based radar performance"

This paper addresses the effect of wind on target detection performance using a space based radar platform. Forests and lakes are constantly being modulated by wind, which then affects the radar pulse returns by suitably amplitude modulating the temporal returns, thus affecting the Doppler. Billingsley has modeled the windblown autocorrelations using a real symmetric function that is the sum of a constant term and a ldquoCauchy density function typerdquo term. Using a rational system approximation on the Billingsley spectrum, it is shown that a sixth order rational model containing two damped sinusoidal terms and two exponentially decaying terms can duplicate the wind spectrum up to about -80 dB in the case of low wind speed. Each sinusoidal component in the wind spectrum generates an additional clutter Doppler component and the effect of damping is shown to generate a bundle of uncorrelated returns for each such frequency, with each uncorrelated return containing a coherent sum of signals. As a result, the degradation in performance when wind is present can be attributed to the coherent returns that can not be nulled out using standard adaptive processing techniques. [C1308]

"New approach to 2d Medium PRF ambiguity resolution with application to air surveillance radar"

This paper illustrates a new algorithm for noncoherent integration and ambiguity resolution in medium PRF wave-forms. Range and Doppler ambiguity resolution is one of the main issues in Medium PRF radars [1,2,3]; it will be shown that the proposed algorithm provides range and Doppler ambiguities resolution as an inherent feature while maximizing detection probability with respect to conventional binary integration. The algorithm is described and tested by means of a numerical examples, in which non ideal radar accuracies and target cell migration are considered and managed with a proper clustering technique. The resulting design of the algorithm shows high robustness to the aforementioned sources of error affecting radar measurements. [C1309]

"Classification of landmines using GPR"

This paper describes a study carried out into the discrimination and classification of anti-personnel landmines using the MINEHOUND GPR. Other techniques, well reported in the literature, are not considered in this study. The techniques investigated enabled the classification of landmines to be achieved on a restricted set of targets. The approach proposes a method whereby a library of radar signatures of landmines is acquired under controlled conditions and then used to classify unknown signatures. Initial results show that this method enables clutter targets to be well separated from landmine targets, with the exception of air voids, such as pipes. The technique offers the potential of a reduction in false alarm rate to 10% of the current performance. [C1310]

"Multi-target detection using noise-like signals"

Both the generalization to space-time adaptive processing (STAP) and to an arbitrary number of targets, of a multiple beamforming technique and its adaptation to noise-like signals are presented in this paper. A hybridization of both the joint domain localized (JDL) and the direct data domain (D3) STAP methods is used to prove the feasibility of multi-target detection in the presence of either homogeneous or nonhomogeneous interferences. This technique is applied to digital video broadcasting-terrestrial (DVB-T) signals in order to prove the feasibility of a passive DVB-T-based multi-target bistatic radar. [C1311]

"Image-while-scan results from the X-band Wideband Experimental Airborne Radar"

Defence Research and Development Canada-Ottawa has developed an experimental airborne radar referred to as the X-band Wideband Experimental Airborne Radar (XWEAR). The radar was designed to support research

into SAR imaging of fixed and moving targets (ocean and land), time-frequency analysis of moving targets, clutter suppression for GMTI radar, and ocean surveillance for small and large target detection. Hence, the system is capable of collecting data in synthetic aperture radar, inverse synthetic aperture radar, ground moving target indication and maritime surveillance modes. In the following, a description of the experimental radar is given. Results from operation in an image-while-scan mode, whereby the system was operating in a maritime surveillance mode and Inverse Synthetic Aperture Radar imagery was produced from the data collected while the antenna scanned maritime targets, are then presented. Finally, the paper summarizes with a discussion on the utility of performing ISAR while in a scanning surveillance mode. [C1312]

"PBR activity at INFOCOM: Adaptive processing techniques and experimental results"

The paper describes the results achieved at the INFOCOM Department of the University of Rome ldquoLa Sapienzardquo on passive bistatic radar (PBR). The developed adaptive signal processing techniques are introduced for: improved disturbance cancellation, multipath removal, and multifrequency target detection. The development of experimental wide-band PBR prototypes is described, as opposed to single frequency channel PBR systems, giving special attention to the system design guidelines and test procedures. The experimental results achieved using the wide-band PBR prototypes are shown, there including the demonstration of effectiveness of the techniques above. The results are shown to be largely consistent with live air traffic control registrations. [C1313]

"Acceleration estimation for Passive Coherent Location radar"

The paper presents a method for estimation of acceleration in passive coherent location (PCL) radar. The method is based on the Generalized Chirp Transform, which is a maximum likelihood estimator in this case. The authors propose a fast and efficient algorithm for calculating acceleration by filtering a two-dimensional range-Doppler surface. The algorithm is tested on simulated data as well as on real-life data from an FM-based PCL system. [C1314]

"Design, development and test on real data of an FM based prototypical passive radar"

This paper describes the design, development and test of a passive covert radar (PCR) exploiting a single non cooperative frequency modulated (FM) commercial radio station as its transmitter of opportunity. The system has been conceived in order to detect low flying and low radar cross section (RCS) targets even in disturbed and hostile electromagnetic environments. Preliminary measurements of the electromagnetic field intensity at the installation and test site of the prototypical PCR, suggested developing: (i) log-periodic antennas with adequate front-to-back ratio; (ii) brand new receivers characterized by state-of-art technology; (iii) adaptive signal processing; (iv) data processing based on particle filtering. The performance of the real-time system, whose refresh rate is less than five seconds, has been assessed comparing its output to truth data provided by air traffic control systems. [C1315]

"Multistatic target classification with adaptive waveforms"

Traditional radar systems rely on a predefined suite of waveforms and post-measurement signal processing to achieve such goals as target detection, classification, and tracking. Cognitive radar (CR) is a newly proposed framework in which the radar actively interrogates the propagation channel and adapts its operating parameters in order to maximize performance. We apply CR to a target classification problem by calculating custom waveforms that maximize the information received from the target echoes. A new MIMO waveform is proposed which maximizes the mutual information between a Gaussian random target and the received data under AWGN. The results indicate that the new frequency-domain formulation offers superior performance compared to both a non-adaptive approach and an ad hoc application of spectral waterfilling to the MIMO setting. [C1316]

"Detection of snow clutter in ATC ground radar signal"

The use of adaptive techniques may prove useful in the processing of radar signals. The proposed radar clutter classificator is aimed to improve the detection of snow clutter presence in data acquired by a ground radar system in an air traffic control environment. The classifier receives as input a set of features which describe the appearance of the same plot in two consecutive scans of the ground radar. The feature set includes two group of parameters, which respectively represent the shape of the plot in each scan, and the displacement of the center of mass of the plot between the two scans. The data set used in simulations has been extracted from a measurement campaign carried out in presence of snow in Italian airports, with the help on an expert operator who manually classified a set of plots as target, or clutter. The performance of the classifier, a multilayer perceptron trained with the backpropagation rule, indicates a correct classification rate of about 98%. [C1317]

"Affordable High-Performance Radar Networks for Homeland Security Applications"

High-performance radar networks have been deployed for homeland security Applications. Having the radars on a network allows for increased coverage via multiple radars, as well as the communication of situational awareness in real time to multiple remote users. The radars and networks exploit commercial-off-the-shelf (COTS) technology to be easily affordable for the wide-area surveillance needed for these applications. Implementing radar networks over the Internet enables the straightforward integration of operational systems. Results from a deployed three-node radar surveillance network covering western Lake Erie are presented. These results include the fusion of target tracks from the three radar nodes. [C1318]

"On the potentials of passive, multistatic, low frequency radars to counter stealth and detect low flying targets"

The potentials of passive, multi-static radars as covert sensors for the detection of low flying, stealth air targets are illustrated by multi-static RCS analysis, coverage simulations for low flight levels and measurement results obtained with an experimental passive radar using digital audio broadcast signals (DAB). The measurement sensor is described and future perspectives are pointed out. [C1319]

"Target identification in a MIMO environment"

A MIMO radar system with M transmitters and N receivers is used for target identification of unknown non-cooperative radar targets. The radar system is assumed wideband with sufficient bandwidth to obtain a target impulse response that shows significant scattering mechanisms and correlates well with the geometry of the target. Contributions in this paper are threefold: First, target identification in a Multi-Input-Multi-Output radar framework is established. Second, the system relies on real scattering signatures as seen by a wideband radar system. Third, the system is tested using real radar signatures collected in a compact range environment using a single-antenna stepped frequency radar interrogating commercial aircraft models at various azimuth angles. [C1320]

"Virtual MIMO radar using OFDM-CDM waveforms"

This paper addresses a new perspective on the exploitation of diversity resembling recent seminal proposals with multiple antennas known as MIMO radar. Our focus pursues similar advantages as spatial MIMO systems but intending to achieve the desired resistance over fading or/and SNR increase without relying on multiple antennas. We design an OFDM-CDM waveform well inspired in modern communications systems that creates a virtual MIMO system operating on the artificial 2D domain formed by a set of well separated carriers (OFDM) and several OFDM symbols each one modulated by orthogonal codes (CDM). We consider the most general scenario with moving targets and large size targets originating an equivalent time variant and frequency selective channel model. Our proposal proceeds in two steps, a first one to reorthogonalize the transmitted set of OFDM signal by proper time and frequency synchronization (this stage provides range and velocity estimators), and a second one based on Neyman Pearson detection improved by the diversity gain. [C1321]

"Performance evaluation of radio frequency interference cancellation techniques in HFSWR"

The co-channel radio frequency interference (RFI) is the most common interference encountered in high-frequency surface wave radar (HFSWR). Normally each RFI shows a line in the range-Doppler map, across all range bins at a certain Doppler frequency, which significantly affects the radar target detection performance. In this paper, the characteristics of co-channel RFI in range, Doppler and spatial domain are analyzed in detail. Then several adaptive beamforming based RFI cancellation techniques are evaluated and compared using experimental data, and the most preferable technique in practical HFSWR environments is recommended. [C1322]

"Radar detection using Siegel distance between autoregressive processes, application to HF and X-band radar"

In this paper, we present an original generalization of the CFAR technique . The technique of CFAR consists in testing two alternative assumptions ldquopresence of targetrdquo versus ldquoabsence of targetrdquo in a distance-azimuth cell called ldquocell under testrdquo. In the case where the noise is Gaussian and additive, one can show that the CFAR is equivalent to withdraw from the signal under test the average of the surrounding signal and to divide the whole by the standard deviation of the surrounding signal. The presence of a target is then decided if the resulting quantity is higher than a given threshold determinated in order to maintain false alarm ratio constant. In our article, the treated data are the In Phase-Quadrature data obtained in each distance-

azimuth cell. Those are interesting because their Fourier transform makes one possible to acquire the Doppler spectrum. These data are vectorial and more exactly are regarded as the realization of circular and centered complex Gaussian vectors. In order to generalize the technique of the CFAR, we take into account the works of C. R. Rao in information geometry and the works of T. Ando and D. Petz in order to define the distance between distributions as well as the concept of average. We will decide the presence of a target if the distance from the sample under test to the mean of the surrounding samples is higher than a certain threshold. [C1323]

"Data association algorithm in multiradar system"

In this paper we apply a data association in track-before detect (TBD) with a polar Hough transform (PHT) in a radar network. The proposed algorithm is applied in multiple input multiple output (MIMO) radar system. We study the sensitivity of TBD multi-radar system as a function of the errors of target trajectory parameters measurement. The results are obtained in the presence of Randomly Arriving Impulse Interference (RAII) and the target coordinates (range and azimuth) are measurable with and without errors. The study of the signal processing used in detectors is performed through Monte-Carlo simulations in MATLAB computing environment. [C1324]

"Quasi-optimal signal processing in ground Forward Scattering Radar"

A signal processing algorithm for ground target detection using forward scattering radar (FSR) is presented in this paper. The effectiveness of the algorithm is shown using both simulated and experimental data. The algorithm is based on the matched filtering approach, where the correlation between the received signal and a set of pre-defined reference functions is calculated. The maximum of the correlation function indicates the estimated target parameters. The algorithm compresses the target signal, increasing signal-to-noise ratio, and allows identification of target speed and its position relative to the FSR geometry. [C1325]

"Waveform design optimization using bandwidth and energy considerations"

The problem of joint transmitter and receiver design for optimum output performance in the context of detection in the presence of clutter and noise is addressed here by maximizing the receiver output signal power to average interference plus noise ratio (SINR) at the specific decision instant. The receiver optimization leads to output SINRin terms of the transmit waveform, and transmitter optimization is further carried out subject to energy and bandwidth constraints. The new design proposed here leads to threshold constraints on transmit energy and the overall performance as a function of bandwidth is illustrated here for various target, clutter and noise scenes. [C1326]

"Analysis of medium grazing angle X-band sea-clutter Doppler spectra"

Doppler analysis of radar sea-clutter is typically performed from a static cliff top location looking out to sea. This constrains the grazing angle to low values and the radar look direction with respect to the wind. Current research at the DSTO is interested in the properties of sea-clutter at medium to high grazing angles, over all azimuth directions, full polarisation and different spatial resolutions. The sea clutter Doppler spectrum investigated in this paper was collected by an airborne platform and analysed using the three component Walker scattering model modified to include Doppler shifts from the moving platform. The modelling results enable the underlying Doppler spectrum and autocorrelation of the sea clutter to be estimated. This will enable future analysis into the performance of medium to high grazing angle target detection algorithms in the maritime environment. [C1327]

"detection of multiple targets in non-Gaussian clutter"

Presence of interfering targets causes a significant loss in detection performance. In this study, detectors of multiple targets, which are located at the same range cell but have different Doppler frequencies, are developed. The clutter is modeled to have compound-Gaussian distribution. The detectors that are designed here can alleviate the masking problem by means of considering the existence probability of an interfering target and performing the estimation of the target returns, clutter texture parameter and Doppler frequencies accordingly. The performance analysis was done through simulations and it was shown that the methods enable the detection with high probability, even in the presence of a strong interfering target. Besides, it was shown that the performance loss of the multiple-target detectors in single-target case is insignificant unless the signal to clutter ratio is too low. [C1328]

"A robust CFAR detector in non-homogenous environment"

In this paper, a robust CFAR detector, composed of an automatic dual censoring algorithm and the cell averaging CFAR detector, is proposed for non-homogenous environment. The new detector is named an

automatic dual censoring cell averaging (ADCCA). The proposed detector does not require any prior knowledge about the background environment and uses two threshold values to reject the unwanted samples in the reference window. The performance of the proposed detector is evaluated and compared with those of the CA, OS and ACCA-OVD CFAR detectors. The simulation results show that the ADCCA-CFAR detector not only provides low loss CFAR performance in homogenous background but also performs robustly in presence of interfering targets and clutter edge situations. [C1329]

"Adaptive radar detection of distributed targets under conic constraints"

In this paper we deal with the problem of adaptive detection of mismatched mainlobe targets and/or sidelobe interfering signals that are distributed in range. More precisely, in order to improve the robustness of the decision rule in presence of mainlobe targets we investigate the impact of modeling the actual useful signal as a vector belonging to a proper cone with axis the nominal steering vector; similarly, in order to improve the rejection capabilities of the decision rule in presence of sidelobe targets we study the effects of replacing the usual noise only hypothesis with a noise plus interferers hypothesis where interferers belong to the complement of a cone with axis the nominal steering vector. Mixed solutions are also studied. At the design stage we adopt the GLRT principle to derive CFAR detectors under the assumption that training data are available and the noise vectors share one and the same Gaussian distribution (with unknown covariance matrix). The performance assessment, conducted also in comparison to other approaches, proves the effectiveness of the proposed strategies. [C1330]

"Multi-target signal processing in FMCW radar system with antenna array"

In the frequency modulated continuous wave radar systems, when the transmitter uses periodic linear symmetric triangular wave modulation, the received signal after processed by the mixer will have many harmonics. In the single target detection, this effect can be ignored. However, in the multi-target detection, targets with different ranges and velocities lead to overlapping of the harmonics. Using the peak detection method at the receiver can only detect the maximum peak position, so the information contained in the other peaks is concealed. In order to resolve this issue, we propose to use an antenna array receiver with array signal processing. This not only improves the signal-to-noise ratio but also resolves successfully the multi-target detection problem. [C1331]

"MLP solutions for approximating the Average Likekihood Ratio detector in radar applications"

Multilayer perceptron (MLP) based detectors are proposed for detecting Gaussian signals with unknown correlation coefficient (rhos) in additive white Gaussian noise. After proving the low robustness of the likelihood ratio (LR) based detector with respect to rhos, the average likelihood ratio(ALR) based detector assuming a uniform distribution of rhosin [0,1] is formulated. Due to the complexity of the involved integral, two NN based solutions are proposed. MLPs trained with target one-lag correlation coefficient (rhos) varying uniformly in [0,1] outperform the LR-based detector for a fixed rhos, when targets with rhosvarying uniformly in [0, 1] are considered for simulation. Two MLPs with 17 hidden neurons each are trained with rhosvarying uniformly in [0,b] and [b,1], respectively. Different values of b are studied: 0.25, 0.5 and 0.75. These three detectors outperform the single MLP, and the best results are obtained with b = 0.5 and 0.75. Finally, results show that the number of hidden units of the MLP trained with high values of rhoscan be reduced to 8, without reducing the detection capabilities. [C1332]

"Performance analysis of TM-CFAR detection in time diversity systems for pulse-to-pulse correlated targets in presence of clutter edges and outlying targets: A comparison through extensive simulations"

In automatic radar detection, performance of time diversity systems is proved to be sensitive to how the multiple-pulse sample echoes, from commonly encountered nohomogeneities, are accumulated within the same receiver. Based upon the ldquonon conventional time diversity systemrdquo(NCTDS), we derive exact expressions for the probabilities of false alarm and detection of a pulse-to pulse partially correlated chi-square target with 2K degrees of freedom for the trimmed mean constant false alarm rate (TM-CFAR) detector. Because of the complex mathematics induced by the ldquoconventional time diversity systemrdquo (CTDS), detection performance of this system is carried out using Monte Carlo simulations. The extensive simulation results show that, while the NCTDS achieves a better nonuniform clutter resilience than the CTDS, the latter outperforms the former in multiple target situations. Hence, when both nonhomogeneities are concomitantly present, the two systems performances become nearly similar. [C1333]

"Detection of known targets in Weibull clutter based on Neural Networks. Robustness study against target parameters changes"

The coherent detection of targets in presence of clutter and noise is considered in this study. Several clutter models are proposed in the literature, although the commonly used for sea and land clutter returns is the Weibull one. Our case of study involves that the target is known a priori, the clutter is Weibull-distributed and a white Gaussian noise is present. In this case, obtaining analytical expressions for the optimum detector is very difficult, so suboptimum solutions are taken as reference. One of this solutions is the target sequence known a priori (TSKAP) detector. This detector has several problems because it is designed for specific target and clutter parameters. So, in order to reduce these problems, a new solution is proposed, which is based in neural networks (NNs). The NNs selected are the MultiLayer Perceptrons (MLPs), which are able to learn from different environments. But, what does it happen if the radar (target or clutter) testing conditions are different of the design ones? In this case, a robustness study with respect to the target Doppler frequency is done for different radar conditions, which shows that the behavior of the proposed solution against this changes is better than the detector taken as reference, the TSKAP detector. [C1334]

"Long-Range Target Classification in a Cluttered Environment Using Multi-Sensor Image Sequences"

Visual surveillance has been an active research area in computer vision and image processing, due to its crucial role in helping military intelligence and law enforcement agencies to fight against crime and terrorist activities. The goal of a visual surveillance system is to detect abnormal object behaviors and to raise alarms when such behaviors are detected. After moving objects are detected, it is essential to classify them into predefined categories, so that their motion behaviors can be appropriately interpreted in the context of their identities and their interactions with the environment. Consequently, object classification is a vital component in a complete visual surveillance system. RADAR (Radio Detection and Ranging) images are often undesirable in military applications because they reveal the location of the imaging system. So we explore visible and infrared images of ships which are generally more consistent than RADAR images and for which it is easier to compensate for environmental effects. Recent advances in visible and IR imaging technology improves its ability to observe objects at very long distances, but it is still militarily desirable to stay away as far as possible from potential enemy ships, which may be observed at different viewing angles. Several methods have been described in literature to perform the automatic classification of big ships (e.g. aircraftcarriers, combat ships, transportation ships, etc) from images, but none of them are based on small boat classification. A Principal Component Analysis (PCA) based target classification system is implemented for visible and IR small boat images which are captured in a highly cluttered background environment. Two robust segmentation algorithms were implemented, Graph-cut for grayscale IR small boat images, and Adaptive Progressive Thresholding (APT) for visible small boat images. These algorithms are tested for images captured in a highly cluttered background. [C1335]

"Earth Observation Remote Sensing and GIS Services for Monitoring of Integration Systems"

Today availability of using the high resolution of space imagery creates a positive environment on application of space technology for monitoring of integrated systems in different areas of industry and commercial purposes. They are an airborne, unmanned aerial vehicles (UAV) and satellite Synthetic Aperture Radar and LIDAR multi-spectral and hyper-spectral sensors. One of the advance methods of feasibility study of appropriate services for monitoring of integration systems is based on remote sensing data and GIS developments. Objective of this approach is to improve safety, security aspects of integration systems, reduce survey costs and improve transportation and transmission efficiency through an increased monitoring frequency. Conceptually monitoring the integration system is structured into four main system components: (1) the Pipeline Operator System (POS), which is the part of the monitoring system which is used by the pipeline operator for delivery and handling of alarms and for specifying the monitoring characteristics for different parts of the pipeline network. (2) the Pipeline Information Management System (PEMS), which stores all relevant information on the pipeline network, the environment around it, and the integrity monitoring and which provides analyses and scheduling functionalities for the pipeline operator. The PIMS also includes an alarm production system, which decides what hazards should be considered as alarms. (3) the Hazard Extraction System (HES), which extracts the hazard report information out of the basic remote sensing imagery layers, using advanced image interpretation techniques. (4) the imagery Collection System (ICS), which collects the required remote sensing imagery with a suit of both spaceborne and airborne platforms and different types of sensors, conform the monitoring priorities. In the ICS all these means are scheduled optimally conform the specified priorities of the pipeline operators and the weather and season conditions- . Here also the data are pre-processed to remote sensing basic imagery layers. The four components in principle can be independent of each other so that maximal flexibility exists. Also each system component in itself is set up as much as possible in a modular and flexible way. By implementation of this above mentioned issues, new technologies on sensors, platforms, data processing, data storage and transfer can be integrated and the system easily can be extended to other operators or areas. The future integration systems monitoring scenarios can only be turned into reality if sufficient supply from spaceborne data will be available for reasonable economic conditions and with certain technical performance. Earth observation for appropriate

investigation requires very high resolution optical and in most cases radar sensors. Very high resolution is here defined as a resolution of 1 meter and better. This scale is required to allow the detection of targets. Very high resolution satellite observation, formerly limited to national and strictly classified reconnaissance tasks, has become a commercial business in the recent years. However, national security users are still the basis for the commercial viability of that business. Affected by satellites losses and pioneered with Space Imaging's IKONOS satellite, better than 1 meter resolution optical data is now available for science and commercial use. [C1336]

"Shape reconstruction of three dimensional buried objects from stepped frequency data"

In this communication the problem of reconstructing the shape of 3D buried targets from stepped frequency GPR data is addressed by exploiting an improved formulation of the Sampling Methods (SM). These latter are simply and efficient methods which may retrieve the geometrical features of dielectric or metallic targets from multiview, multistatic data measured at a fixed frequency. However, while accurate results may be achieved when full-aperture data are available, their effectiveness is quite unsatisfactory in case of aspect-limited data and lossy media, which is the usual case in GPR applications. In order to overcome this drawback, we propose a new formulation, which is able to improve the reconstruction of the deeper part of the investigated region and it is an original extension of the SM to the case of multi-frequency data. [C1337]

"De-cluttering with Integrated Probabilistic Data Association for Multisensor Multitarget ACC Vehicle Tracking"

In the field of automotive environment perception, the state estimation problem of other road users with sensors like video, radar, lidar, or combinations of them has been solved for years now. However, driver assistance systems like ACC are only available for restricted environments like highways and rural roads today. Especially in complex environments, the uncertainty of target existence induced from missing and false detections becomes the dominating error source. Traditional approaches for track verification are rule based systems and trained classifiers. In this contribution, we present an automotive application of the integrated probabilistic data association (IPDA) filter superseding additional validation modules by modeling the probabilistic knowledge about both, state and existence, as temporal Markov chains and computing filter estimates for both issues. The temporal evolution and measurement update models for state and existence estimation are presented for the vehicle tracking problem as well as results from a sensor fusion setup with video and multibeam lidar. [C1338]

"Routing for Emitter/Reflector Signal Detection in Wireless Sensor Network Systems"

In this paper, we consider energy-efficient routing for detection in wireless sensor networks (WSNs). Energy-efficient routing for WSNs has been intensely studied recently, but routing for signal detection in WSNs has not attracted much attention. Moreover, we are not aware of any previous work on routing for detection in WSNs that specifically considers the Neyman-Pearson criterion which is the most accepted metric for radar, sonar and related signal detection problems. By deploying a simple but illustrative model for target detection in WSNs, we formulate a problem of energy-efficient routing for signal detection under the Neyman-Pearson criterion. We propose a routing metric which aims for a route with the maximum mean detection-probability-to-energy ratio, and describe methods for solving the resulting optimization problem. This proposed metric, striving for a balance between the consumed energy and detection performance, is effective for finding the optimal routing that values such an energy-detection tradeoff. [C1339]

"A Data Fusion Algorithm for Large Heterogeneous Sensor Networks"

A distributed search based data fusion algorithm is presented for target detections in large heterogeneous sensor networks. A score function is introduced as the objection function during the optimal search. The network state is determined when the score is the highest. A close to optimal solution can be obtained before the arrival of the next sensor data thus enabling real time target tracking. The algorithm is evaluated with a series of real-time simulations on networks of variable sensor compositions with a commodity Linux cluster. [C1340]

"Precise Registration of 3D Models To Images by Swarming Particles"

The precise alignment of a 3D model to 2D sensor images to recover the pose of an object in a scene is an important topic in computer vision. In this work, we outline a registration scheme to align arbitrary standard 3D models to optical and synthetic aperture radar (SAR) images in order to recover the full 6 degrees of freedom of the object. We propose a novel similarity measure which combines perspective contour matching and an appearance-based Mutual information (MI) measure. Unlike previous work, the resulting similarity measure is optimized using an evolutionary particle swarming strategy, parallelized to exploit the hardware acceleration potential of current generation graphics processors (GPUs). The performance of our registration scheme is systematically evaluated on an object tracking task using synthetic as well as real input images. We show that

our approach leads to precise registration results, even for significant image noise, small object dimensions and partial occlusion where other methods would fail. [C1341]

"Parameter Estimation of Moving Targets in Airborne SAR Based on Fractional Fourier Transform"

Fractional Fourier transform was used in this paper to realize the localization and velocity estimations in both directions, ground range direction and azimuth direction, when it comes to a one-aperture radar system. The theoretical analysis started with the echo signal model of SAR moving point targets and the computer simulation results of motion parameter estimations were given in this paper. The experimental results indicate that using fractional Fourier transform to detect the moving target, nice effect of localization and velocity estimation can be obtained in different signal-to-noise ratio conditions, and there is no cross-term interference when several moving targets exist. [C1342]

"A Study on Scatter-Wave Jamming for Countering SAR"

Modem imaging radar such as SAR is capable of generating images of targets. This paper analyzes the fixed offsets of the false target by using the scatter-wave jamming mode, and then presents a method to synthesize a false target with given offsets both in range and azimuth direction. Finally the modulation equation is given for the jammer. [C1343]

"Time-frequency domain signature analysis of GPR data for landmine identification"

In this paper, the problem of detecting buried antipersonnel (AP) landmines is tackled in the broader context of target identification: determining relevant features, extracted from impulse ground-penetrating radar (GPR) signals, which can be used to classify landmines. These features are extracted in the time-frequency domain using the Wigner-Ville distribution (WVD) and the wavelet transform (WT). Radar data are collected using the MINEHOUNDTM hand-held dual-sensor system over two types of soil and for different landmines and objects. The Wilk's lambda value is used as a criterion for optimal discrimination. Results show that time-frequency signatures from WVD contain more valuable information than the features extracted using WT. Therefore, they could improve landmine and false alarm classification and help to differentiate between two different landmines. [C1344]

"Analysis of Directional Borehole Radar Measurement Data"

We developed a new directional borehole radar system with an array of optical electric field sensors as receivers. The system was tested in a field test site in order to assert its ability to detect three dimensional (3D) location of a subsurface tunnel. In this paper, the result is shown with a comparison to a result obtained by RAMAC directional borehole radar system. It is found that the optical electric field sensors are able to obtain highly coherent signals, that is necessary for the accurate estimation of a target azimuth direction, over the RAMAC system. The mutual coupling effect that deteriorates the coherence is also discussed. The azimuth estimation of the subsurface tunnel, which is located 5.5m apart from the tunnel, showed good agreement with the actual direction to an error of within 10 degree. [C1345]

"Automated False Track Identification"

Suboptimized real-time surveillance systems trade off reporting all targets in the surveillance volume against minimizing the number of false tracks. Analysis of archived data can identify false tracks. By automating the analysis, system optimization can be done sooner. Automated analysis identifies candidate false tracks using track characteristics over the life of the track. These characteristics depend on the sensor data and operational environment. This paper discusses automated false track identification of ASDE-X (Airport Surface Detection Equipment Model X) tracks collected at multiple airports. These tracks are supported by radar and multilateration sensor data. [C1346]

"The Application of KL Transform to Remove Direct Wave in Ground Penetrating Radar Records"

In ground penetrating radar (GPR) records, because of different kinds of noises, especially direct wave of ground surface, the real target is not seen clearly in the radar echo section, which makes the detection of real targets difficult. Considering that the direct waves among traces are not change greatly and have strong correlation, so it can be restrained by certain methods. KL transform often be used to pick up coherent noises and random noises in multi channel seismic records[U 4]. In this paper, KL transform is used to GPR data processing, which fully uses the different second-order statistic characteristics of their correlations on the direct wave, target signals in multi channel GPR data. The target signals are successfully separated form noises according to the corresponding relation of the eigenvalue's magnitude of the correlation matrix and correlation strength of each

component in the multi channel GPR data. [C1347]

"CFAR Matched Detector of Signals in Autoregressive Noise"

The generalized likelihood ratio test (GLRT) for detecting a target signal in autoregressive (AR) noise whose covariance matrix is unknown is presented. We proposed a new constant false alarm rate (CFAR) matched detector whose structure does not depend on noise covariance matrix and level and its performance penalty is small. The evaluation of its performance shows that the loss measured with respect to the corresponding optimum structure with known noise covariance matrix is kept within a few dBs. [C1348]

"Detection of the Stochastic Objects in Multiposition SAR"

Proposed detection method in multiposition SAR is a high-stable, allows to detect objects with high probability of true detection along with low probability of the false alarm in comparison with monostatic/bistatic SAR.Significant advantages of the multiposition SAR are possibility to detect objects hidden for some bistatic pairs; possibility to detect targets even if their backscattering diagram is "almost zero" for some receivers (stealth objects as well); possibility of detection and identification of objects, width of which is closer/smaller than resolution. Optimal and quasioptimal detection algorithms were derived for two kinds of the objects- given by distribution of the complex scattering coefficient and objects given by distribution of the statistical characteristics of the object complex scattering coefficient. [C1349]

"MIMO Radarwaveform Design"

Recently the radar community has been discussing "multiple-input multiple-output (MIMO) radar" that utilizes multiple transmitters to transmit independentwaveforms. MIMO radar offers the potential for significant gains, e.g., diversity gain and spatial resolution gain. Since the employed radar waveform plays a key role in determining the accuracy, resolution, and ambiguity in performing tasks such as determining the target range, velocity, shape and so on, it is meaningful to investigate waveform design specially for this newly proposed MIMO radar. This paper summarizes some of our recent results on MIMO radar waveform design, mainly for identification and classification of extended radar targets. Our waveform design considers optimizing two criteria: maximization of the mutual information (MI) and minimization of the minimum mean-square error (MMSE). In this process, we are also interested in identifying the relationship between the waveforms obtained under the two criteria, given different a prior knowledge of the target's second-order statistics. [C1350]

"Maximizing Detection Performancewithwaveform Design for Sensing in Heavy Sea Clutter"

In this paper, we consider a radar system capable of adaptively adjusting its transmitted waveform to mitigate the effect of the environment and improve detection performance. We thus bring the potential of waveform agility to bear on the challenging problem of target detection in heavy sea clutter. Using a two-stage procedure, we first estimate the statistics of the sea clutter in the vicinity of a predicted target. A phase-modulated waveform is then designed and transmitted so as to maximize the generalized likelihood ratio at the predicted target location, thus improving the signal-to-clutter ratio (SCR). Employing the compound-Gaussian (CG) model, we exploit a subspace-based approach to further mitigate sea clutter and deliver improved detection performance. Simulations illustrate the effectiveness of our method. [C1351]

"Spectrogram-Based Methods for Human Identification in Single-Channel SAR Data"

Radar offers unique advantages over other sensors, such as visual or seismic sensors, for human target detection and identification. Radar can operate far away from potential targets, and functions during the daytime as well as nighttime in virtually all weather conditions. In this paper, we examine the problem of human target detection and identification using single-channel synthetic aperture radar (SAR) data. A 12-point human model, together with kinematic equations of motion for each body part, is used to calculate the expected target return and spectrogram. The unique characteristics of the human spectrogram are analysed and used to design a prototype for an automated gender discrimination scheme. Simulation results show a 83.97% detection rate for males and 91.11% detection rate for females. Inherent deficiencies of spectrogram-based methods are discussed. Future work will focus on the development of an alternative solution for overcoming these deficiencies. [C1352]

"Light Stripe Projection based Parking Space Detection for Intelligent Parking Assist System"

This paper proposes a novel light stripe projection based free parking space recognition method in order to overcome the common drawbacks of existing vision based target parking position designation methods in dark indoor parking site. 3D information of parking site is recognized by light stripe projection method. By analyzing

the 3D information, system can recognize discontinuous points, pivot, and opposite-site reference point. Experiments show that the proposed method can successfully designate target position in spite of dark illumination condition and the black reflective surface of vehicle. Furthermore, because the proposed method can be implemented just by adding a low-cost light plane projector, it is economically practical solution. [C1353]

"Tracking vehicles using radar detections"

This paper is concerned with the problem of tracking vehicles using radar detections. In particular, we deal with problems where multiple detections are received from each target. According to recent studies, automotive radar sensors often receive detections from a discrete set of reflection centers. From these results, we develop a family of sensor models suitable for tracking. A significant difficulty in performing tracking using models from this family is that it involves solving a data association problem with a large number of association hypotheses. To reduce the complexity of this problem, we propose a framework where similar hypotheses are joined into groups. Following this approximation, basic data association algorithms can be implemented and initial studies using both simulated data and real measurements show a promising performance. [C1354]

"Online Localization and Mapping with Moving Object Tracking in Dynamic Outdoor Environments"

In this paper, we present a real-time algorithm for online simultaneous localization and mapping (SLAM) with detection and tracking of moving objects (DATMO) in dynamic outdoor environments from a moving vehicle equipped with laser sensor and odometry. To correct vehicle location from odometry we introduce a new fast implementation of incremental scan matching method that can work reliably in dynamic outdoor environments. After a good vehicle location is estimated, the surrounding map is updated incrementally and moving objects are detected without a priori knowledge of the targets. Detected moving objects are finally tracked using global nearest neighborhood (GNN) method. The experimental results on datasets collected from different scenarios such as: urban streets, country roads and highways demonstrate the efficiency of the proposed algorithm. [C1355]

"Cross-band Inverse Synthetic Aperture Radar (ISAR) Image Fusion"

Research on image fusion is making rapid progress recently, because multiple looks of the same target from different aspects will increase the available knowledge and allow more useful target information to be extracted. Studying on the physical principle of constructing radar images, especially inverse synthetic aperture radar (ISAR) images, make the fusion from multiple individual images generated by radars at multiple locations becomes possible. However, it is a challenge for image fusion if the source images are of different geometric resolutions, which are determined by radar system parameters, for example, the bandwidth of transmitted signals. This paper analyzes the influences caused by the different image resolutions, modifies the data fusion method proposed by previous research, and applies the modified method to an actually measured database. The performance of the modified image fusion algorithm is evaluated by the image attribute rating (iar) curves. The results show that the data collected by radars working at X-band and Ka-band can be fused successfully, and the information contained in the signals at these two frequency bands are complementary to each other. Therefore, the fusion improves target feature detection and thereby enhances target recognition. [C1356]

"A Knowledge-Based Target Recognition Method For Remote Sensing Image"

This paper proposed a knowledge-based target bridge detection method from remote sensing images. Firstly, the prior knowledge about bridge can supervise the low and middle image processing and analysis to detect the edges of bridges and riversides. Secondly, knowledge about the different characters of the bridge edges and riverside edges was used to wipe off the riverside edges and remain the lines of bridges, so that the purpose of recognition on bridge can be achieved. The method was tested on spot remote sensing images and the result shows it can detect the bridges exactly from images. [C1357]

"Lane Boundary Detection and Tracking using NNF and HMM Approaches"

In this communication we present a new algorithm of lane detection and tracking. In the detection step, from the first frame of a video sequence, a linear-parabolic model is used to smooth the estimated trajectories, obtained by using the NNF approach. In the step of tracking, assuming a small change in the model, we use the HMM to update each parameter of the model. The results obtained are satisfactory. [C1358]

"Ionospheric Propagation Effects on Ground and Space Based Radars"

This paper discusses the application of EM propagation theory to account for observations of scintillation from equatorial satellite beacon and radar measurements of transionospheric propagation. Satellite beacon

measurements from the wideband satellite experiment are used to calculate the degradation caused by scintillation in the radar coherent integration process. Coherent integration will be required in any space based radar to achieve separation in Doppler of moving targets from the large return of the earth. Measurements of ionospheric scintillation in the equatorial region taken with the VHF/UHF ALTAIR radar in the Marshall Islands are described. These measurements support the use of the strong scatter limit of the parabolic wave equation that accounts for certain features of the observations. A technique is illustrated to calculate realizations or sample functions of wide bandwidth radar signals that have passed through the ionosphere. This technique gives realizations that are consistent with the ALTAIR observations. Results are given for radar performance of target detection for several different radar signal combining techniques. [C1359]

"Successive Target Cancelation in Pulse Compression Radars"

Many radars suffer from masking of weaker targets by stronger ones due to range sidelobes of pulse compression codes. We propose a method to prevent this by successively detecting targets and canceling their effects. Performance of the proposed method will be investigated in various scenarios with regard to existence of noise, targets, and the Doppler effect. [C1360]

"Dynamic Logic Applied to SAR Data for Parameter Estimation Behind Walls"

Identifying and localizing targets within buildings using exterior sensors will offer superior advantages to the military and law enforcement communities. Research on wall-penetrating radar has produced significant advances in recent years regarding this topic. However, wall parameter ambiguities, multiple reflections, clutter, and measurement noise pose significant challenges to developing robust detection and estimation methods. In the present work we demonstrate can be mitigated using dynamic logic (DL), an adaptive method for iterative maximum likelihood. [C1361]

"Angle-Only Tracking of Manoeuvring Targets using Double Sets of Multiple Range Models and Probability Mass Diffusion"

This paper presents a solution to the problem of tracking of manoeuvring targets by angle-only measurements from a single, manoeuvrable platform. The solution combines the properties of accurate range estimates of non-manoeuvring targets with the ability to track manoeuvring targets in an all recursive setting. While previous methods use combinations of recursive and batch processing and/or threshold type manoeuvre detection, the proposed solution has these properties inherently, with a "soft" manoeuvre detection mechanism. The solution, in this paper, is based on a combination of two previously presented ideas, the Multiple Range Models and the recently presented Probability Mass Diffusion filter. In the paper the general problem of angle-only tracking is discussed and the basics of the proposed solution are given. Performance is shown by Monte Carlo simulations of a wide range of target scenarios. [C1362]

"Optimising bistatic HF radar configurations for target and environmental signature discrimination"

HF radars are large and expensive systems whose performance is strongly dependent on the scattering geometry. There have been several cases where such radars have been poorly deployed, with consequent failure to achieve the surveillance objectives. This paper formulates the problem of radar site configuration in terms of objective mission-related metrics and outlines the optimisation procedure. [C1363]

"The Signal and Interference Environment in Passive Bistatic Radar"

We present a review of the properties of some signals that may be used as illuminators of opportunity in passive bistatic radar systems. It is shown that such signals are not ideal for radar purposes, though modern digital modulation formats are to be preferred, since their ambiguity performance is better and in general does not vary with time. However, with any type of signal the ambiguity performance is also a strong function of bistatic geometry. We also consider the direct signal, multipath and interference environment, and show both by analysis and experiment that this will in general be severe, requiring of order 80 dB or more of suppression to achieve acceptable target detection results, and even then an effective receiver noise figure of order 20 -30 dB should be used in performance calculations. [C1364]

"Multiple Constraint Space-Time Adaptive Processing Using Direct Data Domain Least Squares (D3LS) Approach"

In this paper, a new direct data domain least squares (D3LS) approach is developed for multiple target detection in space-time adaptive processing (STAP). The advantage of the D3LS technique is that it does not rely on any statistical information of the interference as opposed to conventional STAP algorithms. The modified version of

D3LS when more than one target is in a radar scenario will be discussed. This is equivalent to forming multiple beams simultaneously while suppressing all other interference at the radar receiver. Numerical simulations show that multiple beams are directed towards target directions correctly and maintain their gain constraints along those directions such that the target signal intensities or complex amplitudes can be estimated. [C1365]

"Developments in Modern Synthetic Aperture Radar"

Since their origins in the 1950s, the techniques of synthetic aperture radar have come a long way, and SAR is now routinely used, both from satellites for geophysical remote sensing and from aircraft for high-resolution surveillance. This paper presents a subjective and selective review of some developments in systems, techniques and results. [C1366]

"Tracking Moving Ground Targets from Airborne SAR via Keystoning and Multiple Phase Center Interferometry"

Without some form of motion compensation, SAR images experience significant range walk and be quite blurred. In 1997, MITRE reported development of the Keystone Process. Keystone Formatting simultaneously compensates for multiple target motion at multiple radial velocities. The target motion causes the moving targets to appear at locations different from their true instantaneous locations on the ground. In a corresponding interferometric phase image, all points on the ground nominally appear as a continuum of phase differences while the moving targets appear as discontinuities. By threshold comparisons within the intensity and the phase images, we and others have shown that it is possible to detect and georegister moving targets in the SAR.. [C1367]

"Characterization of Vessel Heave and Horizontal Velocities with Airborne SAR"

Vessels on the ocean surface move in response to propulsion forces and the dynamics of the ocean surface. A SAR measures precisely the time delay between the transmission and reception of a RADAR pulse. This paper presents a parametrization of the equations describing the movement of a vessel as it is imaged by a single channel airborne SAR. This parametrization explicitly accounts for the nonlinear vertical motion of the ship. When the vessel is moving with an across track component of velocity, we are able to characterize the pitch motion -with reference to the SAR data only. By capturing the pitch motion at different points on the vessel, we are able to demonstrate an increase in target focus that implies a more accurate estimation of velocities in the horizontal plane. This paper provides the theoretical background for the methodology and presents a case study of a large vessel travelling across track. [C1368]

"Automatic Detection of Power Transmission Series in Full Polarimetric SAR Imagery"

An automatic extraction scheme of power transmission tower series in full polarimetric synthetic aperture radar is presented. Through analyzing the amplitude of four scattering powers in terms of scattering matrix elements based on four-component decomposition model, point-like targets including the power transmission towers are detected in the helix scattering component using the multi-resolution statistic energy level method. Due to the geometrical properties of power transmission tower series, radon transform is used for extraction by applying it to the graph structure which constructed by linking all the isolated power transmission towers. Using L-band Pi-SAR images, the effectiveness of the extraction method is validated. [C1369]

"Adaptive detection of moving target based on velocity synthetic aperture radar"

By dividing a vector sampling at a specified pixel into three components, namely target, clutter, and noise, a novel parametric statistical model is proposed in the multi-channel and multi-look image domain of velocity synthetic aperture radar (VSAR). With the proposed parametric model, an adaptive moving target detection method is also obtained for VSAR, based on which the optimum improvement factors may be achieved. Furthermore, discussions are given for some VSAR systemic parameters. Some detailed numerical experiments are provided to demonstrate the effectiveness of the proposed model and the parametric methods of target detection. [C1370]

"Study on a Nonlinear Frequency Modulation Signal with Polarization-Coded Modulation"

This paper proposes a kind of complex radar signal with polarization agility based on nonlinear frequency modulation (NLFM) signals. This signal has the characteristics of NLFM signals and the anti-jamming ability and performance of low probability of intercept (LPI) can be improved by using the polarization-coded modulation technique. The mathematical expression of the signal is given and the methods of signal processing and target detection are discussed. The performance of the signal is analyzed and simulated when the target signal and the

interference are in the different range cells, the results indicate that the target can be detected and the interference can be suppressed by two dimension signal processing when the target can be distinguished from the interference in polarization domain. [C1371]

"Antenna Array Detection in Highly Cluttered Environment Using Time Reversal Method"

This paper concerns a method of target detection in a cluttered environment where a significantly large number of highly reflective scattering objects exists. With the conventional Radar detection, the detection of a target additional to this highly scattering environment would suffer greatly in their detection dynamic range. In this paper, we present a novel time reversal method that enables automatic destructive interference of the field-probing electromagnetic wave on the reflective scatters of the environment such that the cluttered environment becomes virtually transparent. The experiment in lab tree-scattering environment demonstrates that this time reversal clutter-nulling scheme substantially enhances the detection dynamic range and the signal-to-noise ratio, significantly raising target detectability. [C1372]

"An UWB Wall Scanner Based on a Shape Estimating SAR Algorithm"

This paper describes a complete pulse based high-resolution radar system. This includes the transmitting and receiving unit as well as the signal processing of the down-sampled echoes. The main focus of the hardware design was on the usage of low-cost components. The signal evaluation is based on the shape reconstruction of simple targets in order to use the proposed radar system for wall scanning applications, e. g. the detection of water pipes. [C1373]

"LFM extended target echoes detecting using Radon-Wigner Method"

LFM radar signal with sufficient bandwidth will lead to the high range resolution. When range resolution bin is smaller than the target to be detected, radar echoes will occupy multiple range bins. Dechirping and matched filtering are two pulse compression methods for wideband LFM echoes. This paper put forwards Radon-Wigner transform to detect multi- scatter target echoes. Analysis and computer simulation shows Wigner-Ville transformation of multi-scatter LFM signal will not produce the unwanted cross components, and each component in time-frequency spectrum plot are parallel. Radon-Wigner transform can converge the signal energy together to be detected, so it is a effective processing method. [C1374]

"Fast Extraction of Hyperbolic Signatures in GPR"

The hyperbola exhibited from the local target in B-scan of GPR can contribute to estimate the propagation velocity and locate target. In this paper, a new method of fast extracting hyperbolas and apex is presented. The method is based on peak tracing and the symmetry of hyperbolas. The method was tested on experiments, and the results indicate that it can be achieved in near real-time. [C1375]

"Wall Parameters Estimation for Moving Target Localization with Through-the-Wall Radar"

A new practical approach to estimate wall parameters with the UWB through-the-wall radar for the moving target localization is presented. By moving two independent monostatic single-antenna radar units to the new standoff positions from the wall, the unknown parameters can be determined; then the exact positions of the moving target are obtained with known wall parameters. The algorithm corrects for the shift of the target location due to wall parameters ambiguities. The advantage is that it performs well estimation not only to one parameter unknown, but also to both. Simulation results show that all unknown wall parameters can be estimated exactly. Once wall parameters are determined, through-the-wall radar can be placed in a stationary position to track moving targets, which is very important for detection in security. [C1376]

"Parameter Optimization for Load-Optimal Agile Beam Radar Tracking"

Parameter optimization for agile beam radar tracking is considered to minimize radar resources that are required to maintain a target under track. The parameters to be optimized include the track-revisit interval as well as the sequence of pairs of target signal strengths and detection thresholds associated with successive illumination attempts in each track-revisit. The cost to be minimized is the radar energy resources required per unit time over a given number of track-revisits. This formulation is compared to the optimization problem where the cost is the total radar resources required over a specified tracking period. [C1377]

"Design Challenges for an Autonomous Cooperative of UAVs"

The Defence Science & Technology Organisation (DSTO), which is part of the Australian Department of

Defence, is developing a research capability that uses small, inexpensive, autonomous uninhabited air vehicles (UAVs) to detect, identify, target, track, and electronically engage ground-based targets such as radars. The UAVs, which act autonomously and cooperatively, use a geographically distributed and heterogenous mix of relatively unsophisticated electronic warfare (EW) sensors and other miniaturised payloads networked together to deliver a distributed situational awareness picture that can be shared across the command echelons. If the many design challenges are overcome, the cooperation and networking of these platforms and payloads could provide results superior to those of the significantly more expensive, platform-centric systems, but with the added advantage of robustness. This paper outlines the challenges relating to autonomy, supervision, and control that the developers face and reports on the development of DSTO's multi-UAV cooperative to date. [C1378]

"Data fusion without data fusion: localization and tracking without sharing sensitive information"

It is now well known that data-fusion can improve detection and localisation of targets. However, traditional data fusion requires the sharing of detailed data from multiple sources. In some cases, the various sources may not be willing to share such detailed information. For instance, current allies may be willing to share some level of information, but only if they can do so without revealing their secrets. We show here that, at least for localisation and tracking of targets, data-fusion can be performed without the need to actually combine the data in question, so that no party learns the information of another. Such an approach would allow co-operation between parties that share mutual interests, and yet do not completely trust each other. The particular application on which we concentrate is localisation and tracking of a target using multiple sensors (radars or sonars, or other devices). We show that multiple sensors can be used to refine a target's position estimate, or even obtain a position estimate where no single sensor has enough information to do so (e.g., each has only range information), without sharing the details of the sensor, such as its position, or accuracy of its estimates. [C1379]

"A 24GHz Low-Cost, Long-Range, Narrow-Band, Monopulse Radar Front End System for Automotive ACC Applications"

This paper presents details and results of the development of a low-cost, narrow-band, long range radar (LRR) front end system at 24 GHz, intended for autonomous cruise control (ACC) and other medium and long-range automotive applications. The system uses a high directivity patch array Tx/Rx antenna and a low-cost, high sensitivity RF front end. The narrow band, pulse radar concept is well suited for the applications envisaged, avoiding at the same time some well known regulatory issues related with existing UWB short range systems. The accurate azimuth detection functionality has been implemented by employing a phase/amplitude comparison monopulse solution using a dual receive patch-array antenna. Key performances currently achieved with the new system include: range detection of up to 120 meters for regular car size targets, azimuth detection range of plusmn 8deg, with azimuth accuracy better than 0.3deg. The successful realization of such low-cost, long range radar system at 24 GHz could potentially lead to two important developments in the near future: the implementation of the new radar technologies into the lower class, high volume car market and challenging the dominance of the much more expensive ACC systems currently developed at 77 GHz. [C1380]

"Retrodirective Radar for Small Projectile Detection"

Retrodirective systems are of growing interest because of their unique functionality and relative simplicity compared to phased-array and synthetic-aperture approaches. Retrodirective communications has been investigated the most and is now emerging in commercial systems. Retrodirective radar is a more recent development, starting with basic research on retrodirective noise correlating radar (RNC). This presentation summarizes recent research on a much more robust retrodirective radar approach that provides the wide search and autofocus capabilities of the RNC radar, but with far better capability to measure the bearing of small, fast-moving targets in the presence of clutter. [C1381]

"CramГґB©r-Rao Bound for Multiple Target Tracking Using Intensity Measurements"

The paper investigates the recently proposed ultimate Cramer-Rao lower bound (CRLB) for tracking multiple targets (Ristic et al., 2004). There are three main contributions: (1) The effect of interaction between targets is analysed; (2) The multi-target CRLB is verified via Monte Carlo simulations; (3) The broader implication of the CRLB is illustrated in the context of a wireless sensor network. [C1382]

"Comparative Theoretical Performance of Maneuverable Unmanned Vehicles versus Conventional Towed-Arrays for Passive Sonar"

This paper considers the potential for passive acoustic target detection using a maneuverable unmanned underwater vehicle (UUV) equipped with towed line array. The objective is to assess target detection

performance as a function of vehicle maneuverability, environmental variability, and array length. Detection performance is evaluated by mapping the search region onto a graph wherein vehicles are constrained in their trajectories as function of their maximum turning angle. Detection range, as a function of location on the graph, is encoded on the edge weights between nodes. With this framework, the UUV trajectory which maximizes the probability of at least one target detection along a transit through the region can be determined using the computationally efficient Dijkstra algorithm. Increasing UUV maneuverability is shown to significantly improve detection performance given known environmental variability since the optimal trajectory is able to visit more favorable locations, or "hot spots" with respect to environmental conditions. Moreover, it is shown that in sufficiently variable, but known, environmental conditions, a maneuverable UUV with short array is competitive to a much longer non-maneuverable array. [C1383]

"Study of Detection Technique Simulation of High Resolution Radar Based on BP Neural Network"

Technology applying neural network to detection of high resolution radar is advised. Firstly, it analyses the principle of detection technique of high resolution radar and the conception of "distance corridor". Secondly, it introduces the basal principle of BP algorithm. The principle and structure of three layers BP neural network is analysed. Thirdly, the detection technology and algorithm of high resolution radar based on BP neural network is researched. The result of research of target detection technology based on BP neural network possesses superperformance, which is in view of four distance corridor and ten distance corridor, which are the neural network that possesses four input neurons and ten input neurons. At last, the research is carried out by Matlab, the result are visible and understandable. [C1384]

"Collaborative Detection Probability of Mobile Target for Coverage in Large-Scale WSN"

How to estimate the collaborative detection probability (CDP) for given certain number of sensors, characteristics of sensor and target is an important problem for coverage in large-scale WSN. A triangular analytical model (TAM) is developed to analyze CDP for a randomly deployment sensors in a 2-dimensional region. Making use of binomially stochastic distribution and normalization analysis methods, we theoretically characterize the relationship between the CDP for 3 collaborative sensors with the factors of sensor normalization node density (NND) and normalization specified path length (NSPL) on an assumption of target moving direction in parallel to X-axis, and work out a lower bounds on the CDP for 3 collaborative sensors at worst case on condition of NSPL no more than 1. The simulations of random deployment of sensors and target randomly moving direction show that the mobile target moving direction assumed in theoretical analysis has little influence on the detection performance analysis, and that the CDP for 3 collaborative sensors can be evaluated by the NND and the NSPL. [C1385]

"Canonical Framework for ATI and DPCA"

The topic of moving-target detection in clutter has been extensively studied, there are many methods, such as along-track interferometric (ATI) phase, displaced phase center antenna (DPCA) method, space-time adaptive processing (STAP), or some other metrics. A canonical framework is proposed that encompasses ATI and DPCA. The statistical test metric for ATI and DPCA is established in an simple form, via the definition of the complex central Wishart distribution, deduces the statistics of the test metric, the probability distribution of the test metric for ATI and DPCA have the complex central Wishart distribution of 1times1 case, namely the chi2-distribution. The theory foundation offers the possibility to construct the united multi-channel SAR GMTI detector, and derive the constant false-alarm rate (CFAR) detector tests for separating moving targets from clutter. [C1386]

"Design of the High-powered Clutter Suppression System Based on ADSP-TS203"

The paper studies the design to implement moving target indication (MTI) and moving target detection (MTD) based on a piece of ADSP-TS203. Digital signal processor (DSP) provides great flexibility for the design of the software. After pulse compression, the radar echoes including clutter, noise and targets are transmitted to DSP for MTI and MTD. The system mainly adopts the arithmetic of three-pulse elimination to realize MTI. MTD can be completed by using a narrow-band-Doppler-filter group in frequency domain. At last, it's verified that this system can restrain clutter and distinguish the targets effectively, which has been tested on the hardware. Meanwhile, the improvement factor is also improved. The system can be widely used in radar signal processing. [C1387]

"Noise-Linear Frequency Modulation Shared Waveform for Integrated Radar and Jammer System"

This paper presents an integration of radar and Electronic Warfare (EW) utilizing Noise-Linear Frequency Modulation (NLFM) waveform, which is capable of simultaneous operation of radar and EW function for target

detection and jamming against the Linear Frequency Modulation (LFM) Pulse Compression (PC) radar. The basic properties, detection and jamming capability of the NLFM waveform are investigated. Analysis indicates that the NLFM waveform has better range resolution and sidelobe suppression than LFM PC and random signal waveform, and that it has higher jamming efficiency against LFM PC radar than normal noise jamming waveform. [C1388]

"Multi-sensor Based Lane Detection and Object Tracking Method"

Considering the relation between the movement of vehicles and the lane parameter, a novel fusion method of lane detection and object tracking is proposed. Though millimeter radar can accurately provide longitude range and velocity information of vehicle ahead, it can not recognize lateral position and road state, which makes it easy to loss targets when vehicle ahead turns or changes its lane. To solve this problem, lane information achieved from image is integrated with radar-filtered information. With the selected road shape model and the intensity feature of lane image, an optimization algorithm was established to maximize likelihood function evaluating how well the image gradient data on an assumed lane marking supports a given set of template parameters. Lane curve parameter can be transformed into vehicle front wheel orientation, and finally the fusion estimation of vehicle state can be achieved by UKF (uscented Kalman filter) estimator and least-squares based data fusion algorithm. Simulation results validate the proposed method can improve vehicle's pose tracking accuracy significantly. [C1389]

"Adaptive waveforms for target class discrimination"

This paper compares the performance of two matched-illumination waveform design techniques for distinguishing between M target hypotheses. The waveforms are implemented within a closed-loop, sequential-testing framework. In contrast to our earlier work, in this paper the target hypotheses are statistically characterized by power spectral densities. Thus, the waveforms are matched to the target class rather than to individual target realizations. As the class probabilities change in response to received data, the waveforms are adapted, which leads to faster decisions. [C1390]

"Conditional and constrained joint optimization of RADAR waveforms"

In this paper we describe a methodology of jointly designing waveforms for a semi-cooperative, distributed radar system. Some radars have waveforms which are fixed and cannot adapt. The remainder of the group must optimize their emanations conditioned on the existence of the non-cooperative radars. We term this 'conditional joint optimization.' A special case is termed constrained joint optimization examines the problem when the RADAR configuration is completely cooperative. Only classic constraints such as phase-only, finite energy, etc. are considered. The overall metric that is used in the optimization is signal to interference plus noise ratio (SINR). We will show the results of a number of empirical experiments based on canonical spectra and knowledge aided sensor signal processing for expert reasoning (KASSPER) simulated data that show that a joint conditional design will outperform a non-cooperative, individually optimized RADAR network. [C1391]

"Polarization diversity for detecting targets in inhomogeneous clutter"

Polarization diversity has proved to be a useful tool for radar detection, especially when discrimination by Doppler effect is not possible. In this paper, we address the problem of improving the performance of polarimetric detectors for targets in heavy inhomogeneous clutter. First, we develop a polarimetric detection test that is robust to inhomogeneous clutter. We run this polarimetric test against synthetic and real data to assess its performance in comparison with existing polarimetric detectors. Then, we propose a polarimetric waveform-design algorithm to further improve the target-detection performance. A numerical analysis is presented to demonstrate the potential performance improvement that can be achieved with this algorithm. [C1392]

"Detection of Moving Target in FM Broadcast-Based Passive Radar"

Passive radar utilizes transmissions of opportunity to detect targets and estimate targets parameters. This paper systematically presents key techniques that concern the detection of moving targets in FM broadcast-based passive radar via ambiguity function. It addresses the common problems that exist in passive coherent radar, such as system design, interference cancellation and signal processing. Among which, the idea of automatic hardware cancellation is original. The efficacy of the proposed solution is demonstrated by offline processing real collected data sets. [C1393]

"Concurrent operation and cross-radar interference cancellation of two over-the-horizon radars"

It is known that improved target characterizations can be achieved by concurrently using multiple over-the-

horizon radars (OTHRs) as compared to a single OTHR operating alone. However, a key limitation with OTHR radar is the selection of an appropriate operating frequency, given the rising demand on radar waveform bandwidth commensurate with the range resolution requirements. The authors have considered concurrent operations of two OTHR systems that use the same frequency band with different chirp waveforms, and a cross-radar interference cancellation technique has been developed. The purpose of this paper is to examine the performance of cross-radar interference cancellation in the presence of multiple target returns from both auto- and cross-radar reception modes. It is shown that, the interference between target returns corresponding to the same radar is negligible, whereas the residual error of cross-radar interference cancellation in the presence of signal returns corresponding to different radars takes a low value in a typical application scenario. [C1394]

"Computationally efficient waveform diversity"

In this paper, a new signal processing approach referred to as simultaneous range-Doppler (SRDreg) is presented. It applies fractional Fourier transforms in a manner that yields projections and slices of the cross-ambiguity function (CAF). Waveform diversity (WD) techniques often require extensive processing resources, thus precluding WD from smaller, more mobile systems, or applications with limited resources. By employing SRDreg, the feasibility of WD in these applications is greatly increased. The projection and slice processing is used to detect targets and estimate their unambiguous range and Doppler in the CAF range-Doppler space. SRDregdetects peaks of the CAF in a processor-efficient manner, thereby reducing the computational load associated with traditional approaches since computing the entire CAF is avoided. The number of required operations is reduced to O(Nlog2(N)) as opposed to O(N2log2(N)). Since SRD* processing load is insensitive to waveform modulation and coding, orthogonal waveforms can be exploited to confer temporal, spatial, and spectral diversity to a sensor system, without incurring any processing penalty. Fundamentally, SRDregoffers waveform flexibility and increased processing efficiency, which can be applied to broaden the scope of applicability of WD to sensor systems. [C1395]

"Operability Aspects of a Transmitter-Independent Receiver Network Against Radar and Communication Jamming"

A transmitter independent receiver network (TIRN) is a network of radar receivers that operates in an area without cooperating with a particular radar transmitter, but rather using transmitters of opportunity (TOA) in order to detect and track airborne, ballistic or surface targets. In this paper a brief vulnerability analysis is given in both the detection/tracking and the communication subsystems of such a network. Electronic defense (ED) solutions and interference avoidance techniques are given. A TIRN is mostly based in silent (low emission) operation and redundancy techniques. It is briefly described in the introduction. In the following paragraphs dealing with jamming techniques and is discussed, for both the detection and communication subsystems, comparing the results with the classic radar equivalent where applicable. It is finally concluded that such a network less vulnerable than conventional radars in most cases and in some cases even detect possible jammer effectively, at a fraction of the cost of classic radar network. [C1396]

"Neural Modeling Fields for Multitarget/Multisensor Tracking"

We describe a new approach for combining range and Doppler data from multiple radar platforms to perform multi-target detection and tracking. In particular, we assume azimuthal measurements are either coarse or unavailable, so that multiple sensors are required to triangulate target tracks using range and Doppler measurements only. The algorithm framework is based upon neural modeling fields, a biologically-inspired neural architecture, which yields advantages over conventional multi-target tracking algorithms by reducing the computational complexity during data association by several orders of magnitude. The algorithm is tested on synthetic multi-sensor data, and the results demonstrate that accurate tracks can be estimated by exploiting spatial diversity in the sensor locations. These results are promising, and demonstrate a surprising degree of robustness in the presence of nonhomogeneous clutter and uncertainty in the number of targets. [C1397]

"Knowledge-Based Space-Time Adaptive Processing"

This paper presents a novel concept for knowledge-based control of space-time adaptive processing. Firstly use a-prior knowledge to pre-adaptive, and then use non-homogeneity detector (NHD) to distinguish homogeneous range cells and non-homogenous ones. Secondly respectively use statistical algorithm and two-stage hybrid approach or other non-statistical approach to process homogeneous range cells and non-homogeneous range cells, to detect and track target. Lastly Mountaintop data simulation results show that this knowledge-based space-time adaptive processing approach significantly enhances the processing performance for airborne surveillance application in practical complex environment. [C1398]

"Recent Developments in Ground Based Millimeter Wave Radars"

This paper is a continuation to the paper entitled "Developments in Millimeter Wave Packaging brings down the Cost of Ground Based Perimeter Surveillance Radars" presented at Carnahan 2006, Kentucky, USA [IJ. In this paper it present the continuation in manufacturing techniques with focus on the antenna, followed by the development of a well know military techniques called "track-while-scan". This technique allow to track multiples intruders to extract the Doppler signature, while maintaining full capability in scanning the detection area to detect any new intruders. [C1399]

"Benefits of Wide Area Intrusion Detection Systems using FMCW Radar"

The history of perimeter protection is based on building fences. That basic concept evolved into detecting activity along the fences using a variety of sensors. Today a wide variety of fiber and wire-based sensors are available to mount on a fence, as well as many different types of IR, radar, optical, seismic and acoustic sensors to place along the fence line. Generally some camera support is provided, with the cameras programmed to point to pre-set locations along the fence. A more robust perimeter protection would consist of wide area sensors with the capability to look out beyond the fence to detect potential intrusion and track intruders to determine their intention. In looking beyond the perimeter, wide area sensors can provide precious time to plan and initiate the appropriate response. In addition, because they sweep a 360-degree circle, the sensors can provide continued tracking of the intrusion even after penetration of the perimeter, greatly enhancing the effectiveness and safety of the response team. The new wide-area concept consists of using modern radar technology for wide area detection of objects which are moving, and then using the precise location information from the radar to point a camera for assessment. Without having to continually stare at a bank of video monitors, the operator is presented with the location, direction of travel and identification and number of potential intruders, all in a matter of seconds. This paper first presents the features of this new wide area system, followed by an overview of radar technology and closes with a discussion on the benefits of the FMCW topology over pulse Doppler in security and surveillance applications. [C1400]

"Border Intrusion Detection: Thinking outside the perimeter"

Detecting infiltration across national borders is not simply a matter of deploying commercial-off-the-shelf perimeter intrusion sensors. The sheer length of border systems has led some to propose using wide area surveillance systems to reduce cost. Unfortunately the most common of these technologies: thermal infrared and visible wavelength sensors integrated with video analytics and ground radar have line-of-sight limitations and less than optimum nuisance alarm characteristics for real world border applications. The missing link is a cost-effective terrain following trip-wire sensor to cue these wide-area systems and mitigate their performance limitations. Buried ported coax, sometimes called leaky coax or guided radar sensors have protected high value perimeters for over two decades. In theory, their high probability of detection, resistance to defeat and vandalism, invisible terrain following volumetric field and good nuisance alarm characteristics make them well suited to secure borders; but their high cost per zone and inability to accommodate different soil conditions have argued against their use. OmniTraxГ‚Вї is a new ultra wideband spread spectrum ranging guided radar which changes this equation with a lower cost per zone, one-meter target resolution and the ability to accommodate different soil types. Ongoing research may eventually result in the ability to track targets along the cables, determine the direction of travel of targets crossing the cables, surface mount the sensor cables in rocky terrain and cost effectively install the sensor cables in soil or sand using cable plows; any of which would only improve the technology's utility in border intrusion detection. [C1401]

"Development of a Display Platform of the AIS Information"

AIS (automatic identification system), a new type of the radio navigation system at sea, can provide more target information than radar. It is very important how to make a desk officer intuitively observe the information so as to conveniently judge the motion tendency of the targets around own ship. We had developed a system of the AIS information display based on the platform of ENC (electronic nautical chart) by using Microsoft VC++software tool. The 6 bit encapsulated data from the AIS output interface were received and decoded. After being converted into ASCII code in the format, the AIS information was showed on the platform of ENC with both graphic and alphanumeric mode, complied with the international criterion. The results of a spot test show that the system has a lot of advantages including good interface and so on. [C1402]

"Design of Embedded Display Control Terminal Based on Windows Mobile 5.0"

The method of designing the embedded display control terminal based on Windows Mobile 5.0 is introduced in this paper. Through the analysis of movement of target, the two track models of straight flight movement and

round arc movement are built. The key technique of drawing screen by using GDI+, and the data transmission by FT245BM chip are given in the final part. [C1403]

"Wide-Band High Resolution Homing Sonar Echo Detect Based On Spread Spectrum Technology"

This paper propose and analyze high resolution auto-navigation sonar system based on DS/SS technology. Compare to traditional auto-navigation sonar system, the system have big time and frequency range, can provide high distance and speed resolution and good anti-interference capability. Paper discuss the principle of waveform design and enduce ambiguity function of DS/SS modulation signals. In the case of high-speed target, paper provided and proved a algorithm using CZT which can estimate Doppler frequency offset and target speed in very low SNR condition. [C1404]

"MM-Wave Modules for Short Range Radar Systems"

High performance mm-wave miniature module for short range Doppler and FMCW radar sensors has been developed. The module is shown in fig.1. It includes: circular polarization diplexer, monolithic GaAs balanced mixer, power divider, and Gunn diode VCO. The low 1/f noise mixer diodes and high performance oscillator enhance the detection sensitivity at low IF frequency and circular polarization waveform improves reception ability for various radar targets. Module has been designed to be used in automotive, industrial and military sensing applications, has low cost and suitable for mass production. [C1405]

"A Radar Guided Vision System for Vehicle Validation and Vehicle Motion Characterization"

This paper describes a radar-guided monocular vision system that detects, validates, and tracks the preceding vehicle and thus predicts its lane-change intentions. A vision-based lane tracking process is developed to create a stable motion model in order to map the radar targets to image coordinates and consequently generate the region of interest (ROI) to search for a potential preceding vehicle. Model-based object classification algorithms are then applied to validate the existence of a vehicle in this ROI. Once the detected primary target vehicle, which is in the same lane as the host vehicle, is validated, it will be continuously tracked until it leaves the host lane. The spatial-temporal tracking history of the primary target vehicle is used to infer its intention of changing lanes. This prediction results from a characterization process for the primary target motion vector. The radar-vision integrated system has been evaluated on real-world data collected using a test vehicle equipped with a radar sensor, vision sensor, and a host processor. [C1406]

"Vehicle Frontal Collision Warning System based on Improved Target Tracking and Threat Assessment"

A vehicle frontal collision warning system (FCWS) based on improved target tracking and threat assessment for collision avoidance is described in this paper. The system acquires longitudinal and lateral position of objects from radar and Lidar. Together with host's speed and angular velocity, the system tracks all the targets in front. The threat assessment, based on the knowledge of current state, provides a warning signal to the driver when a potential collision is detected. Extensive field tests show that, with the stable and accurate tracks, the warning system not only provides high accuracy in detecting potential collisions but also responds exactly in time to assist the driver. [C1407]

"Polarimetric Monopulse Radar Intelligent Emulator"

For debugging polarimetric monopulse radar and testing polarization algorithms, a new polarimetric monopulse radar intelligent emulator is proposed and designed in this paper. The polarization information, as a basic character of the target echo, plays an important role in modern radar detection nowadays. The polarization algorithms are developed with rapid speed. It is not realistic to test all algorithms on real radar in research stage. Therefore, the polarimetric radar emulator is required. The functions of radar emulator are as follows: recording the valuable experiment data for researching, playing the experiment data as a radar receiver for radar signal processor debugging, running some polarization programs with real experiment data to test the programs. In the paper, the polarimetric monopulse radar intelligent emulator is introduced in detail. Firstly, the index of emulator is given; secondly, the emulator is divided into 3 modules to be introduced; thirdly, the system architecture and key techniques are analyzed; finally, the performance of emulator is given. [C1408]

"Parameter Estimations of SAR Moving Target Based on DPCA-FrFT Algorithm"

The DPCA-FrFT algorithm is used in this paper to realize the localization and velocity estimations in both ground range direction and azimuth direction when it comes to a two-aperture radar system. The moving point target's echo model of two-aperture SAR system is established. Then, the linear frequency-modulated

characteristics of moving target's DPCA signal is elaborated. According to this characteristics, fractional Fourier transform is adopted to detect the moving target and estimate parameters. Because of the good capability of DPCA technique for clutter cancellation and the nice effect of FrFT for chirp signal detection, the DPCA-FrFT algorithm can suppress the clutter and realize the localization and velocity estimations well in different signal-to-noise ratio conditions. The simulation results validate the effectiveness of this algorithm. [C1409]

"Node-Replacement Policies to Maintain Threshold-Coverage in Wireless Sensor Networks"

With the rapid deployment of wireless sensor networks, there are several new sensing applications with specific requirements. Specifically, target tracking applications are fundamentally concerned with the area of coverage across a sensing site in order to accurately track the target. We consider the problem of maintaining a minimum threshold-coverage in a wireless sensor network, while maximizing network lifetime and minimizing additional resources. We assume that the network has failed when the sensing coverage falls below the minimum threshold-coverage. We develop three node-replacement policies to maintain threshold-coverage in wireless sensor networks. These policies assess the candidature of each failed sensor node for replacement. Based on different performance criteria, every time a sensor node fails in the network, our replacement policies either replace with a new sensor or ignore the failure event. The node-replacement policies replace a failed node according to a node weight. The node weight is assigned based on one of the following parameters: cumulative reduction of sensing coverage, amount of energy increase per node, and local reduction of sensing coverage. We also implement a first-fail-first-replace policy and a no-replacement policy to compare the performance results. We evaluate the different node-replacement polices through extensive simulations. Our results show that given a fixed number of replacement sensor nodes, the node-replacement policies significantly increase the network lifetime and the quality of coverage, while keeping the sensing-coverage about a pre-set threshold. [C1410]

"Time-orthogonal-waveform-space-time adaptive processing for distributed aperture radars"

Distributed aperture radars represent an interesting solution for target detection in environments affected by ground clutter. Due to the large distances between array elements, both target and interfering sources are in the near field of the antenna array. As a consequence the characterization of both the target and the clutter is complicated, combining bistatic and monostatic configurations. Using orthogonal signaling the receivers can treat the incoming signals independently solving separately bistatic problems instead of the initial multistatic problem. Recent works have demonstrated the benefits of the use of frequency diversity space time adaptive processing for distributed aperture radars. This paper modifies the waveform diversity signal model, resorting to a time orthogonal signaling scheme, which does not present the coherence loss exhibited by frequency diversity. [C1411]

"A new signal detection with unknown doppler in an unknown background using spectrogram"

The current methods of detecting targets operate based on interference, clutter, noise, parameters and/or on signal Doppler specifications. There is no optimum detector for a general environment in unknown Doppler shifts. In this paper based on the combination of tolerance interval technique and time-frequency signal analysis, a new method is presented to introduce a new detector. The method is non-parametric, signal is analyzed in time-frequency domain by its spectrogram and the time interval of signal presence is determined. Finally, the adaptive thresholding is utilized and signal detection is fulfilled. [C1412]

"Research on LEO Satellites Time Synchronization with GPS Receivers Onboard"

Precise relative navigation of spacecraft is required for its critical movement, such as rendezvous and formation flying-key aspects of many current and future space missions. Potential applications of interest include the capabilities to detect and track slowly moving ground vehicles (ground moving target indication (GMTI)) and perform synthetic aperture radar (SAR) imaging, with the requirement to provide GMTI and SAR data to users in a timely manner. Extensive research has been carried out on terrestrial applications of global positioning system (GPS) time transfer. For low earth orbit (LEO) satellites, such missions can use the GPS signals for relative positioning and data time tagging. This paper focuses on linking these two key applications-the use of GPS in LEO for relative navigation and precise formation flying, and time and frequency transfer between LEO satellites. As an example, the research investigates co-orbiting satellites A and B of gravity recovery and climate experiment (GRACE) at a separation of about 200 km. The observations of GPS receivers onboard both GRACE A and B satellites are transferred into receiver independent exchange format (RINEX) format (1 Sept. 2003). The orbit of both satellites is then computed using the zero-difference precise point positioning technique. The RMS orbital difference between the results obtained and the precise orbits from GFZ is below 0.07 m. Two methods are proposed to compute the time difference between GPS receiver onboard satellites A and B respectively. One

uses onboard GPS RINEX observations and the GRACE orbit from GeoForschungsZentrum Potsdam (GFZ) which has a large relative latency, the times between A and B in multi-channel common-view mode are compared. Another method computes the clocks of A and B by use of GPS observation onboard and the computed orbit. The times between A and B are then compared. Results indicate that a RMS accuracy of 2-3 nanoseconds (ns) can be achieved. This suggests that GPS-has the capabilities of high-precision time transfer between LEO satellites. [C1413]

"A Structured Approach to Passive Sonar Track Association"

The presence of multiple, apparently independent track segments originating from the same target complicates the track-level passive sonar picture. If some of these segments can be shown to have common origin, they can be associated into a single composite track, simplifying that picture. The process could also provide additional information about the target, such as range or classification. Track association is typically a manual process, relying on the expertise of a human sonar operator. If a method could be found to reliably apply numerical scores to the degree of apparent relationship between pairs of tracks, those scores could be used to assist an operator in the track association process or as inputs to a fully automated track association process. This paper outlines the construction of a test based on the sample correlation coefficient and describes the result of its application to tracks produced by a probabilistic data association filter (PDAF) from a set of towed array sensor data. [C1414]

"A Nested Multi-static HF Radar Testbed for the New York Bight and Beyond"

Surface currents are envisioned to be an integral component of the Integrated Ocean Observing System (IOOS) and High Frequency (HF) radar technologies provide the means to measure these data across multiple scales. The Rutgers University Coastal Ocean Observation Lab (COOL) has continuously operated a nested network of HF radars since 1998 as part of a sustained coastal observatory centered on the New York Bight. Components of this network include 25 MHz, 13MHz, and 5 MHz Tx /Rx shore stations and offshore buoy mounted Tx stations. These components are linked through GPS synchronization technology to provide fully nested multi-static surface current coverage. Data from these systems are supporting a growing number testbed activities and large science campaigns. Testbed activities focus on extending the present surface current mapping coverage closer to the beach with the development of new nearshore wave and current applications. Additional software and hardware modifications are beginning to extend the environmental monitoring to full maritime domain awareness by transitioning the sites to a dual-use mode that include hard target detection and tracking. The HF radar data has most recently supports two science campaigns, the Shallow Water 2006 (SW06) Joint Experiment supported by the Office of Naval Research and the Mid-shelf Front Experiment supported by the National Science Foundation (NSF). Both campaigns have used the HF radar as a resource for adaptive sampling. During the SW06 experiment, HF radar data was incorporated into daily reports along with other observation and forecast data to support the science fleet offshore. In addition to the adaptive sampling application, the mid-shelf front experiment takes advantage of the 5.5 year dataset within the study site. Long term means show a significant cross-shelf transport pathway south of the Hudson Shelf Valley that could possibly feed the mid-shelf front. These Rutgers systems fit into a larger effort across th- e entire Mid-Atlantic Bight (MAB) region from Cape Hatteras, NC to Cape Code, MA. HF radar groups across this region have now formed a consortium for the operation and maintenance of the entire network, including system hardware, data management, and product delivery. Through this consortium the existing pockets of systems, of which Rutgers is one, can be operated as one regional system that spans over 1000 km of coastline. This network consists of 11 long-range sites providing total vector coverage across a large portion of the region from Cape Hatteras NC to the apex of the New York Bight. Additional funded sites for Moriches, NY and Block Island, RI, will extend the coverage north to Cape Cod, MA and Nantucket MA In addition there are four higher resolution sub-systems made up of 15 sites in operation in the Chesapeake Bay, New York Harbor, the Long Island Sound and the Delaware Bay estuaries. In addition to scientific research and education applications, the United States Coast Guard Research and Development Center has identified the Mid-Atlantic Bight as a testbed for the new search and rescue planning tool, SAROPS. [C1415]

"Target Detection Using HF Radar Data"

High frequency (HF) radar systems have a potential to detect targets which are located beyond the optical horizon on the sea surface. Unfortunately sea clutter may be strong enough to prevent such detection. In this work we present results of applying space-time adaptive processing (STAP) to this problem. Real, registered signals were used for numerical experiments. [C1416]

"Polarization Diversity for Detecting Targets in Heavy Inhomogeneous Clutter"

Polarization diversity has proved to be a useful tool for radar detection, especially when discrimination by Doppler effect is not possible. In this paper, we address the problem of improving the performance of polarimetric detectors for targets in heavy inhomogeneous clutter. First, we develop a polarimetric detection test that is robust to inhomogeneous clutter. We run this polarimetric test against synthetic and real data to assess its performance in comparison with existing polarimetric detectors. Then, we propose a polarimetric waveform-design algorithm to further improve the target-detection performance. A numerical analysis is presented to demonstrate the potential performance improvement that can be achieved with this algorithm. [C1417]

"Detection/Imaging of Buried Objects: Using Spatial/Angular Diversity with Distributed/Embedded Sub-Surface Sensors for Reduced Mutual Coupling and Suppressed EM Emissions"

The proliferation of strategic subsurface sanctuaries has increased the need for enhanced remote sensing techniques providing for the accurate detection and identification of deeply buried objects. A new RF Tomographic Technique is proposed in this concept paper for developing RF CAT Scans of buried objects using spectral, spatial/angular, and polarization diversity. This imaging technique uses an embedded ring of subsurface radiators, delivered by earth-penetrating, non-explosive, electronic "e-bombs", as the source of strong underground radiated transmissions and uses distributed surface-contact sensors to collect the tomographic data for relay to a circling UAV and transmission to a remote control site (using layered sensing). Three-dimensional imaging algorithms are being developed to detect, image, and characterize deeply buried targets. Distributed transmitters and receivers significantly increase unwanted mutual coupling and EM emissions that interfere with signal reception. However, by embedding the transmitters underground, reduced mutual coupling and EM emissions (and improved signal-to-noise ratios) can be achieved. Simple surface SAR experiments over deep mine shafts have been performed to validate the 3D processing algorithms using 2D surface SAR sensor data. WIPL-D models have also been used to simulate the embedded and distributed sensors and to verify the significant enhancement in the received signal-to-noise ratio obtained by burying the radiating ring under the surface sensors. [C1418]

"Remote Sensing of the Sea and Target Detection Improvement Using a Wavelet-based Extraction of Sea Echoes from High Frequency Radars"

High frequency radars (HFR) use HF waves (3 MHz to 30 MHz). They interact with the sea surface and are well-suited radars to perform remote sensing of the sea. Moreover, HFR coverage range is not limited by the radio horizon: it is possible to keep watch over the sea up to few hundred kilometers from the coast line (surface wave mode) or up to few thousands kilometers (space wave mode). Oceanographic parameters (i.e. wave height, surface current velocity, wind direction and wind velocity) are derived from the so-called sea spectrum. Moreover, HFR can be used for maritime surveillance of the Exclusive Economic Zone (EEZ). In that case, the sea spectrum is an unwanted signal because it can mask targets. So, sea spectrum extraction is an important topic of HFR signal processing since it is a key point for remote sensing accuracy and target detection features. Wavelet-based processing allows an efficient extraction. [C1419]

"Motion compensation for a frequency stepped radar"

A few hundred MHZ synthetic bandwidth requires the transmission of many (~100) frequency stepped pulses when a small instantaneous bandwidth (<10 MHz) is available. The actual trend in radar imaging is towards wide instantaneous bandwidth (>50 MHz) thanks to improved technology. However the need of retrofit of narrow instantaneous bandwidth to HRR (high range resolution) seems to be still cost effective in the industrial context. In this case the processing time, combined with a large synthetic bandwidth, requires a proper motion compensation of radial target velocity and acceleration. Target kinematics parameters are estimated by minimization of a like-autocorrelation cost function; this technique is capable of detecting minima of aliasing created by uncompensated motion condition. Accuracies are estimated by Monte Carlo simulation and compared to those achievable by entropy and contrast based techniques. [C1420]

"Code selection for radar performance optimization"

In this paper we consider the synthesis of radar waveforms in the presence of colored disturbance. We focus on the class of coded pulse trains and determine the best radar codes according to some established optimality criteria. We propose three coding methods. Two of them are based on the maximization of the detection performance under a control on the estimation accuracy of the target Doppler frequency. The third relies on the maximization of the detection performance under a binary constraint on the code alphabet. Two proposed techniques require the solution of non-convex optimization problems which are solved resorting to the theory of relaxation and semidefinite programming. At the analysis stage the performances of the new coding strategies are assessed also in comparison with a standard radar code both in terms of detection probability and target

Doppler estimation accuracy. The results show that the proposed techniques may lead to codes whose performances are close to the benchmark curves. [C1421]

"Multichannel parametric detectors for airborne radar applications"

We consider the problem of detecting a multichannel signal in the presence of spatially and temporally colored disturbances. The parametric Rao and GLRT detectors, recently developed by exploiting a multichannel autoregressive (AR) model for the disturbance, have been shown to perform well with limited or even no range training data. The performance of the parametric detectors, however, has been evaluated through the limited computer simulations. The disturbances were generated to follow the exact multichannel AR processes and independently from each other with the same distribution whereas the disturbances in an airborne radar environment do not follow the exact multichannel AR model. In this paper, we evaluate the detection performance of the parametric Rao and GLRT detectors using airborne data obtained from the multi-channel airborne radar measurement (MCARM) database. This data contain typical clutter found in airborne radar systems, and cover a variety of scenarios including dense-target or heterogeneous environment Numerical results show that the parametric Rao and GLRT detectors work well with limited or even no range training data in an airborne radar environment. [C1422]

"Target tracking using particle filtering and CAZAC sequences"

When tracking targets in radar, the selection of the transmitted waveform and the method of processing the return signal are two of the design aspects that affect measurement accuracy. Increased measurement accuracy results in enhanced tracking performance. In this paper, we apply sequential Monte Carlo methods to propose matched filtering operations in the delay-Doppler space where a target is expected to exist. Moreover, in the case of thresholding the measurements, these methods are used to form resolution cells that have the shape of the probability of detection contour. These methods offer an advantage over traditional radar tracking methods that form tessellating resolution cells to approximate the probability of detection contours, and exhaustively perform matched filtering operations over the entire delay-Doppler space. With the use of a Bjorck constant amplitude zero-autocorrelation (CAZAC) sequence, a high resolution measurement is attained and the use of thresholding is avoided. This is an advantage over commonly used waveforms such as linear frequency modulated chirps (LFMs). We examine the properties of Bjorck CAZACs and demonstrate improved tracking performance over LFMs in a single target tracking scenario. [C1423]

"Use of frequency-randomized SAR waveforms for the detection and mitigation of small-motion effects in precision RCS measurement"

The use of SAR and ISAR imaging is an important tool in the laboratory RCS characterization of scattering patterns across signature critical platforms. Despite measures to the contrary, air turbulence and mechanical vibration can produce unwanted complex perturbations of the target during the imaging process. The slow sweep time of many laboratory stepped-frequency CW radars means that a target can undergo significant motion even during a sweep, leading to substantial and time-varying defocusing of range profiles, unsuited to conventional motion-correction schemes. Model code was written to provide simulations of representative complex motions for a string-suspended target. Comparison of images produced using monotonic and randomized waveforms could detail the presence and pattern of very small motion-related changes in RCS. The ability to do this was found to have a complex dependence on the relative lengths of the radar sweep time and the characteristic oscillation period of the motion. When the sweep time and oscillation period are comparable, it may be possible to accurately retrieve the target's entire motion history, from the phase perturbation recoverable from the difference of the monotonic and randomized waveforms in the raw frequency domain. This can then be applied back to the data as a motion correction. [C1424]

"Experimental HF radar trial of real-time STAP"

An alternative multi-static HF radar architecture, known as the Forward-Based Receiver Augmentation (FBRA) system, has been developed and tested by the Defence Science and Technology Organization [1]. The experimental system has performed beyond expectations in a number of trials involving targets of interest. This is not only due to the impressive hardware capabilities, but also the advanced signal processing for clutter and interference mitigation, particularly STAP which was shown to be indispensable for the successful operation of the system. This paper describes the real-time STAP algorithm in the FBRA system, and demonstrates its experimental detection performance on a cooperative aircraft target with flight path "ground truth" data available from on-board GPS logging equipment. [C1425]

"Discrete Suppression with ΣΔ-STAP"

This paper presents the hybrid algorithm of SigmaDelta-STAP and direct data domain(D3) which is robust to the discrete interferer. SigmaDelta-STAP provides high performance result with the relatively low complexity of calculation. It also requires small number of training sample to estimate covariance matrix. However this algorithm is vulnerable to the discrete interferer which is target-like interferer with high SNR. This paper shows that SigmaDelta-STAP can suppress discrete interferer signal in conjunction with direct data domain (D3) method which is an effective method to eliminate non-correlated interference such as discrete interferer in the non-homogeneous environment. [C1426]

"Varying FM rates in adaptive processing for distributed radar apertures"

Previous work in waveform diversity for distributed apertures for target detection has focused largely on orthogonal transmissions. This paper investigates an alternative approach; implementing waveform diversity based on differing slopes of the linear FM pulse to the application of target detection for a distributed radar aperture system in the presence of noise and clutter. This paper add develop the required signal model corresponding to the proposed system, accounting for the cross-coupling between the linearly FM pulses. This paper determines whether applying this type of waveform diversity will result in improved performance in the discrimination of the target from noise and interfering sources and compare the performance whether this method is a feasible solution. A crucial step is the optimization of the FM rates using sequential quadratic programming. [C1427]

"The benefits of matched illumination for radar detection of ground based targets"

This paper compares the radar detection performance of a narrow band rectangular pulse, linear chirp and nonlinear stepped frequency waveform approximating to a matched target illumination against two target types (a farm tractor and a main battle tank) in the presence of clutter (soil/sand, rocks and woodland). [C1428]

"An approach for interference detection and rejection from other sensors by using Hough Transform and image processing"

This paper presents some results of studies on radar interference rejection using a Hough-Transform-based technique and image processing. If target detection is done by comparing the magnitude of each bin with a threshold produced by a CFAR algorithm, a number of radar systems operating at the same frequency band can cause reciprocal interference, thereby affecting detection and increasing false alarm probability. In this work we will refer to this interference as to "other sensor interference" (OSI). The goal of this work is the definition of methods to detect and remove the interference patterns from radar raw video images. We show that the substitution of interferences with samples estimated from cells (cross range samples) in close proximity of the OSI-affected samples allows CFAR algorithms performance to be improved. [C1429]

"Air target detection and tracking using a multi-channel GSM based passive radar"

This paper presents a summary of the hardware system design and associate signal processing schemes of a multi-channel GSM based passive radar and most importantly presents new experimental results to demonstrate the multichannel GSM based passive radar ability to detect and track the Doppler frequency of aircraft target as well as measure the aircraft target bearing. [C1430]

"Real-time PRF selection for medium PRF airborne pulsed-doppler radars in tracking phase"

This paper proposes a new method to select optimal pulse repetition frequency (PRF) sets for use in tracking mode of medium PRF airborne pulsed-Doppler radar. Neural networks algorithm is used to map from engagement variables to the optimal PRF set. On-line computation during flight can be made real-time after off-line training of the neural network. The training sets for the neural network need to be generated by selecting optimal PRF set for the possible engagement scenarios from which range-Doppler clutter map is calculated to check the decodability and detectability for all PRF candidates. The PRF sets generated by the method must guarantee the maximum detectability inside the target tracking window as well as maintaining good decodability. Simulation result shows that the proposed method has much better range-Doppler detection performance compared to the previous algorithms by applying different optimal PRF set to different engagement scenarios and target positions. [C1431]

"A Monte-Carlo Approach for Tracking Mobile Personnel"

In this paper, we propose a Monte-Carlo method based on the particle filter framework to track footfall locations generated by mobile personnel using seismic arrays. While the particle proposal function follows a simple bootstrap approach, the novelty in our algorithm comes from a unique weighting strategy that takes into account

the sparse nature of the seismic footfall signal and is robust against missed detections and clutter which could appear in the form of other impulsive sources or other walkers. Our weighting strategy automatically makes use of the wavefront shape, either planar or circular, and assigns weights in x-y space. Data association is built into the system, eliminating the need to explicitly associate the received footfall impulses with different walkers. Hence our algorithm is ideal for tracking multiple mobile personnel. We also demonstrate the fusion of our system with range information available by means of radar. Fusion with radar improves x-y tracking when range resolution is lost due to a large distance between the target and the seismic array leading to planar wavefronts. [C1432]

"Multiple Target Tracking Using Maximum Likelihood Probabilistic Data Association"

The maximum likelihood-probabilistic data association (MLPDA) target tracking algorithm is effective in tracking very low observable targets. A key limitation of MLPDA is that it is restricted to tracking a single target. We derive and implement a multiple target version of MLPDA called Joint MLPDA (JMLPDA). While the JMLPDA implementation presented in this paper is focused on a two-target case, this algorithm is extensible to any number of targets. The MLPDA and JMLPDA algorithms are combined to form a multi-target MLPDA tracking algorithm. Performance of the JMLPDA and the multi-target MLPDA algorithms are compared to a probabilistic multi-hypothesis tracker (PMHT) for two crossing targets, focusing on track management/update. Simulation results show that under conditions of heavy clutter, the multi-target MLPDA outperforms PMHT in terms of reduced track errors and longer track life. [C1433]

"A Study for a Space-Based Passive Multi-Channel SAR"

This paper deals with the potentialities obtained by splitting the passive antenna of a space-based bistatic SAR into multiple sub-apertures. A preliminary analysis is performed in order to identify the main orbital and system design parameters for a satellite equipped with a multichannel passive radar sensor. The effectiveness of the resulting bistatic system is investigated paying particular attention to the assessment of the achievable MTI capabilities. In particular the conceived system is shown to allow: (i) clutter cancellation and detection of slowly moving ground targets for surveillance purpose, and (ii) relocation of moving targets in high resolution SAR images. [C1434]

"Advanced Methods of Multivariate Anomaly Detection"

The generic problem in anomaly detection is identifying unusual samples present in a large population. Each member of the population is described by a list of characteristics that define a feature vector. One statistical method that accounts for mutual correlations among the components has defined the standard for anomaly detection in communication, radar, and hyperspectral signal processing for several decades. This paper describes an advanced methodology that constructs nonlinear transformations to account for observed data distributions not amenable to a statistical description. The construction relies on a combination of stochastic methods and phenomenological constraints. Examples are taken from hyperspectral target detection. [C1435]

"Intelligent Surface Threat Identification System (ISTIS)"

Stottler Henke in conjunction with the US Navy has developed and continues to enhance the Intelligent Surface Threat Identification System (ISTIS). ISTIS improves the surface threat ID process, quality, and efficiency in the Littoral Combat Ship (LCS) Surface Mission Module. This improved performance includes better use of scarce ID resources, better ID estimations from available information, sooner ID determinations, ID accomplished at a greater range, prevention of ID "surprises", and improved operations in more complex environments. Other LCS applications and other ship types can also benefit from the techniques. [C1436]

"Online Multisensor-Multitarget Detection and Tracking Using Variable Rate Particle Filters"

In this paper we present an online approach for joint detection and tracking for multiple targets using variable rate particle filters (VRPFs). Unlike conventional models and particle filters, the proposed method utilises the applied forces (tangential and radial components) to model target motions and does not assume the hidden state to change at the same rate as the observations. In effect not only does the proposed method enable us to model parsimoniously the manoeuvring behaviours of targets with a single dynamical model but it also provides a more efficient framework for recursive estimation of the targets' positions since much fewer states will be estimated. In addition, a target detection/termination module will be integrated in the proposed method in which a track initiation, termination, or maintenance move is randomly executed using Bayesian Monte Carlo methods. To model a more realistic observation environment Poisson process is chosen for all target originating and spurious measurements. Unlike other observation models, the proposed model does not require extensive computation for data association between active targets and observations, prior to target state estimation, as a result. To

improve the quality of the particles we adopt a data-dependent importance sampling strategy in which the latest observations are involved when new particles are updated. This enables the target states to be updated as new observations arrive while keeping the number of states sufficiently low to track the manoeuvres of the targets. Computer simulations demonstrate the potential of the proposed method for detecting and tracking multiple highly manoeuverable targets in a hostile environment with high clutter density and low detection probability. [C1437]

"A robust adaptive detection scheme for radar Doppler processing"

Adaptive detection procedures offer significant advantages with respect to conventional (data-independent) processing, particularly in structured interference environments that are commonly encountered in practical radar applications. This paper illustrates the use of adaptive Doppler processing for main beam interference cancellation, where it is the temporal (pulse-to-pulse) structure rather than the spatial structure of the interference that is exploited to achieve performance gains relative to conventional Fast Fourier Transform (FFT) based approaches. The experimental performance of a generalized adaptive detector, that exhibits robustness against mismatched targets as well as unwanted signals in structured interference environments, is compared against conventional FFT-based Doppler processing and modern adaptive detection schemes that have also been derived using the generalized likelihood ratio test (GLRT) methodology [1]. [C1438]

"Sidelobe suppression of LPI phase-coded radar signal"

Sidelobe suppression is one of the major subjects in LPI phase-coded signal processing. Low sidelobe level is essential for target detection. Traditional sidelobe reduction techniques are not effective for phase-coded signal unless large calculation is involved. What's more, traditional sidelobe suppression filters are generally not applicable when target is eclipsed. In this paper, a novel sidelobe reduction method based on code agility is proposed, which can apply to all kinds of phase-modulated sequences including seriously eclipsed radar echo without heavy computation. [C1439]

"Range Doppler correlation for time-orthogonal distributed aperture radars"

Distributed aperture radars represent an interesting solution for target detection in environments affected by clutter. Due to the large distances between array elements, both target and interfering sources are in the near field of the antenna array. Recent works have demonstrated the benefits of combining frequency diversity and space time adaptive processing for distributed aperture radars. Using orthogonal signaling the receivers can treat the incoming signals independently, solving several bistatic problems instead of the initial multistatic problem. However, a well known problem in bistatic radar is the dependency of the clutter Doppler center on range. We analyze the benefits of joint use of waveform diversity and adaptive techniques to counteract the non-stationarity of the clutter Doppler. [C1440]

"HF radar ship detection and tracking using WERA system"

High frequency (HF) radars are capable to detect and track targets at extremely long ranges. The signal environment that includes external noise, different kinds of clutter and interference will significantly limit the detection performance and system capability. This paper considers a new approach to solve the ship detection and tracking problem in a complex HF radar signal environment. It uses a conventional constant false-alarm-rate (CFAR) detection procedure but the thresh-olding scheme is based on regression analysis of power spectrum values along range and Doppler cells. The ship tracking scheme includes the model in polar coordinates that uses tracking state vector consisted of range, azimuth and velocities and fixed-coefficient filter parameters to get smoothed tracks. The proposed detection and tracking schemes have been tested using real HF radar data from WERA system. [C1441]

"The dependence of radar target detectability on array weighting function"

This paper assesses the dependence of target detectability in the presence of clutter on the transmitting and receiving antenna array weighting functions for airborne, medium pulse repetition frequency radar. Target detectability is best for functions which result in the lowest average sidelobe levels. [C1442]

"Target detection using orthogonal netted radar system (ONRS)"

An Orthogonal Netted Radar System (ONRS) is a networked system consisting of multiple radars, each of which uses an orthogonal set of coding waveforms, and operating at the same carrier frequency. ONRS can simultaneously operate in a monostatic and a multistatic mode, and thus possesses the advantages offered by both a monostatic and a multistatic radar system. The principles and structure of ONRS are described in this

paper. The detection schemes using ONRS and an initial performance analysis is carried out. [C1443]

"Clustering Polarimetric SAR Image Under Deorientation Theory"

In natural complex terrain surfaces, scattering targets with random orientations produce random fluctuating echoes which lead to confused classifications by directly using target decomposition on polarimetric SAR (PolSAR) image. In order to reduce the influence, the target vector is transformed into the state with minimization of cross-polarization. Then a set of new parameters u/v/w are used to characterize scattering mechanisms under the deorientation theory, and the fuzzy membership is adopted instead of "hard" division of parameter plan. Characterizing the sample coherency matrices as complex Wishart distribution, the PolSAR image is clustered based on Bayes maximum likelihood (ML) criteria. Experiment is carried out on an L-band NASA/JPL SIR-C PolSAR image over Danshui town, Guangdong, China. Comparison results with the popular used methods show that the proposed method provides a significant improvement in classification and the associated scattering mechanism of class is more accurate and beneficial for automatic terrain recognition. [C1444]

"Automatic Censoring Detection Using Binary Clutter-Map Estimation for NonGaussian Environments"

In this paper, we propose an automatic censoring detector using binary clutter map estimation, for multiple target situations and compound dominated-clutters. The proposed censoring procedure dynamically discards the unwanted samples by implementing an adaptive pre-thresholding, for the incoming clutter echoes. Thus, the obtained decisions are sent serially into a shift register to form the binary clutter map (BCM) estimation. Finally, the logical states of the clutter map register are used to yield the background level estimation. To show the robustness of the clutter map-based detection scheme, the effects of speckle correlation and interfering targets on the censoring efficiency are analyzed. [C1445]

"Rapid-fluctuating Radar Signal Detection with Unknown Arrival Time"

We study the rapid-fluctuating radar signal detection, where the arrival time of the received signal, i.e., the range cell index of the target, as well as the complex amplitude of the signal and the noise are unknown. We show that even in additive white gaussian noise (AWGN) environment, uniformly most powerful invariant (UMPI) test does not exist. Instead, the UMPI detector in known SNR is used as an upper performance bound for performance evaluation of any invariant detector performance. In addition, we derive generalized likelihood ratio (GLR) detectors for this signal in AWGN with unknown noise variance and also in clutter with unknown covariance matrix. The GLR test statistic for AWGN represents the ratio of the maximum power over all cells to the total power. The GLRT for a clutter environment is also a power ratio which is the maximum over all range cells of the Euclidean norms of the spatially whitened observed sequence. Simulation results demonstrate that the performance of the proposed GLR test in AWGN is very close to the upper bound performance, i.e., to the UMPI test in known SNR. [C1446]

"Non-Linear Prediction of Inverse Covariance Matrix for Stap"

For bistatic ground moving target indication radar, the clutter Doppler frequency depends on range for all array geometries. This range dependency leads to problems in clutter suppression through STAP techniques. In this paper, we propose a new approach of applying non-linear prediction theory to address the range dependency problem in bistatic airborne radar systems. This technique uses a non-linear function to obtain an estimate of the range-dependent inverse covariance matrix. Simulation results suggest a non-linear fit for the model (nonlinear relationship between the inverse covariance matrices) and show an improvement in processor performance as compared to conventional STAP methods. [C1447]

"SAR Processor based on a CFAR Signal or Interference Subspace Detector Matched to Man Made Target Detection in a Forest"

This paper deals with two new SAR processors based on CFAR subspaces detector. These two algorithms aim at improving man made target detection performances in a forest clutter by using electromagnetic scattering models. The implementation of the two detectors is described. An application on simulated data shows the interest of the two methods [C1448]

"Detecting and Tracking Moving Objects in Sequences of Color Images"

A statistical change detector, implemented as a zero-latency finite-memory filter, is used to identify anomalies in temporal pixel statistics. An F-distributed test statistic is computed for each pixel and used in a hypothesis test.

The tracker, with automatic track initiation and termination, uses a low-complexity pairwise joint probabilistic data association (JPDA) algorithm, which has been restricted to consider clusters (sub-problems) containing no more than two tracks. The track state and clutter model are augmented to include color. The detector and tracker are used to process sample video data [C1449]

"Analysis and Emulation of FM Radio Signals for Passive Radar"

Due to its high power levels provided, and its wide coverage, FM radio could be a good opportunity transmitter for passive coherent location (PCL) radar systems. In this paper we study the effectiveness of FM signals as radar waveforms by means of simulated and real data analysis. To this purpose, an emulation of FM radio transmitter is presented, whose outputs are compared with real FM data collected by an experimental digital receiver. In this way, we also achieve a reliable instrument to optimize target detection performance by a successive adaptive signal processing. To complete the analysis of opportunity waveforms, the signals' self-ambiguity functions and spectra are evaluated, so it is possible to improve the knowledge of how to select the most appropriate FM channel. Since emulated data differ from real data in means of the transmission channel, a statistical analysis of the real channel is presented. [C1450]

"Array Shape Self-Calibration for Large Flexible Antenna"

This paper presents a method dealing with the self-calibration problem in term of array shape for large flexible antenna. This implies to take into account the phenomena of distortion and vibration that this kind of antenna, like an array mounted under flexible wing, can suffer from. We propose a technique that eliminates, on the first part, the phase ambiguities due to the large static bending, and on the second part, that estimates an instantaneous array shape. This two-step method allows us to follow the antenna during its dynamic fluctuations due to vibrating modes. We present simulation results in case of two particular large flexible antennas. [C1451]

"Evaluation of Knowledge-Aided STAP Using Experimental Data"

Recent advances in knowledge-aided space-time adaptive processing (KA-STAP) have resulted in significant performance improvements for ground moving target indication (GMTI) radar systems. In particular, the use of prior knowledge including terrain, clutter discretes, and previously detected targets has been shown to be effective for mitigating the poor performance often encountered when operating in heterogeneous clutter environments. This paper provides an evaluation of KA-STAP techniques based on extensive processing of experimental data. Two major performance issues are addressed: high false alarm rates due to under-nulled clutter discretes and target cancellation due to corruption of the STAP training data by other targets in the scene. Each of these problems is demonstrated using experimental multi-channel X-band radar data. Methods for using prior knowledge to improve performance are presented and processing results using the experimental data are provided that show how KA-STAP can lead to significantly improved detection performance relative to conventional STAP processing. [C1452]

"A Performance Comparison of Two Time Diversity Systems using TM-CFAR Detection for Partially Correlated Chi-Square Targets in Nonuniform Clutter and Multiple Target Situations"

In automatic detection, performance of time diversity systems is proved to be sensitive to how the multiple-pulse sample echoes, from commonly encountered nohomogeneities, are accumulated within the same receiver. Based upon the "non conventional time diversity system"(NCTDS), we derive exact expressions for the probabilities of false alarm and detection of a pulse-to-pulse partially correlated chi-square target with 2K degrees of freedom for the trimmed mean constant false alarm rate (TM-CFAR) detector. Because of the complex mathematics induced by the "conventional time diversity system" (CTDS), detection performance of this system is carried out using Monte Carlo simulations. The obtained results show that, while the NCTDS achieves a better nonuniform clutter resilience than the CTDS, the latter outperforms the former in multiple target situations. Hence, when both nonhomogeneities are concomitantly present, the two systems performances become nearly similar. [C1453]

"A Simple Estimator of Multiple Target Positions for Automotive Short Range Radar Networks"

For safety applications, automotive radar networks show an interesting potential. Apart from long range radars, networked short range radar systems are under development. Additional applications can be accomplished, such includes precrash detection, parking aid and blind spot surveillance. We research the automotive radar networks using short range radars. The network is built with multiple radars. In this paper, we consider data processing using measured ranges provided by the radars in order to estimate multiple target positions with high accuracy. Firstly, we derive a method based on MAP estimation. Secondly, we propose a method which reduces the calculation complexity compared to the above MAP method. Finally, we introduce a method which can detect targets with low undetected targets. The case often happens when the measured ranges are lost because of

miss-detections. We evaluate the performance with computer simulations. [C1454]

"Trajectory Comparison for Civil Aircraft"

This paper investigates the algorithms needed to compare two tracker outputs running on the same air situation trajectories. Tracking system provides aircraft trajectories containing aircraft kinematics supplemented with additional data. Tracker accuracy performance as well as tracker data output integrity and continuity is essential for controllers and safety nets applications, which guarantee a high safety level. The comparison procedure described in this paper provides tracking performance, automatic detection of tracking anomalies and is performed by considering a tested tracker and a reference. The reference is given by another tracker or a set of trajectories given by a sensor simulator. Results based on live data and simulation scenarios are presented. This method is used for mutual validation between two different types of tracker, perform some regression testing between two releases of the same tracker or assess the tracking performances using a sensor simulator. [C1455]

"Pedestrian detection based on automotive radar"

Automotive radar sensors are able to measure the target range, azimuth angle and radial velocity simultaneously with high accuracy and update rate even in multiple target situations. Target recognition of radar objects is still a technical challenge and one of the most important topics to support future advanced driver assistance systems (ADAS). There is especially a large interest to distinguish between radar echo signals from human beings and from other objects in the target recognition scheme. Therefore, this paper elucidates the motion sequence of a walking pedestrian and describes this complicated process in a suitable technical model with different reflection points and related Doppler frequencies. Based on some measurements with a 24 GHz radar sensor several signal features are generated, which are used for the target recognition procedure. [C1456]

"Moving target detection for synthetic aperture radar via shadow detection"

In this paper a novel technique is presented for detecting moving targets in SAR imagery by tracking the shadow of the target over multiple looks instead of using the target direct energy return. Unlike the SAR image of a moving target that is blurred and displaced, the shadow of the target is displayed at the true target location. The detection performance using shadow is primarily independent of the target radar crosssection and depends upon the clutter to noise signal level. A change detection method is developed that provides detection via identification of the target shadow as an outlier from a background distribution. The background is inferred from a sequence of SAR images. It is shown that simple temporal averaging by alignment of the image for estimating the background works reasonably well with SAR images offering good shadow contrast. The technique was successfully demonstrated initially using real radar data from a short range spotlight SAR system. Results against weaker shadow signals at longer stand-off range have also proved very encouraging showing a moving target being detected at 10 km standoff range. [C1457]

"Developments to a multiband passive radar demonstrator system"

The system and design issues of a multiband passive radar demonstrator developed by BAE Systems Advanced Technology Centre have been reported [1], together with some initial results from measurement trials. Further enhancements have been implemented at system, hardware and software levels to improve the overall performance of the demonstrator, through the introduction of analogue cancellation circuitry, computer control of RF band selection and switching, and faster run time signal and data processing. This paper briefly summarises the original multiband passive radar demonstrator, then outlines the rationale for the various enhancements, their practical implementation, and the supporting analysis, simulation and modelling. Results from recent trials of the enhanced demonstrator with civil aircraft 'targets of opportunity', that confirm the improved detection performance and multiband operation, are presented and discussed. [C1458]

"Impact modelling of wind farms on marine navigational radar"

The impact of wind turbines on radar systems is of increasing concern. This paper addresses the problem of the offshore wind farm and presents a methodology used to model the interference of wind turbines with pulsed marine navigational radar. It will show the ability to model some of the main issues such as; target spreading, sidelobe detection and the appearance of ghost targets. A comparison between the results from the model and measured data taken near the North Hoyle wind farm in North Wales, UK is provided. [C1459]

"Passive radar detection using wireless networks"

We report the first results of simulation and experiments on the utilisation of 802.11 wireless network

transmissions in a passive radar system. Target detection of a range of objects has been simulated and then experimentally demonstrated. Waveform analysis shows that some of the modulations used within the transmission sequence have suitable properties for target localisation. These initial results suggest this technique has a high potential for the basis of a widely available low cost passive surveillance system. [C1460]

"Regularisation methods for covariance matrix estimation in low sample support stap"

The interference covariance matrix in space time adaptive processing is usually estimated from training data that is drawn from adjacent range gates to the cell under test. The sample support required to achieve good detection performance may not be available in practice due to many factors such as system design or clutter heterogeneity. In this paper, we address this problem by proposing and evaluating a number of covariance matrix regularisation methods that attempt to reduce the bias of the eigenvalues of the estimated covariance matrix and hence improve the signal detection performance. [C1461]

"Bistatic JDL-STAP for ground moving target detection"

Optimum STAP requires knowledge of the true interference covariance matrix. In practice, this matrix is not known and is estimated from training data that must be target-free and statistically homogeneous with respect to the test data. These conditions are often not satisfied, which degrades the detection performance. Single-data-set algorithms have been proposed to circumvent this problem, which works solely on the test data. In this paper, we study the issues associated with applying reduced-dimension techniques to these algorithms in a bistatic radar system. Simulation results show an improved detection performance against conventional STAP algorithms in heterogeneous environments. [C1462]

"Robust radar detection of moving ground targets with STAP"

Airborne radar sensors are able to detect small and slow moving ground targets using short dwell times by distinguishing the weak target signature from the dominant ground clutter signal. The capability of a Ground Moving Target Indication (GMTI) sensor is principally governed by the Probability of Detection (PD). Other capabilities such as geolocation, tracking and recognition are derived from these detection data. One method used to enhance the PD for platforms with multiple phase centres is Space Time Adaptive Processing (STAP). In this paper we report an experimental assessment of a robust STAP algorithm [1, 5, 6] using the QinetiQ Enhanced Surveillance Radar (ESR) data. From our results it is apparent that robustness may be introduced if a selective training methodology is employed to estimate the data covariance. Results are given for both Pre- and Post-Doppler STAP [C1463]

"RFInD: An RFID-Based System to Manage Virtual Spaces"

We present RFInD, a cost-effective utilitarian system for locating objects using RFID technology. RFInD separates the notion of location from that of physical co-ordinates by using the abstraction of a virtual space. A virtual space is created by using RFID tags to label entities and locations in the physical space as references. RFInD manages the virtual space by using the references to create a spatial map, over which objects can be tracked and located. The target objects are labeled and embedded in a virtual space by associating them with proximate reference tags. RFInD creates the technology to automatically and efficiently manage these associations. In this work, we first characterize the capabilities of a commercially available RFID reader. We show how to use these capabilities for two tasks, namely proximity detection and tag association. RFInD uses these capabilities as primitives to create virtual spaces, embed objects in the virtual space, and navigate the space to track the embedded objects. Further, our experiments establish the effectiveness of our approach in managing virtual spaces [C1464]

"Design and development of a signal and data processor test bed for a passive radar in the FM band"

This paper describes the design and development of the signal and data processing chain required by a Passive Covert Radar (PCR) exploiting a single non co-operative frequency modulated (FM) commercial radio station as its transmitter of opportunity. The processing chain is proved to: 1) efficiently remove interference and clutter from the received signal, 2) detect targets and extract their bistatic range, bistatic Doppler and azimuth, 3) track targets in the Cartesian domain via the use of particle filtering. The whole processing sequence has been tested using emulated FM radio signals and scenarios as an input to receiving channels. Detection and tracking performance of the passive radar have been assessed comparing the performance of the signal and data processor test bed to the truth data feeding the test bed itself. [C1465]

"Space-Time Adaptive Processing in the presence of non-Gaussian sea clutteR"

Space-Time Adaptive Processing (STAP) is an optimum technique for target detection in the presence of Gaussian clutter [1,2]. However, for high resolution sea surveillance radar, clutter statistical properties are different [5]. Therefore classical STAP must be redefined. It can be done in the framework of the theory of Spherically Invariant Random Process (SIRP). In this paper a simple method of improving STAP performance in the presence of non-Gaussian clutter is proposed. Results are validated using simulated data. [C1466]

"A rare event approach to the detection of target-like signals in CFAR training data"

A new method based on the existence of rare events (RE) is proposed to detect the presence of nonhomogeneous samples in a set of Constant False Alarm Rate (CFAR) training data. Two RE schemes designated as the mean-to-mean ratio (MMR) and the variance-to-variance ratio (VVR) tests are proposed. No a priori knowledge of the nonhomogeneity topology is assumed. Analysis using Monte-Carlo method based on Rayleigh clutter and Swerling I target models is presented. Target-like interferences which seriously degrade the detection performance of the cell-averaging CFAR detector can be detected with a higher probability by RE detectors. [C1467]

"Constrained adaptive detection of range spread targets"

In this paper we consider the problem of detecting range spread targets in the presence of steering vector mismatches and Gaussian disturbance with unknown covariance matrix. To this end we resort to the Generalized Likelihood Ratio (GLR) principle and devise several detectors accounting for possible mismatches between the actual and the nominal steering vector. At the analysis stage, we assess the performance of the new algorithms, both in the matched and mismatched signal cases, also in comparison with a previously proposed GLR Test (GLRT) designed assuming that the nominal and the actual steering vectors coincide. The results show that the new tests may achieve performance improvements over the previously proposed GLRT when the mismatch is present. Moreover they exhibit an acceptable performance loss in the matched signal case. [C1468]

"Maximum likelihood CFAR for lognormal clutter with censored samples"

In this paper the structure of Maximum Likelihood (ML) CFAR for lognormal clutter is derived assuming that some reference samples are censored to avoid destructive effect of interfering targets. It is shown that under some acceptable approximations we will achieve in a simple structure for this detector which is suitable for real time processing. The proposed detector is compared with non censored ML CFAR (i.e. logt CFAR) via simulation. It is shown that while the proposed detector is a little weaker than logt CFAR in homogeneous clutter, in non homogeneous clutter it outperforms the logt CFAR. [C1469]

"Experimental results on moving target detection by focusing in UWB low frequency SAR"

The main objective of this paper is to present and evaluate a method to detect moving targets in Ultra Wideband (UWB) low frequency Synthetic Aperture Radar (SAR). Moving target detection at low radar frequencies is associated with long integration time and has to handle azimuth focusing for reliable detection. The examined method tests different hypotheses on relative speeds in the area of interest. The optimum step size between the hypotheses is found from a point target approximation. Experimental results show that the ability to detect moving targets increases significantly. In this study, the improvement of the Signal-to-Clutter Noise Ratio (SCNR) is up to approximately 20dB using a single antenna. The focusing method allows initial estimates in speed of moving targets. The SAR data, which is used in our experiments, was collected by the airborne UWB low frequency CARABAS-II system. [C1470]

"GLRT based adaptive detection for MIMO radars"

In this paper, the problem of adaptive target detection using temporal coherent pulse train in presence of clutter is considered for MIMO radars. We have formulated this problem as a hypothesis test. For clutter with unknown statistics two adaptive decision rules have been developed using two-steps generalized likelihood ratio test (GLRT). The performances of the proposed detectors have been evaluated using Monte-Carlo simulations. The results show the superiority of the MIMO radars with temporal coherent processing over the conventional phased arrays due to both angular spread and a newly presented phenomenon which is called Doppler spread in this paper. [C1471]

"Radar detection and classification of jamming signals based on cone classes"

This paper deals with the problem of detecting and classifying a radar signal (target signal or jamming) in the

presence of Gaussian disturbance. The jamming signal is modelled as belonging to a cone whose centre vector is the true target steering vector. Two different detection/classification approaches are analysed (the well-known ACE and GLRT approaches), yielding both to a two block device. The performance of the two decision algorithms are evaluated analytically, where possible, and by Monte Carlo simulation, otherwise. Some numerical results are reported along with some concluding remarks. [C1472]

"Performance of multichannel parametric detectors with MCARM data"

We consider the problem of detecting a multichannel signal in the presence of spatially and temporally colored disturbances. The parametric Rao and GLRT detectors, recently developed by exploiting a multichannel autoregressive (AR) model for the disturbance, have been shown to perform well with limited or even no range training data. In this paper, we evaluate the detection performance of the parametric Rao and GLRT detectors using airborne radar data obtained from the Multi-Channel Airborne Radar Measurement (MCARM) database. The data contain typical clutter found in airborne radar systems, and cover a variety of scenarios including dense-target or heterogeneous environment. Experimental results with the MCARM data show that the parametric Rao and GLRT detectors can provide good detection performance with limited or even no range training data in real radar environments. As such, these detectors offer useful solutions to detection problems in dense-target or heterogeneous environments. [C1473]

"Modelling sea clutter temporal correlation in detection calculations"

The calculation of target detection performance in a combination of K-distributed sea clutter and radar system noise has, to date, been limited to the case where the clutter speckle component is independent from pulse to pulse (as sometimes occurs with frequency agility). Recent advances in computational techniques reported here allow the speckle and noise to have different correlation times, thereby allowing fixed frequency and limited frequency agility radars to be modelled at all ranges and at all clutter to noise ratios. [C1474]

"Polarisation filtering for small target discrimination in ground clutter"

The Electronic Warfare and Radar Division (EWRD) of the Defence Science and Technology Organisation (DSTO) has initiated a number of studies investigating the exploitation of polarimetric analysis for the detection of small targets in strong ground clutter. This paper presents the results of experimental trials and associated signal processing research where an understanding of the scattering mechanisms present is used to design discrimination filters in the polarisation domain. It is shown that these physics-based filters provide highly efficient detection and identification of a variety of manmade targets immersed in strong clutter environments. [C1475]

"Time-frequency analysis of late time electromagnetic transients from radar targets"

Radar target recognition based on late time target resonance detection has been widely reported in the literature. Determination of the commencement of the late time period is crucial when extracting such resonance information because including the early time components significantly degrades the accuracy of the extraction due to the time-varying behaviour in this portion of the signature. In this paper an investigation of the late time commencement point is carried out in the Time-Frequency domain using the example of a wire scatterer. [C1476]

"Optimal search and optimal detection"

The application of optimal search and optimal detection to radar is summarized. Optimal search and optimal detection distribute limited search effort (energy and time) in the optimal manner in both space and time to maximize target detection performance and to minimize target search energy and time. A savings of several dB of power-aperture or search time is obtained for most radars. [C1477]

"The effect of land clutter statistics on automatic gain control"

Modern radars are rarely able to sample the full dynamic range of observed land clutter. Therefore designers must employ gain control to make best use of the receiver hardware. This paper considers suitable land clutter models for use in the development of automatic gain control for high-resolution radar. The clutter statistics observed by the radar also have an impact on other areas including detection and target classification, but this paper concentrates on the problem of controlling the front-end gain of the radar receiver. [C1478]

"Netted radar hough detector in randomly arriving impulse interference"

In this paper, two Hough Detectors, decentralized and centralized, with the polar Hough transform (PHT) that operate in the presence of randomly arriving impulse interference (RAII) are proposed and studied. The usage of the Hough transform (HT) in systems for air traffic control enables to detect more effectively the target trajectory in the presence of RAII. The study of the signal processing employed in detectors is carried out using Monte-Carlo simulations in MATLAB computing environment. The results obtained show that the detection probability of the multi-sensor centralized Hough detector is higher than that of the decentralized detector. [C1479]

"GLRT-Based Adaptive Doppler Processing for HF Radar Systems"

High frequency skywave and surface-wave over-the-horizon (OTH) radars are required to detect targets in the presence of powerful clutter and interference from man-made and natural sources. However, the received disturbances may be highly structured in the time domain (i.e. pulse-to-pulse) within the coherent processing interval (CPI). This provides scope for adaptive Doppler processing to enhance detection performance with respect to conventional FFT-based methods. This paper proposes a generalized likelihood ratio test (GLRT) based detector that not only possesses the valuable constant false alarm rate (CFAR) property invariant to disturbance scale-change, but also exhibits distinct advantages over the adaptive coherence estimator (ACE) and adaptive subspace detector (ASD) when unwanted signals are present. Here, we present the first experimental results for this detector in a HF surface wave radar Doppler processing application. [C1480]

"Computer Simulation of an Integrated Multi-Sensor System for Maritime Border Control"

This work describes a computer simulator for an integrated command and control (C2) multi-sensor system acting in a maritime border control scenario. The analyzed system is composed of two platforms of multiple sensors: a land based platform, equipped with a vessel traffic system (VTS) radar, an infrared camera (IR) and an automatic identification system (AIS); an airborne platform, carrying an airborne early warning radar (AEWR) and an IR camera. The mission of the system is the detection, tracking and identification of multiple naval targets inside a sea region, their threat level evaluation and the selection of an intervention against possible threat targets, in order to inspect their nature. The measures of effectiveness (MoE) of the integrated system are evaluated, i.e. the system performance during the detection, the threat evaluation process and the intervention. [C1481]

"Coherent Detection for MIMO Radars"

Superiority of multiple-input multiple-output (MIMO) radars over conventional phased array radars has been recently shown in many aspects. MIMO radars have better detection performance and can extract target information more precisely than phased array radars. In this paper, the problem of target detection using temporal coherent pulse terrain is considered for MIMO radars. We have introduced a structure that is suitable for coherent processing. Based on this structure, we have formulated this problem as a hypothesis test. One decision rule is developed for detection of target with unknown amplitude embedded in additive white gaussian noise (AWGN) with known power using the generalized likelihood ratio test (GLRT). Another adaptive scheme for the case of unknown power is presented. We have also proposed an ad-hoc constant false alarm rate (CFAR) detector against AWGN with unknown power. Performance of these detectors have been evaluated analytically. The results show the superiority of the MIMO radars with temporal coherent processing over the conventional phased arrays. [C1482]

"A Co-Channel Signal Detector Based on Phase Tracking for Pulse Doppler Radar"

Doppler processing is routinely applied to isolate targets from noise, clutter and interference in conventional pulse-Doppler radar. If a target is co-located in range and azimuth and has a similar radial velocity (co-channel) as another target (or interference), that target may not be detected. This is because only amplitude or power information is used in the detection stage, which does not provide sufficient information to discriminate co-channel signals from each other. In this paper we propose a detector which can resolve co-located targets (or target with interference) with similar Doppler frequencies. Instead of only using phase information for the coherent integration, our proposed detector tracks the phase modulation differences of the co-located, co-channel, targets. The amplitude information of the targets can also be estimated and forwarded to the tracker. One application of this method is HF radar where a target may have a Doppler frequency similar to a Bragg line-first order sea clutter. The Bragg lines are generally dominant at all ranges and exist in all directions. Conventional processing fails to discriminate when targets radar features are similar to the Bragg lines. Simulations of the proposed method show promising results that targets with Doppler frequencies near Bragg lines can be detected. [C1483]

"Detection in Range-Heterogeneous Weibull Clutter"

The paper deals with detection in range-heterogeneous Weibull clutter. Heterogeneity is defined as a sharp transition from one homogeneous region to another with a different scale and/or shape parameter. The proposed method, firstly, tests the homogeneity of the window. If it is found to be heterogeneous, the transition point is estimated and the threshold is set accordingly. It is known that usual CFAR methods suffer from target masking or increased false alarm rate when operated in non-Rayleigh or range-heterogeneous clutter. The proposed algorithm is shown to perform well in homogeneous or heterogeneous Weibull clutter environment and yield better performance than commonly known methods. [C1484]

"Computationally Efficient Angle Estimation Using Maximum Likelihood In A Digital Beam-Forming Radar"

We present a new signal processing method that uses maximum likelihood estimation (MLE) to estimate target angle-of-arrival (AOA) for a digital beam-forming phased array radar. We describe the motivations for abandoning conventional monopulse estimation, and contrast our proposed method to other recently proposed MLE approaches. In particular, we describe a method which eases the computational burden associated with maximum likelihood AOA estimation, making it feasible for use in real-time signal processors for phased array radar systems. We discuss improvements in beam-shape loss and AOA estimate accuracy for search radar applications. [C1485]

"Algorithm Overview Based On Image Processing with Electromagnetic (EM) Techniques in X Band and GA Approach for Depth Estimation of Shallow Burried Dummy Mines"

Detection of buried landmines and estimation of depth by modeling layered media is a complex and computationally intensive task. Microwave remote sensing with the capability to penetrate subsurface and its ability to resolve landmines as well as non-lethal targets can therefore be used for subsurface landmine detection. A model based on electromagnetic scattering and image analysis techniques at X-band frequency for sub-surface detection of dummy landmines buried under a sand layer and estimation of its depth has been proposed in this paper. An extensive set of lab experiments have been carried out using dummy landmines (without explosives) and backscatter observed at different depths. The raw data is processed through a series of image processing steps, the detection is carried out using Otsu's thresholding and the depth estimated by optimizing through a GA (genetic algorithm) based electromagnetic model developed. The method does not have any requirement of separate training and test data set to train the optimizer and validate the results. The results under laboratory conditions indicate that detection of dummy landmines is possible using thresholding techniques with data generated in X band and the proposed model is capable of estimating depth of the buried landmine to a significant accuracy. [C1486]

"Detection of an Unknown Number of Targets via Track-Before-Detect Procedures"

This paper addresses the problem of early detection of K ges 1 multiple moving targets in radar systems through the use of track-before-detect (TBD) techniques. Assuming prior knowledge of K, a binary generalized likelihood ratio test (GLRT) is first derived, which shows that the multi-target TBD problem can be regarded as a K path trellis search. Next, a novel multi-hypothesis test strategy is presented for K unknown as the solution of a constrained optimization problem, which subsumes the convectional binary GLRT. Both optimal and sub-optimal implementations of the proposed TBD strategies are discussed which allow to trade better detection and tracking performances with a lower computational burden. Numerical examples are also provided and commented. [C1487]

"Compression Waveforms for Non-Coherent Radar"

Non-coherent pulse compression (NCPC) was suggested recently. It was described using on-off keying (OOK) signals based on Manchester-coded binary pulse compression sequences (e.g., Barker, Ipatov). The present paper expands the discussion on waveform choice for both periodic and a-periodic cases, and on detection performances of this method. OOK transmitter and a receiver based on envelope-detection, suggested for the NCPC system, are simpler to implement than a binary phase-coded transmitter and a coherent receiver with I&Q synchronous detector, required for coherent pulse compression. NCPC can be used in simple radar systems where Doppler information is not required, in direct-detection laser radar systems and in ultra wide band (UWB) radar. Non-coherent processing has drawbacks in cases of reflections from multi-scatterer targets. The drawbacks and means of mitigating them are considered in section II. [C1488]

"Statistics of Clutter Residue in MTI Radars with IF Limiting"

In an MTI (moving target indicator) radar, when the received signal from clutter exceeds the IF (intermediate

frequency) dynamic range, i.e., limits in the IF bandpass limiter, the radar literature states that good MTI performance cannot be achieved. Close examination of clutter sequences shows that when the dynamic range of the radar is exceeded, occasional large spikes of clutter residue do occur but good clutter rejection is obtained in most of the clutter cells. This paper provides insight into the cause of the spikes of clutter residue and presents the statistics of the residue for two-pulse, three-pulse, and four-pulse MTI filters. The percentage of clutter-limited cells with good MTI performance supports the conclusion that most of the clutter-limited cells do exhibit good MTI performance. The infrequent residue spikes have a distinct pattern at the output of the clutter filter that is markedly different from targets. With the insight of the time domain view, this paper suggests that false alarms can be avoided with the use of a binary detection scheme and that by using an m-out-of-n detection criteria, clutter rejection performance can be as good as that for linearly processed signals. [C1489]

"Track-Before-Detect of Multiple Slowly Moving Targets"

We describe a new approach for combining range and Doppler data from multiple radar platforms to perform multi-target detection and tracking. Increasing the number of sensors can cause data association by conventional means to become impractical due combinatorial complexity, i.e., an exponential increase in the number of target to signature mappings. If the azimuthal resolution is coarse, this problem will be exacerbated by the resulting overlap between signatures from multiple targets and clutter. Our approach avoids combinatorial complexity during data association by performing an efficient optimization in the space of all target tracks and mappings between tracks and data. The reduced computational complexity of our approach scales only linearly with increasing numbers of targets and sensors. As a proof-of-concept, a simplified (single-sensor, range-only) version of the algorithm is tested on experimental radar data acquired with a stretch receiver. These results are promising, and demonstrate a surprising degree of robustness in the presence of nonhomogeneous clutter. Also the full, multi-sensor, version of the algorithm is tested on synthetic data. These results demonstrate that very accurate tracks can be estimated by exploiting spatial diversity in the sensor locations. The algorithm appears to be robust in the presence of clutter and uncertain knowledge regarding the number of targets present. [C1490]

"Comparison of Efficient Design Techniques for Surveillance Radars"

The manner in which any radar is configured to carry out its specific task is determined by the specific measurements it has to make, the physical environment in which it must function and the interferers it is expected to encounter. This paper puts forward the comparison between the various design techniques of one such significant radar group i.e. search radars or surveillance radars. The work explained eases the efforts of a radar designer by putting forward the best-suited technique for different specifications. We present the techniques for selection of beam types, time budgeting and power budgeting for the radar to be designed in accordance with the requirements cited by the user. Two approaches have been mainly considered to verify the feasibility of the design to meet the requirements. First approach is the design with pencil beam in which the advantages and disadvantages of using pencil beams for a radar design have been highlighted. In the second approach, multibeams in azimuth and elevation have been considered for design. The designs with multi beams have been considered with the variation of parameters such as elevation beam width, search frame time, rotational speed (RPM),beam widening with elevation, grouping of beams per rotation and with and without beam steering in azimuth. The paper puts forward all the comparative results of both the approaches with variation in different design parameters with respect to time on target, peak power requirement, power aperture product, accuracy, Doppler resolution, elevation coverage, design complexity, interception issues and electronic counter counter measure (ECCM) capability. [C1491]

"Target Tracking in Sensor Networks: Criteria for Sensor Selection"

This paper discusses the performance of a sensor selection scheme based on four expected performance criteria in a target tracking scenario, namely best expected heading, range, Doppler and bearing accuracy. The sensor selection algorithm is based on the Modified Riccati Equation, which is capable of handling sensors with probability of detection pdles 1. The Particle Filtering technique have been used for target tracking with an adaptation for missed detections in the case of pdles 1. Results are compared using multiple runs with simulated data for a single, moving target and a stationary two radar configuration. One sensor yields range, Doppler and bearing information, the other range and bearing information. Three cases of pd's are considered. The analysis includes the quality of the state estimate and the sensor selection strategy. The sensor selection strategy is evaluated for a multiple time step planning horizon. [C1492]

"Human Tracking Using Doppler Processing and Spatial Beamforming"

We present a continuous-wave Doppler radar with a multi-element receiver array for tracking humans. Joint Doppler processing and spatial beamforming are used to resolve multiple movers in the Doppler and direction of

arrival (DOA) space. The improvement in the performance of the multi-element array compared to a previously developed two-element system is evaluated through Monte Carlo simulation. In an array of limited size, the sidelobes of the strong targets prevent the detection of weaker targets. To overcome this limitation, the monopulse, CLEAN and RELAX algorithms are investigated in conjunction with software beamforming. The improvement in the performance of the radar towards the detection of multiple targets is evaluated by simulation. Measurements are conducted using a 4-element receiver for different targets in line-of-sight and through-wall scenarios. [C1493]

"Hitchhiking bistatic radar: principles, processing and experimental findings"

An experimental low cost bistatic hitchhiking radar has been developed at FFI utilizing the transmission of a civilian ATC radar. It uses off-the-shelf components in the receiver to produce close to real time traces of targets of opportunity. The processing enables positioning in 2D with good suppression of nearby clutter by continuously monitoring the clutter variation. [C1494]

"Wavelets: a Versatile Tool for the High Frequency Surface Wave Radar"

Widely used in image processing, wavelets seem to be a promising versatile tool for the high frequency surface wave radar (HFSWR). HFSWR is based on the ability of HF waves (3 MHz to 30 MHz) to propagate along the earth curvature. HFSWR can detect targets up to few hundred kilometers beyond the horizon. The two main applications of the HFSWR are the maritime surveillance of the exclusive economic zone (EEZ) and the remote sensing of the sea. Beside the classical noise which affects all radar signals, the detection capabilities of HFSWR suffer from two limitations: the sea clutter and the ionospheric clutter which are target masks. However sea clutter can be used to perform remote sensing of the sea. In this paper we are studying how wavelets may contribute to the improvement of radar signal processing. We consider general de-noising feature for radar signals, we carry out a wavelet-based improvement of remote sensing of oceanographic parameters and we show the first results of a wavelet-based processing for ionospheric clutter mitigation. [C1495]

"MEMS Electronically Steerable Antennas for Fire Control Radars"

Large apertures are of great benefit to applications that are prime powered limited as is found on aerostat and other airborne platforms. Electronically scanned array antennas are often proposed for these applications. However, increasing the aperture area with conventional array technology is met with prohibitive cost, weight, and prime power increases because of the dense spacing of phase shifters and/or active T/R modules. This paper discusses the recent development of RF MEMS (microelectromechanical system) switch technology and the use of these switches in a Radant lens configuration for arrays of approximately 10m2at X-band. A proof-of-concept 0.4m2MEMS electronically steerable antenna (ESA) containing 25,000 MEMS switches has been successfully designed fabricated and tested. The 0.4m2MEMS ESA was then integrated with an AN/APG-67 radar system to form the MEMS demonstration radar system. The MEMS Demonstration Radar system successfully detected both airborne and ground moving targets during a series of extensive radar demonstrations. This is believed to be the first large scale employment of MEMS switches in a scanning antenna and radar system. The low-cost, lightweight and low power technology demonstrated here can enable weight and power constrained platforms with electronic steering. [C1496]

"An Adaptive Beamforming Technique for Countering Synthetic Aperture Radar (SAR) Jamming Threats"

In a hostile environment synthetic aperture radar (SAR) is likely to be subjected to electronic countermeasures (ECM) to prevent target detection and classification. In practice, noise jamming may not always provide an effective ECM against the SAR because of the large power output required to obscure the SAR image. A potentially more potent threat is presented by deception or repeater jamming, which can exploit the SAR processing gain and prevent target identification and classification using relatively low power output. Such jammers are likely to be light, inexpensive and readily deployable. This paper presents an adaptive beamforming (ABF) for SAR technique which can provide robust and efficient suppression of both noise and deception jamming. The paper also includes results from experiments with SAR trials data containing jamming which demonstrate the effectiveness of the technique in a system offering using two spatial channels. [C1497]

"Ionospheric clutter mitigation with knowledge aided pre-whiten in High Frequency Surface Wave Radar"

Ionospheric clutter has proven to be the greatest impediment in high frequency surface wave radar (HFSWR). It influences most range bins, all Doppler bins and beams. Knowledge-aided ionospheric clutter mitigation using

multiple coherent processing interval (CPI) data was described. The approach is based on estimation of the near vertical incidence clutter by past CPI data to provide improved knowledge of clutter statistics. Knowledge aided pre-whitening filter was used to cancel both near vertical incidence clutter and the range wrap clutter. Experimental results demonstrate that the algorithm is able to suppress the ionospheric clutter whilst preserving the desired characteristics of the target echoes. [C1498]

"An Analysis of Measurement Derived Sea Clutter Simulations at Very Low Grazing Angles, in the Presence of Surface Based Ducting"

Sea clutter can have significant performance impacts on shipboard radar systems, particularly against low flying targets. It is essential to the evaluation of shipboard radar system performance, for engineers to have available very accurate sea clutter simulation models, which include the effects of anomalous propagation, as well as rough surface scattering, on the clutter return. In at-sea-tests, sea clutter returns from long ranges have been measured which are larger than the current sea clutter models have predicted. Not only do such large undesirable returns interfere with detection performance, but the presence of strong surface based ducting can result in extended range clutter folding, which may limit the usefulness of clutter mitigation approaches. The importance of the key parameter, grazing angle, in the computation of sea clutter cannot be overstated. Within the horizon the grazing angle is well understood, beyond the horizon grazing angle is a topic of considerable discussion (D.E., Barrick, 1998). The sensitivity of the sea clutter reflectivity models to grazing angle, within the context of trans-horizon ducted propagation is the focus of the issue being raised by this paper. In addition to the trans-horizon grazing angle issue, the difficult decision of selecting the height at which the propagation factor is modeled, is also discussed. [C1499]

"Short-data-record Adaptive Detection"

The classical problem of detecting a complex signal of unknown amplitude in colored Gaussian noise is revisited in the context of adaptive detection with limited training data via the auxiliary-vector (AV) filter estimation algorithm. Based on statistical conditional optimization criteria, the iterative AV algorithm starts from the target vector and adding non-orthogonal auxiliary vector components generates an infinite sequence of tests that converges to the ideal matched filter (MF) processor for any positive definite input autocorrelation matrix. Computationally, the algorithm is a simple recursive procedure that avoids explicit matrix inversion, decomposition, or diagonalization operations. When the input autocorrelation matrix is replaced by a conventional sample-average estimate, the algorithm effectively generates a sequence of MF estimators; their bias converges rapidly to zero and the covariance trace rises slowly and asymptotically to the covariance trace of the familiar adaptive matched filter (AMF). For finite data records, the generated sequence of estimators offers favorable bias/covariance balance and members of the sequence are seen to outperform in probability of detection (for any given false alarm rate) all known and tested adaptive detectors (for example AMF and the multistage Wiener After algorithm). White the issues treated refer to general adaptive detection procedures, the presentation herein is given in the context of joint space-time adaptive processing for array radar. [C1500]

"Knowledge Aided Detection and Tracking"

Proper use of knowledge of the environment can assist in the detection and tracking of targets within a radar system. Referenced research shows that knowledge-aided (KA) algorithms using terrain data enhances radar performance in the filtering, detection and tracking stages of processing. This paper addresses the development and experimental demonstration of a new post detection filtering algorithm that uses digital terrain elevation data to identify shadowed regions where ground targets are not observable. This knowledge is used to eliminate false alarms from within these regions prior to track processing. A demonstration experiment is described and improvements on the order of 9.4 dB are reported. [C1501]

"Soft Decision M-Pulse CFAR Detection in Weibull Clutter"

CFAR detector is an essential component in any radar system. This component ensures that the system may not be overloaded by false targets. In the past it was common to model the interfering signal (clutter) in a radar system with a Rayleigh distribution. But as a progress in the radar systems, nowadays the Rayleigh model is insufficient, therefore some other models such as Weibull and lognormal are proposed and CFAR detectors for these models are developed through the papers. But majority of these proposed CFAR detectors are derived for single pulse operation. When more than one pulse exists, it is proposed to use binary integrator to improve the performance. It is mentioned through literatures that binary integration leads to some losses. But alternative solutions are not discussed widely so much. In this paper we will introduce some soft rule for combining the statistic of different pulses in a single decision structure and will show out performance of this method in comparison with binary integration. [C1502]

"Signal Detection using the Correlation Coefficient in Fractal Geometry"

Using the Fractal Geometry in Signal processing has been extended nowadays. They have found several applications in signal detection and recognitions. They use the chaotic feature of the noise and clutter and try to distinguish between the noise, clutter and the desired target. Recent works show that lots of clutters like sea and ground clutters have fractal behavior so this kind of approach to the signal detection has been extended these days. In this paper we have used the Box-Counts of a signal rather than the Fractal dimension of a signal as will be defined later in the text. By applying the new defined concept we have developed different methods of signal detection. We use the correlation coefficient of the Box-Count and the time domain range for different ranges. By using the difference in the behavior of these coefficients when we have or don't have a target, we can set statistics from these variables and set up some detectors to determine whether the received signal contains a target or not just by comparing the statistics with some thresholds. One of the applications of the method is in high resolution radars. The received signal contains the Range Profile of the target which is unknown in our point of view. So using matched filters cannot be such helpful. In this paper the proposed detectors can act much better the common detectors of these signals. We have shown the advantage of the new methods. They bring us about 3 db increases in SNR. [C1503]

"Ultra-Wide Band Near-Field Imaging System"

An experimental ultra-wideband radar system prototype is presented for imaging objects located in the near field of the radar antennas. The system is primarily intended for through-matter, e.g. through-wall, target detection and imaging. The radar hardware is based on several novel technical solutions in the design of its electromagnetic (EM) and circuit components including a new antenna element with wide impedance and gain bandwidth. The same elements are employed for the transmit channel and the two-element receive array. The signal processing and target imaging algorithms are presented. Some results of indoor tests to image in 2-D the spatial position of a cylindrical object are reported. In particular, a brightest-spot recognition technique is demonstrated that uses a number of special radar calibration routines to set properly the time/range scale required for precise target localization and imaging while avoiding appearance of false target responses. [C1504]

"Development of diver detection and sensor integration for wharf surveillance software"

The underwater security sonar system is the port surveillance system which surveys over harbors and ships in order to protect harbor facilities such as wharfs, oil refineries, airports and vehicles, from the terrorism attack under or on the sea. For our surveillance system, it is required to develop the software which can perform "automatic detection of doubtful target" by processing the signal of sonars, and which can provide the high surveillance performance and usability by integrating the information of the sensors. For this purpose, we developed the algorithm for auto-detection and tracking of doubtful target. Also, we developed the algorithm for data acquisition and image processing specialized for the infrared camera for this system. [C1505]

"Compensation behaviors in echolocating bats measured by a telemetry microphone during flight"

Some echolocating bat species are well known to compensate for the Doppler shifts in the echoes by changing their pulse frequencies so that the echo frequencies remain constant at which the bats can hear best. This behavior is termed "Doppler-shift compensation" and is an important behavioral adaptation for echolocating bats. In this study, we present the evidence for another compensation mechanism of echolocating bats, in which pulse intensity is adjusted in relation to the distance to a target resulting in maintenance of a constant intensity of the echo. Our custom-made telemetry microphone (Telemike) mounted on the back of the bat allowed us to observe not only the emitted pulses, but also the returning echoes which the flying bat actually listened to. The signal characteristics of pulse-echo pairs were analyzed combining with a high-speed video camera system as a bat flying toward the wall on which a landing mesh was attached in the flight chamber. We found that pulse intensity in bats intending to land exhibited a marked decrease by approximately 30 dB within 2 m of distance from the target wall, and the mean reduction rate was 6.5 dB per halving of distance. In contrast, the intensity of echoes returning from the target wall at the head of the flying bat indicated a nearly constant intensity while approaching the target wall. These findings provide direct evidence that bats are supposed to adjust pulse intensity to compensate for changes in echo intensity to maintain a constant intensity within the range necessary for optimal signal processing (echo-intensity compensation). [C1506]

"Development of an Experimental Prototype Multi-Modal Netted Sensor Fence for Homeland Defense and Border Integrity"

Potential terrorists/adversaries can exploit a wide range of airborne threats against civilian and military targets. There is no effective, low-cost solution to robustly and reliably detect and identify small, low-flying airborne

vehicles such as fixed-wing aircraft or unmanned aerial vehicles (UAVs) that might be carrying out chemical, biological or nuclear attacks, or smuggling drugs or illegal immigrants across the border. This paper presents a low-cost and low-power methodology for performing key 24/7 sentry functions that can be used for the protection and the surveillance of critical infrastructure from airborne threats. The methodology is based on joint multi-sensor fusion technology. It consists of a forward-based fence comprised of a mixture of selected low cost, low power, netted sensors including a simple radar, acoustic microphone array and optical (infrared and visible) cameras to detect, track and discriminate potential airborne targets. An experimental prototype end-to-end proof of concept system with deploy able software, hardware and connectivity is built using COTS component. Multi-modal senor fusion algorithms employing Kalman filter for target tracking and acoustic and image recognition algorithm for target classification are implemented. Results from field tests reveal reasonable detection and discrimination among candidate aircraft. [C1507]

"A New Differential Clutter Map Processing in Modern Surveillance Radars"

In this paper we propose a new differential clutter map processing to reduce the false alarms from stationary ground clutter, sea clutter and improve the detection probability of the slow moving target with low Doppler frequency shift. The proposed clutter map is a scan to scan processing which receives the echo signal from Doppler filter bank tuned at lowest Doppler frequency, processes it and delivers the processed signal to the CFAR processing. The simulation results show that the false alarm rate is reduced by more than -30 db. The Clutter map also increased the probability of detection of low speed target, slower than 100 Km/hr. [C1508]

"Design and Analysis of Wideband Antenna with Application to Ground Penetrating Radar System"

In this paper, a wide band antenna is proposed for ground-penetrating radar (GPR) system. This antenna consists of dipole antenna housed in a rectangular conducting reflector whose inner walls are coated by an absorbing material. The coating is composed of a number of layers with a conductivity profile designed to achieve the minimum voltage standing wave ratio (VSWR) of the dipole antenna over the frequency band of operation. The antenna impedance and VSWR are calculated using the finite-difference time-domain (FDTD) method. The antenna impedance and VSWR are presented over a wide-band of frequency. The capability of buried target detection by the proposed antenna is examined by investigating the coupling between the transmitting and receiving antennas in the presence and absence of buried targets. The operating bandwidth of the antenna is shown to be about 50%. The effect of the ground soil on the antenna characteristics is studied when the GPR system is placed at different heights above such a soil. The GPR system with the proposed antenna is shown to be capable of detecting the existence of buried targets. [C1509]

"Performance Evaluation of Separated Aperture Sensor GPR System for Land Mine Detection"

In this paper, the performance of the separated-aperture sensor working as ground- penetrating radar (GPR) is assessed over the operating frequency band. The capability of the separated-aperture sensor to detect buried targets is examined by evaluating and comparing the electromagnetic coupling between the transmitting and receiving antennas in two cases: (i) when the system is placed over an empty ground and (ii) when it is placed over a ground inside which a practical target is buried at the proper depth. The finite-difference time-domain (FDTD) method is used for electromagnetic simulation and the results concerning the coupling between the transmitting and receiving antennas are presented considering various practical parameters such as the operating frequency, the electric properties of the ground soil and the buried target, and the depth at which the target is buried under the ground surface, it is shown that target detectability using the separated-aperture sensor is strongly dependent on all of the above parameters. [C1510]

"Improving Detection in Sea Clutter using Waveform Scheduling"

In this paper, we propose a method to exploit waveform agility in modern radars to improve performance in the challenging task of detecting small targets on the ocean surface in heavy clutter. The approach exploits the compound-Gaussian model for sea clutter returns to achieve clutter suppression by forming an orthogonal projection of the received signal into the clutter subspace. Waveform scheduling is then performed by incorporating the information about the clutter into the design of the next transmitted waveform. A simulation study demonstrates the effectiveness of our approach [C1511]

"Performance Bounds and Algorithms for Tracking with a Radar Array"

Target tracking using a radar array system is considered. A signal model which includes the effects of path loss, signal delay, Doppler shift and angle-of-arrival is adopted. The conventional approach to radar tracking assumes that the raw measurements are processed to produce a collection of candidate target detections. We propose a new approach in which the raw received measurements are used for tracking. Performance bounds and a

simulation analysis of filters developed for each model demonstrate the performance gains which can be achieved by tracking with raw sensor measurements [C1512]

"Blind Adaptive Algorithm for M-Ary Distributed Detection"

In a parallel distributed detection system each local detector makes a decision based on its own observation, then transmits its local decision to a fusion center. Given fixed local decision rules, in order to design the optimal fusion rule for the M hypotheses, the fusion center needs to have perfect knowledge of the performance of the local detectors as well as the prior probability of the hypotheses. Such knowledge may not be available in practice. In this paper, we propose a suboptimal algorithm for M-ary decision fusion based on binary groupings of multiple hypotheses. Simulation results show that this method is effective in practice [C1513]

"Concurrent Tracking and Detection of Slowly Moving Targets using Dynamic Logic"

We describe a new approach for combining range and Doppler radar data to perform multi-target detection and tracking. The algorithm framework is based upon dynamic logic, a biologically-inspired neural architecture, which yields advantages over conventional multi-target tracking algorithms by reducing the computational complexity during data association by several orders of magnitude. The algorithm is tested on experimental range-plus-Doppler radar data, and the results demonstrate a surprising degree of robustness in the presence of nonhomogeneous clutter and uncertainty in the number of targets [C1514]

"Fourier Approach to Moving Target Indication and Detection in Multichannel SAR Data"

This paper outlines a solution to the multi-channel synthetic aperture radar (SAR) moving target indication and detection (MTI/MTD) by means of inverse systems approach. A novel model of the problem is presented and an approximate analytic solution to it will be given. It will be demonstrated how a moving target indicator can benefit from a multichannel SAR system as opposed to a traditional approach that separates MTI and SAR systems. It will be shown that the problem of separation of moving targets from stationary ones can be solved completely by using multi-channel approach and in such a way that a spatial distribution of the stationary targets does not play a role [C1515]

"Through the Wall Imaging using Chaotic Modulated Ultra Wideband Synthetic Aperture Radar"

A novel chaotic modulated ultra wideband (UWB) synthetic aperture radar (SAR) imaging scheme and its post data processing technique are presented for through the wall surveillance applications. It is illustrated that the proposed radar has an excellent resolution performance due to the autocorrelation properties of chaotic signals. Through modeling room reverberation and target reflection, and deriving energy distribution at the receiver, detection performance is carried out to show the advantages of proposed radar. Electromagnetic (EM) simulations are performed in a through the wall scenario. Compared with the conventional UWB radar, the result verifies the effectiveness and superiority of the proposed technique [C1516]

"UWB Radars: Recent Technological Advances and Applications"

A number of challenging radar applications (such as anti-personnel mine detection and human being detection) is discussed. In these applications UWB technology has multiple advantages over the traditional narrow-band approach, in particular very high positioning accuracy, rigidity to multi-path propagation and target classification abilities. On a number of examples recent advances of UWB technology in radar have been demonstrated and remaining challenges have been discussed. [C1517]

"A Target Recognition Method Based on Non-Linear Polarization Transformation"

This paper proposed a target recognition method to distinguish ships from chaff by polarization information for the fully polarized dual-channel radars with low resolution. The method expands the original single polarization radar system to dual polarization radar system with both left and right circular polarizations by receiving and processing the foil polarization information of radar echoes. It recognizes the target by taking advantage of the difference of the left and right circular depolarization characteristic parameters of the target and chaff in radar echoes. The recognition rate were improved in results by enlarging the difference between the cross-polarization component and co-polarization component of the radar echoes involving target and chaff employing non-linear polarization transformation. In the end, the recognition results were proved to be more desirable by processing information in polarization domain than in time and frequency domain. [C1518]

"Theoretical Analysis of Polarization Recognition between Chaff cloud and ship"

Chaff is a kind of passive disturbance which is commonly used. It is difficult to find an efficient method to depress and recognize chaff in both time and frequency domain. This paper tries to recognize chaff and target such as warship in polarization domain under the theoretical analysis of the polarization scattering cross section of chaff. In order to find target more exactly, non-linear polarization transformation and polarization smoothness were applied to process the polarization information of chaff and ship target. The resulting recognition was effective by simulation. [C1519]

"Radar Performance Degradation due to the Presence of Wind Turbines"

Wind turbines located in the vicinity of a radar system may affect the system's detection and tracking capability. A description of adverse effects is given in the paper for both primary and secondary radar. In order to judge the consequence of the shadowed volume cast by a wind turbine, results of radar performance analyses are presented. It is shown that radar performance may be significantly degraded when a low-RCS target deliberately seeks a shaded volume. Suggestions to alleviate the problem are given. [C1520]

"Next-Generation W-Band Radar Testbed"

This paper presents a 94 GHz (W-band) FMCW radar system under development for airborne situational awareness. Military CONOPS require pilots of both fixed and rotary winged aircraft to land at remote sites in degraded visibility or brownout conditions due either to the weather (such a fog, rain, snow, blowing sand) or by prop or rotor wash. Quite obviously, man made obstacles such as poles and wires within the flight path hinder operations and rocks, berms, obstacles and uneven terrain make last second landing decisions mandatory. To be able to resolve these small targets and obstacles, the bandwidth of the linear FM sweep must be large since target resolution is proportional to the inverse of the frequency deviation. The purpose of this on-going program is to demonstrate highly linear wide-bandwidth W-band FMCW radar designed utilizing COTS components. We have completed the first phase of a technology demonstration and we are currently developing an advanced testbed for detecting these obstacles. [C1521]

"Nanosecond Gigawatt Radar: Indication of Small Targets Moving Among Heavy Clutters"

For indication of low-RCS targets moving among natural clutters, radars with short high-power transmitted RF pulses are known (Skolnik, 2001) to be advantageous over radars with relatively long broadband-coded pulses of the same energy. In accordance with the theory(Skolnik, 2001), an experimental X-band nanosecond-gigawatt-pulse radar proved to be efficient for detection, recognition and tracking of ~1 m2RCS planes, helicopters and motor boats moving within forest and sea clutters. Further upgrades of the radar are possible. [C1522]

"An Integral Detection Scheme for Moving Object Indication in Dual-Channel High Resolution Spaceborne SAR Data"

Upcoming SAR satellite missions like TerraSAR-X or RADARSAT-2 will deliver high resolution dual channel SAR data with large coverage. These new missions-together with rising interest in area-wide traffic monitoring-motivate spaceborne GMTI as an attractive alternative to conventional traffic data acquisition. However, a moving object appears distorted in the SAR image since the well-known stationary world assumption in the SAR focusing process is violated. In this paper, a detection approach is presented, which considers simultaneously the effects of azimuthal and radial motion of an object. The mathematical framework of this detector combines information of the measured signal, the expected signal, and their variances. Furthermore, the performance of the proposed algorithm is analysed using experimental airborne SAR data. [C1523]

"Moving Target UWB Radar Demonstration using Real-Time Sampling"

Moving target bistatic 2D UWB radar trial with two receiving antennas using modification of time-domain back-projection technique with use of 50 GHz equivalent sampling oscilloscope in comparison of two channel 1 GHz real time sampler is presented. Sub nanosecond first derivate Gaussian pulse with peak-peak amplitude 1.2 V was used. As a target a metal barrel was chosen and his movement by shifting with 5 cm step simulated. Using real-time sampler was the goal. Acquired data were processed and the radar images shown. [C1524]

"An Analysis of 2D Target Positioning Accuracy for M-sequence UWB Radar System under Ideal Conditions"

This paper describes analysis of target positioning accuracy for ultra wideband (UWB) maximum length binary sequence (M-sequence) radar system under ideal conditions in two dimensional space. In this case, it is shown that the target position estimation error is cased by quantization of time of arrival (TOA) measured by the radar system. The appropriate statistical quantities are suggested for describing these errors. The properties of M-

sequence UWB radar systems performing under ideal conditions are illustrated by a set of simulations. The results obtained in this paper can be applied as a base for the design of positioning system based on M-sequence UWB radar. [C1525]

"Resource Management for Airborne Surveillance Radars"

This paper will discuss the radar resource management research currently being undertaken at Thales Aerospace. A detailed simulation of a radar resource manager and the associated environment and target models has been produced in order to investigate resource management and its integration with tracking, as well as its application to an airborne surveillance radar and related scenarios. Several potential benefits may be predicted through the use of such a system as compared to a conventional track-while-scan (TWS) radar, including increased detection range, reduced track initiation time, and the ability to more intelligently consider secondary sources of information such as digital terrain elevation data and a clutter map when making decisions. Several example problems are discussed in this paper, with simulation results presented, including the use of adaptive track update times for the case where two or more tracks mix, the use of a target likelihood function to schedule additional looks for targets in a clutter environment and so reduce track initialisation time, and operator interface considerations. [C1526]

"Applications of Multi-source Remote Sensing Information to Urban Environment Monitoring in Mining Industrial Cities"

Remote Sensing (RS) has been viewed as the one of the most effective tools for environment monitoring, urban resources and environment investigation, change detection and urban growth analysis in mining industrial cities. Firstly, the framework and structure of applying multi-source RS information to environment monitoring of mining industrial cities is proposed based on the general methodologies of RS applications and the characteristics of mining industrial cities. RS can be used to monitor land use/cover change, extract subsidence land because of underground mining, analyze the dynamic change and simulate the trends of mining industrial city growth, monitor the extension of mining contamination, analyze the impacts of mining to farmland and ground buildings, assess the feasibility and performance of land reclamation and ecological reconstruction, and so on. Land subsidence is a very serious environmental damage caused by mining, and that leads to more negative impacts to ecological system, even leads to geological disaster. Three methods to extract subsidence land from RS image: thematic information based on decision tree, object-oriented subsidence land extraction and target identification based on RS information, geographical data and domain knowledge are experimented. Multi-source and multi-temporal RS information fusion is used for environmental analysis in mining areas. By the fusion of Landsat TM and SAR image, both high spatial resolution and multi-spectral information can be integrated so high classification and target extraction accuracy can be got. IHS fusion algorithm is improved by considering the image content and adaptive IHS fusion is experimented. Multi-temporal RS information fusion is used for change detecting and dynamic monitoring. By the case study in Xuzhou city, it proves that remote sensing can play important roles in environmental analysis and assessment in mining industrial cities and serve as the efficient decision-making support tool f- or regional sustainable development. [C1527]

"Detection and classification of urban structures based on high-resolution SAR imagery"

In this paper, several advanced methods for detecting and classifying urban structures in high-resolution SAR imagery are presented. The detection of man-made structures resp. the suppression of clutter, for example natural surfaces, can be accomplished by a coherent time-frequency analysis. These techniques can detect targets in the scene that behave like point-scatterers (such as edges, poles, etc.) by their high degree of correlation across sub-apertures of the scene. If polarimetric data are available, this approach can be extended by taking into account the frequently anisotropic polarimetric backscattering of man-made targets. As a third approach, a simple but powerful operator for detecting urban structures by analysing texture inhomogeneity in SAR images is developed. A second objective of this paper is the segmentation and classification of the detected urban structures. Based on the detected man-made structures, the characteristic structure size is investigated, using several approaches, to distinguishing between residential areas, industrial areas and dense city centres. The methods are evaluated using several real airborne SAR datasets. [C1528]

"FDTD Modelling of a Realistic Room for Through-the-Wall Radar Applications"

This work describes the use of the finite-difference time-domain (FDTD) method to investigate the capabilities and limitations in the use of a UWB radar system, to detect a human model target inside a realistic room. A 0.8 ns pulse at a center frequency of f0= 1.1 GHz is used. The room is modelled with all its components (water & heating pipes, windows, electrical outlets, brick walls, barred windows, etc.). The radar setup is also modelled to simulate a realistic system. The performance of the UWB radar is examined by generating 2-dimensional (2D)

images of the room interior with the human body model included. This is done by considering monostatic and multistatic radar scenarios where responses are recorded and processed using the time-domain back-projection method. Images from the FDTD modelling detected the human body model at the correct location inside the room. As expected, the multistatic radar setup provided a cleaner image than that of the monostatic radar setup due to greater diversity in aspect angle. [C1529]

"Target Tracking with Range and Bearing Measurements via Robust Linear Filtering"

In this paper we provide a robust version of a linear Kalman filter for target tracking with nonlinear range and bearing measurements. Moreover, we prove that the state estimation error is bounded in a probabilistic sense. We compare our approach with the current state of the art in converted radar measurement based linear filtering. [C1530]

"Stereo-Vision-Based Moving Object Tracking via Robust Linear Filtering"

Vision-based tracking sensors typically provide nonlinear measurements of the targets Cartesian position and velocity state components. In this paper we derive linear measurements using an analytical measurement conversion technique which can be used with two (or more) vision sensors. We derive linear measurements in the target's Cartesian position and velocity components and we derive a robust version of a linear Kalman filter. We show that our linear robust filter significantly outperforms the extended Kalman Filter. Moreover, we prove that the state estimation error is bounded. [C1531]

"Distributive Target Tracking in Wireless Sensor Networks under Measurement Origin Uncertainty"

This paper addresses the problem of tracking a single target under measurement uncertainty due to clutters and missed detections in wireless sensor networks. By adopting the particles' representation of the probability density function of target state, this paper develops a particle filter (PF) and probabilistic data association filter (PDAF) hybrid tracking algorithm, name as PF-PDAF. PF-PDAF extends the well-known PDAF to the general nonlinear system. Based on the hierarchical sensor network architecture, the distributive PF- PDAF is also implemented. Moreover, the posterior Cramer-Rao lower bound (PCRLB) is computed to provide a theoretical bound on the tracking performance of the developed algorithms. Simulation results are provided. [C1532]

"Time Reversal Transmission in MIMO Radar"

Time reversal explores the rich scattering in a multipath environment to achieve high target detectability. MIMO radar is an emerging active sensing technology that uses diverse waveforms transmitted from widely spaced antennas to achieve increased target sensitivity when compared to standard phased arrays. In this paper, we combine MIMO radar with time reversal to further improve the performance of radar detection. We establish a radar target model in multipath rich environments and develop likelihood ratio tests for the proposed time-reversal MIMO radar (TR-MIMO). Numerical simulations demonstrate improved target detectability compared with the commonly used statistical MIMO strategy. [C1533]

"Derivation and Analysis of an Adaptive Detector With Enhanced Mismatched Signals Rejection Capabilities"

We consider the problem of adaptive radar detection with a view to provide a detector with high sidelobe signals rejection capabilities. Towards this end, we consider a modification of the adaptive beamformer orthogonal rejection test by enforcing the presence of a fictitious signal under the null hypothesis, orthogonal to the presumed target signature in the whitened space. We derive the generalized likelihood ratio test for this problem and provide analytical expressions for its probability of false alarm and probability of detection, for both matched and mismatched signals. The new detector is shown to offer very good performance in terms of mismatched signals rejection. [C1534]

"Wavefront Adaptive Raymode Processing for Over-the-Horizon HF Radar Clutter Mitigation"

Detection of surface targets using over-the-horizon radar (OTHR) is extremely challenging due to ionospherically-induced Doppler spread clutter. In particular, low Doppler targets are often masked by ground clutter arriving via multipath propagation at different elevation angles, each with a different ionospheric Doppler shift. The wavefront adaptive raymode processing (WARP) approach presented here exploits the azimuthally distributed nature of the clutter return and adaptively estimates the "crinkly" spatial wavefront arriving on each raymode by using its distinct Doppler spectral characteristics. Rather than the plane-wave beamwidth of the array aperture, the raymode resolution of WARP is limited by the wavenumber-extent-spatial-aperture (WESA) product of the clutter return. Thus it is possible to spatially separate clutter raymodes using limited array

apertures. Using simulated radar data, WARP is shown to provide a signal-to-clutter-plus-noise ratio (SCNR) improvement of as much as 30 dB over conventional processing for targets buried in Doppler spread clutter. [C1535]

"Comparison of Radar-Based Human Detection Techniques"

Radar offers unique advantages over other sensors in the human detection problem, such as remote operation during virtually all weather and lighting conditions. Many radar-based human detection systems today employ Fourier analysis, such as spectrograms. However, spectrograms perform poorly in high clutter environments. Also, an inherent SNR loss is caused by the implicit assumption of linear target phase. In this paper, human modeling is used to derive a more accurate non-linear approximation to the true non-linear target phase and the likelihood ratio is optimized over unknown parameters to enhance detection performance. Performance is compared both analytically and through MATLAB simulations. [C1536]

"Adaptive Sensing of Dynamic Target State in Heavy Sea Clutter"

We propose an adaptive estimation method for the spatio- temporal covariance matrix of sea clutter. The motivation is to enable adaptive detection approaches that rely on accurate estimation of this matrix. The method involves vectorization of the equations for the dynamical system model governing the temporal evolution of the clutter matrix followed by a multiple particle filtering approach to deal with the high dimensionality of the formulation. The estimated sea clutter covariance matrix is applied to the problem of detection of a small target in heavy clutter; effectiveness is demonstrated via simulations. [C1537]

"Target identification and signal processing of millimeter-wave"

In this process, the control of DSP is the most critical, which controls the dual-channel analog/digital converter to transform the signal of millimeter wave radar in the first half cycle of one clock, whereas the signal of millimeter wave radiometer in the last half cycle. When the signal processing and target identification is finished, the results are returned to the high-speed memory, or to the computer display through the general serial interface of DSP. Regarding to passive detection and identification, 12-bit high-speed A/D converter in TMS320LF2812, of which the highest sampling conversion time is 80 ns, is used to distance ranging, feature extraction and target identification of MMV targets. The outputs of MMW high-stability oscillator, which go by the modulator, pour into the millimeter wave power amplifier. In the receiver mixer, echo signal and high-stable original signal are mixed to produce the difference frequency signal. [C1538]

"Multiresolution feature extraction in target detection of UWB SAR"

This paper firstly analyzes the difference between high-frequency synthetic aperture radar (SAR) and low-frequency ultra-wide band synthetic aperture radar (UWB SAR) in extraction of multiresolution feature. And then we establish the equivalent models of target and trunk clutter in UWB SAR images and analyze the differences of multiresolution characteristic between target and trunk clutter as image resolution is varied from fine to course. Two forms of first-order autoregression (AR) model are introduced to model multiresolution sequences, and a two-dimensional (2-D) definition of generalized likelihood ratio (GLR) is presented to improve the robustness of multiresolution feature extraction. At last a feature extraction experiment of multiresolution based on region of interest (ROT) is accomplished. The results of experiment testify that the multiresolution feature is effective to improve the performance of UWB SAR target detection. [C1539]

"Targets detection and analysis in coastal area using Polarimetric SAR images"

Polarimetric SAR (PolSAR) is sensitive to orientation and characteristics of object thus may yield several new descriptive radar target detection parameters and leads to improvement of radar detection algorithms. Ship detection is one of the most important tasks of the seaport surveillance. In this paper, some methods, such as polarimetric target decomposition, time-frequency analysis, and radon transform, are proposed to detect and analyze moving targets using PolSAR image. We generate a validity test using multi-look X-band PolSAR image acquired by PiSAR in coastal Area. Both moving target and stationary target are included in the images. Results show the potential capability of proposed methods for moving target detection and analysis. [C1540]

"Submillimeter-wave active radar imager"

The authors have developed and demonstrated 3D imaging using a submillimeter-wave FMCW radar with a fast microwave chirp and phase coherent detection. The technique provides an important advantage over more traditional CW RF imaging in that time gating of the return signals allows optimization of the received scene illumination or specific depth reconstruction. This can be used to enhance (or hide) specific objects or greatly

reduce background clutter. The system was initially prototyped with available RF components near 600 GHz and a 12.6 GHz chirp producing a 250 MHz/msec sweep yielding a range resolution of 1.2 cm. Lateral resolution on the scene is set by a 20 cm diameter Teflon lens antenna producing approximately 2 cm at 4 m distance. The RF transmit power (generated by a W-band power amplifier and an in-house frequency multiplier chain) is less than 0.5 mW but when coupled with a heterodyne downconverter (in-house developed fundamental balanced Schottky diode mixer, 4000 K DSB noise temperature) yields a measured dynamic range of more than 70 dB. A more compact and higher resolution system is currently under construction and will employ an 18 GHz msec sweep rate microwave chirp for sub-cm range resolution, a 40 cm reflector and a higher power transmitter, dramatically increasing resolution and dynamic range. The talk will cover the system design and some early results we have obtained on test targets at 4 m. [C1541]

"Wavefront Adaptive Sensing for Radar Spread Clutter Mitigation"

In spatially inhomogeneous, Doppler-spread radar environments, adaptive processing is often precluded because neither the target wavefront is sufficiently known nor is signal-free training data available. This paper presents a new clutter mitigation method designed to overcome these challenges by combining minimum variance (MV) adaptive beamforming and blind source separation (BSS) for distributed sources. Wavefront adaptive sensing (WAS) is a hybrid adaptive beamforming approach which uniformly maximizes gain against clutter by avoiding MV signal cancellation due to mismatch at high SNR and poor BSS threshold performance at low SNR. Simulation results are presented for target detection in a multi-mode spread-Doppler over-the-horizon radar scenario. [C1542]

"Laser range finder based obstacle tracking by means of a two-dimensional Kalman filter"

This article presents a implementation of a two- dimensional tracking filter in an automotive application. A headway alert system is a considered application for this tracking system, whose key component is a Kalman filter estimating and filtering two-dimensional trajectories of vehicles and various other obstacles that may occur in a traffic scenario. A reliable tracking system is essential for developing a robust headway alert application to identify obstacles and to avoid false warnings. The data, on which the Kalman filter algorithm is based on, is provided by a prototype laser range finder mounted in front of the host car and delivering range and angular data from obstacles in front. These data are filtered and combined with ego-motion data from the host car to decide whether to warn the driver about a potential threat. [C1543]

"Target's radiation cross section modeling and analysis for passive millimeter wave detection"

On the base of the analysis for passive millimeter wave (PMMW) detection, target's radiation cross section was modeled as new token for target's millimeter wave (MMW) characteristics. Target's radiation cross section was then explained and analyzed for application; it was also analyzed for application on the base of actual testing. At last, the essence of PMMW stealth is target's radiation cross section reduction was pointed out. [C1544]

"An unsupervised target detection algorithm in SAR images"

An unsupervised target detection algorithm in SAR image is proposed in this paper. In the algorithm, 2-D fussy entropy is used as objective function. Ant colony algorithm and genetic algorithm are used to search the optimal thresholds for SAR target detection problem separately. In the ant colony algorithm, the ant move direction is determined by the trail pheromone. Each ant in the colony will generate a path based on the relative positions of the nodes and feedback information about the best paths generated by previous colonies. In the Genetic algorithm, the near optimal results are searched from selection, cross and mutation. Tests results showed that, due to ant colony algorithm's ability of both finding good search paths and escaping from local minima, the proposed method could achieve more stable target detection results than genetic algorithm though its detect performance was similar to that of genetic algorithm. [C1545]

"Multi-scale feature analysis method for bridge recognition in SAR images"

Target recognition is an important field in remote sensing image processing. This paper handles with the problem of bridge recognition in Synthetic Aperture Radar (SAR) images. Based on features of bridges, rivers and land in different spatial resolution SAR images, a method of multi-scale analysis is proposed. The original data is split into low and middle resolution level. The bridge candidates are located in low level by automatically detecting river. And regions of interesting (ROI) are obtained in middle one. So, bridges are recognized by analyzing those regions. The example results indicate that the processing speed can be greatly improved and the precision of recognition can also be ensured. [C1546]

"Sequential discrimination with multi-features to remove false ROIs in SAR ATR"

Because the prescreening usually adopts an anomaly detection approach to highlight the vehicle-targets in SAR image, many false regions of interest (ROIs) are produced to reduce hardly the efficiency of the ATR. A new method based on sequential discrimination with multi-features is proposed to remove these false ROIs in this paper. By quantitatively analyzing the redundancy, robustness and separability of the candidates, the optimal features are selected to form an orderly vector, which is compared with the vector of threshold to finish a sequential discrimination. The performance of the above algorithm is validated by the X band MSTAR data, and is compared with the quadratic distance discriminating (QDD) method. [C1547]

"An algorithm of SAR GMTI in the presence of blanketing jamming"

Jamming and clutter must be effectively suppressed for moving target detection. A method of detecting slow-moving ground targets based on three-aperture synthetic aperture radar (SAR) in the presence of blanketing jamming is presented. It uses two-aperture cancellation method to suppress SAR jamming to target then to detect the moving ground targets. Firstly, spatial geometry model and echo signal model of three-antenna SAR were built, then an algorithm of SAR moving target detection based on clutter suppression interferometer (CSI) was derived, and the realization steps were presented. Finally, computer simulation results validate its effectiveness. [C1548]

"Extracting information from shadows in SAR imagery"

The presence of speckle noise presents considerable challenges in interpreting SAR imagery. Despite the very high resolution that is on offer with modern SAR systems, the extraction of reliable intelligence from SAR imagery in an automated and robust manner has faced considerable difficulties. Shadow regions in SAR imagery are unique in terms of absence of speckle and any distortion from imaging artefacts. This paper presents a series of work that has aimed at exploiting the information in SAR shadows. Earlier work looked at combining shadow features with target features obtained with single look imagery. This provided for better target classification and led to a technique for estimating heights for urban structures. However, it is with multiple perspective imagery that SAR shadows have proved really effective. Using shadow delineation alone, information from different look angles over a sequence of SAR images is combined together to provide very reliable and unambiguous estimates of building dimensions. Another remarkable success has been the detection of moving targets from their shadows over a sequence of SAR images. The images of moving targets are blurred and distorted making it difficult, if not impossible, to detect the moving targets in SAR imagery. However, the target shadows are undistorted. Initial results with short-range data have been successfully replicated with detecting moving targets at much longer ranges. In all of these cases performance will be affected where clutter background is weak, dynamic range is poor or shadows from different objects overlap. Nevertheless, this paper has highlighted a range of applications from target detection and location to urban scene analysis where SAR shadows have been shown to provide a highly effective way of extracting information from the imagery. [C1549]

"Adapting to Change: The CFAR Problem in Advanced Hyperspectral Detection"

Newer, realistic models of targets and backgrounds used in hyperspectral detection do not always lend themselves to a CFAR (constant false alarm rate) formulation. Several advanced techniques are considered here. It is found that incorporating a particular empirically validated method of target evolution permits an exact CFAR version of a large class of advanced detectors based on elliptically contoured distributions. Other validated detectors are considered, for which no closed form normalization exists to convert them to CFAR form. For these a geometrical approach to achieving approximate CFAR performance is described and analyzed. [C1550]

"An experimental independent bistatic radar system for wideband application"

The aim of this research is to develop techniques for bistatic ISAR as applied to target imaging. A scheme of an independent bistatic receiving system without dedicated data links was carried out under the support of national science foundation. The research defined a system configuration and assesses its potential performance via modeling. It was developed to support pulse compression of wideband waveforms for applications. The associated implementation issues introduced by electro-optical component characteristics were discussed. Coherent detection was used to implement difference mixing for subsequent digital processing. This system is independent since it requires no timing control signals for synchronization provided by illuminators, but the necessary reference signal is intercepted from the radar's sidelobe emissions. [C1551]

"Parameter Estimation and Number Detection of MIMO Radar Targets"

This paper considers the problem of target parameter estimation and number detection of multi-input multi-

output (MIMO) radar targets. Cyclic optimization algorithms are presented to obtain the maximum likelihood (ML) estimates of the target parameters and a Bayesian information criterion (BIC) is used for target number detection. Specifically, an approximate cyclic optimization (ACO) approach is first presented, which maximizes the likelihood function approximately. Then an exact cyclic optimization (ECO) approach that maximizes the exact likelihood function is introduced for target parameter estimation. The ACO and ECO target parameter estimates are used with the BIC for target number determination. Numerical examples are presented to demonstrate the effectiveness of the proposed approaches for target parameter estimation and target number detection. [C1552]

"Multi-Channel Fast Parametric Algorithms and Performance for Adaptive Radar"

Airborne radar systems employing radar sensor arrays utilize multi-channel (MC) signal processing techniques for optimal detection and localization of targets. The detection and localization statistics have mathematical structures that typically require the inverse of an estimated covariance matrix in order to be evaluated. Due to the size of sensor arrays and the number of pulses in a coherent processing interval (CPI), the dimension of the covariance arrays is very large (1000s) and the computational burden of estimating and inverting such large arrays has led to the development of parametric methodologies that significantly reduce both the computational requirements and the amount of measured data to create the inverse co-variance matrix estimate. Recent developments have indicated non-stationary covariance estimates may provide enhanced detection performance over stationary covariance estimates. This paper outlines the fast computational structure possibilities of both stationary and non-stationary covariance inverse structures in one-dimensional and multi-channel cases. [C1553]

"RF Tomography with Application to Ground Penetrating Radar"

RF tomography and ground penetrating radar are combined to detect and identify hidden targets, such as underground facilities and hard and deeply buried targets. Past experience in below-ground imaging is described, current measurement results are presented, and future plans are discussed. [C1554]

"Auxiliary-Vector RADAR on MCARM Data"

Derived from statistical conditional optimization criteria, the auxiliary-vector (AV) detection algorithm starts from the target vector and adding non-orthogonal auxiliary vector components generates an infinite sequence of tests that converges to the ideal matched filter (MF) processor for any positive definite input autocorrelation matrix. When the input autocorrelation matrix is replaced by a conventional sample-average estimate, the algorithm effectively generates a sequence of estimators of the ideal matched filter that offer exceptional bias/covariance balance for any given finite-size observation data record. In this work, the AV algorithm is evaluated on collected airborne phased-array radar data from the MCARM program and is seen to outperform in probability of detection (for any given false alarm rate) all known and tested adaptive detectors (for example AMF, generalized likelihood ratio test, the multistage Wiener filter algorithm, etc.). [C1555]

"Knowledge-Aided Space-Time Adaptive Processing"

A fundamental issue in knowledge-aided space-time adaptive processing (KA-STAP) is to determine the degree of accuracy of the aprioriknowledge and the optimal emphasis that should be placed on it. In KA-STAP, the a priori knowledge consists usually of an initial guess of the clutter covariance matrix. This can be obtained either by previous radar probings or by a map-based study. In this paper, we consider a linear combination of the aprioriclutter covariance matrix with the sample covariance matrix obtained from secondary data, and derive an optimal weighting factor on the aprioriknowledge by a two-step maximum likelihood (ML) approach. The performance of the two-step ML approach is compared with that of the convex combination (CC) approach and is evaluated using the KASSPER data. [C1556]

"Statistical Modeling and ML Parameter Estimation of Complex SAR Imagery"

Accurate statistical models for the complex pixels forming fine-resolution synthetic aperture radar (SAR) images are needed for several engineering applications, including coherent signal detection in SAR clutter, automatic target recognition, and automatic SAR RCS calibration without calibration targets. We derive the maximum likelihood estimator for the parameters of a complex generalized Gaussian distribution and show that it can be efficiently computed. Applying this to fine-resolution SAR images representing a wide variety of scene contents, we show that this model very accurately captures both the central regions and tails of the data distribution. [C1557]

"A Comparison of MIMO and Phased Array Radar with the Application of Music"

The utilization of diversity in radar systems has shown improvements over conventional phased array radars in many aspects of the system performance including target detection probability, number of targets, and beam-pattern. We present here the application of the MUSIC algorithm to MIMO radar and the associated benefits of increasing the diversity to its performance for a single target and two closely spaced targets, but also show that a system with diversity can perform worse than that of a phased array system due to the directional transmit beamforming gain available to the phased array. [C1558]

"A Novel Approach for Multiple Moving Target Localization Using Dual-Frequency Radars and Time-Frequency Distributions"

Accurate range estimation and tracking of moving targets is an important task in urban sensing applications. A dual-frequency radar, which estimates the range of a target based on the phase difference between two closely spaced frequencies, has been shown to be a cost-effective approach to accomplish both range-to-motion estimation and tracking. This approach, however, suffers from two drawbacks: it cannot deal with multiple moving targets, and has poor performance in noisy environments. To overcome these drawbacks, we propose, in this paper, the use of time-frequency signal representations. High signal-to-noise ratio (SNR) is obtained by focusing on the moving target instantaneous Doppler frequency law provided by the power localization properties of time-frequency distributions. The case of multiple moving targets is handled by separating the different Doppler signatures prior to phase estimation. [C1559]

"Radar resources optimization by adaptive serch domains priority assignment based on most threatening trajectories computation"

The main challenge of future phased array multifunction radar will be to optimise the radar time budget to avoid deleterious overload effects. For this purpose, we propose a new technique for priority assignment of Search Domains. Then, we have developed new algorithms for most threatening trajectories computation based on Calculus of Variations approach developed for "shortest path computation" in image processing. [C1560]

"Track management and PMHT"

PMHT algorithm, as proposed, promises high performance multi target tracking in clutter with (relatively) modest computational resources. However, when applied to practical target tracking situations, a number of problems need to be overcome. PMHT assumes fixed number of tracks, and furthermore it assumes that all tracks are true tracks. No track quality measure is provided within PMHT to enable false track discrimination. In this paper we add the probability of target existence to PMHT processing, and accommodate a variable number of tracks. [C1561]

"Fusion of over-the-horizon radar and automatic identification systems for overall maritime picture"

Over-the-horizon (OTH) radar and automatic identification system (AIS) are commonly used in the surveillance of maritime areas. This paper presents a method, which includes tracking and association algorithms, for fusing the information from these two types of systems into an overall maritime picture. Data to be fused consists of asynchronous track estimates from the OTH system and measurements obtained from AIS. The data available at the fusion center, as output of real world systems, contained incomplete information, compared to theoretical tracking and fusion algorithms. A method to estimate the missing information in the input data is described. Results obtained using real data as well as simulated data are presented. This type of fusion provides overall pictures of maritime areas, with benefits for surveillance against military threats, as well as threats to exclusive economic zones. [C1562]

"Quickest detection of statistical changes with application to tracking"

As part of the track-management process it is necessary to know when new tracks start and when old ones die. Thus some knowledge of the theory of detection of statistical changes is important, and the purpose of this talk is to give the audience some overview of what is available. Specifically, we shall discuss sequential testing, this information necessary as a precursor to an understanding of the procedure and performance of the Page "quickest" detection of statistical changes. We shall also discuss the Shiryaev test, which represents a more Bayesian point of view. We shall present applications to detection of target spawn based on monopulse radar data, and also to the track management of sonar targets whose aspect-dependent SNR is modeled as hidden Markov-the suboptimality of Page procedures for detection of a changes between HMMs is rather surprising. [C1563]

"Subaperture wiener filter construction for time-varying RFI suppression in UWB SAR"

Ultra-WideBand synthetic aperture radar (UWB SAR), operating in the very high frequency/ultra-high frequency bands, has foliage and ground penetrating capability to detect targets hidden in forest or under the ground. The existing services such as television, radio and communications, referred to as radio frequency interference (RFI), degrade the quality of focused UWB SAR image. The Wiener filter has been found to have superior suppression performance and be more computationally efficient than other RFI suppression methods but its construction needs additional recorded RFI data, which increases the radar system complexity. In this paper, a subaperture Wiener filter (SWF) construction method is proposed, which does not require additional recorded RFI data and can deal with the time-varying RFI. The proposed SWF has been proved efficient by real UWB SAR data. [C1564]

"The scheme and key components design of W-band coherent doppler velocity radar front-end"

This paper presents a scheme of W-band coherent Doppler velocity radar front-end, which can be used to measure the velocity of target ranging from 10 m/s to 2000 m/s. After the comparison of the advantage and disadvantage of several schemes, the scheme using the phase-locked dielectric resonator oscillator (PLDRO) and direct digital synthesis (DDS) is chosen. The two coherent X-band signals are produced by mixer and power-divider mechanism of the PLDRO and DDS. Then, transmitting signal and receiver LO is obtained by the 8th-order multiplier from the two X-band signals. The superheterodyne receiver is adopted to increase the system signal-to-noise ratio (SNR). The finished key components have good performance, indicating that the scheme increases the sensitivity and the resolution of the radar. [C1565]

"Data association for target tracking by several passive sensors"

In recent years, there has been considerable interest within the tracking community in the approach to data association based on the assignment algorithm. The focus of this paper is to describe a new dynamic S-D assignment algorithm. In the presence of clutter, missed detections, the new method incorporates the image intensity information into the dynamic assignment cost coefficient. To reasonably utilize the special feature of IR sensors, the association becomes more accurate and, at mean time, the complexity of the algorithm has not obviously increased. The simulation results show that the proposed approach has better performance than traditional approaches. [C1566]

"Gaussian mixture cardinalized PHD filter for ground moving target tracking"

The cardinalized probability hypothesis density (CPHD) filter is a recursive Bayesian algorithm for estimating multiple target states with varying target number in clutter. In particular, the Gaussian mixture variant (GMCPHD) for linear, Gaussian systems is a candidate for real time multi target tracking. The present work addresses the following three issues: (i) we show the equivalence between the GMCPHD filter and the standard Multi Hypothesis Tracker (MHT) in the case of single targets; (ii) using a Gaussian sum approach, we extend the GMCPHD filter by employing digital road maps for road constraint targets. The utilization of such external information leads to more precise tracks and faster and more reliable target number estimates; (iii) we model the effect of Doppler blindness by a target state dependent detection probability, leading to more stable target number estimation in the case of low Doppler targets. [C1567]

"A fusion study of the FAVS sensors suite"

This paper presents a fusion process developed for the future armoured vehicle system (FAVS) technical demonstration (TD) project. One of the project objectives was to develop, optimize and demonstrate a multi-sensor suite mounted on an army vehicle to detect and identify targets while the platform was moving. The sensors consisted of a cooled infrared camera, millimetre-wave radar and a defensive aide suite. For the purpose of this paper, only the first two sensors were considered in the fusion study. This paper presents the sensor suite, the fusion process, a description of a field trial used to gather target detection data, and the results and analysis of the fusion process. [C1568]

"Multisensor tracking and fusion for maritime surveillance"

Over the past several years, the NATO Undersea Research Centre has conducted extensive research in multisensor networks for undersea surveillance, culminating in the development of the DMHT tracker. In this paper, we discuss upgrades to this technology and its application to maritime surveillance. [C1569]

"Sensor selection: the modified riccati equation approach compared with other selection schemes"

In this paper a comparison is made between a sensor selection algorithm (SSA) based on the modified Riccati equation (MRE) on the one hand, and a random sensor selection (RSS) or a fixed sensor selection (FSS)

scheme on the other hand. The goal is to investigate the benefits the MRE SSA yields compared to the other selection schemes. The MRE SSA is capable of handling sensors with probability of detection pd< 1 and performs sensor selection based on various expected performance criteria in a target tracking scenario. For all three selection schemes the particle filtering technique has been used for target tracking with an adaption for missed detections in the case of pd< 1. Results are compared using multiple runs with simulated data for a single, moving target and two stationary radars. One sensor yields range, Doppler and bearing information, the other range and bearing information. The analysis includes the quality of the state estimate and the sensor selection strategy. [C1570]

"A novel framework for the network-wide distributed detection problem"

This paper presents a new framework for distributed target detection in wireless sensor networks (WSNs). In our previous work, for multiple networked sensors collaboratively detecting the presence or absence of a target in the sensor field, every sensor uses an identical threshold for local decision-making. In this paper, we propose a framework where the sensors in the network collaboratively decide and select non-identical thresholds to improve network-wide detection performance in a dynamic manner. This threshold selection scheme is based on a new statistical metric called false discovery rate (FDR). Assuming a signal attenuation model, where the received signal power decays as the distance from the target increases, various performance indices like system level probability of detection and probability of false alarm are studied. Analytical and simulation results are provided for system level probability of false alarm and probability of detection. Performance comparison between the proposed approach and the classical identical local sensor threshold approach is provided to demonstrate the effectiveness of this scheme. [C1571]

"Drift aware wireless sensor networks"

The focus of wireless sensor networks is to develop low cost sensors with sufficient computing and communication capabilities to support networked sensing applications. The emphasis on lower cost led to sensors that are less accurate and less reliable than their wired sensor counterparts. Sensors usually suffer from both random and systematic (bias) problems. Even when the sensors are properly calibrated at the time of their deployment, they develop drift in their readings leading to biased sensor measurements. The drift in this context is defined as a unidirectional long-term change in the sensor measurement. Assuming that neighboring sensors have correlated measurements and noting that the instantiation of drift in a sensor is uncorrelated with other sensors and inspired by the resemblance of registration problem in radar target tracking with the bias error problem in sensor networks we devise a novel algorithm for detecting and correcting sensors drifts and show how it improves the reliability and the effective life of the network. [C1572]

"Multiple target tracking with asynchronous bearings-only-measurements"

An algorithm for detection and tracking of multiple targets using bearings measurements from several sensors is developed. The algorithm is an implementation of a multiple hypothesis tracker with pruning of unlikely hypotheses. Tracking conditional on each hypothesis can be performed using any suitable filtering approximation. In this paper a range- parameterized unscented Kalman filter is used. Each hypothesis describes a track collection with varying number of targets. Final track estimates are obtained by weighted clustering according to hypothesis probabilities and clustered track states. Simulation experiments include arbitrary setup of multiple targets and multiple moving receiver platforms (sensors). The main results are the asynchronous modeling of measurements arrivals which allows an effective and efficient processing in a Bayesian MHT framework. [C1573]

"Time allocation of a set of radars in a multitarget environment"

The question tackled here is the time allocation of radars in a multitarget environment. At a given time radars can only observe a limited part of the space; it is therefore necessary to move their axis with respect to time, in order to be able to explore the overall space facing them. Such sensors are used to detect, to locate and to identify targets which are in their surrounding aerial space. In this paper we focus on the detection schema when several targets need to be detected by a set of delocalized radars. This work is based on the modelling of the radar detection performances in terms of probability of detection and on the optimization of a criterion based on detection probabilities. This optimization leads to the derivation of allocation strategies and is made for several contexts and several hypotheses about the targets locations. [C1574]

"An effective SAR-GMTI technique based on eigen-decomposition of the covariance matrix"

An effective multi-channel SAR-GMTI technique based on eigen-decomposition of the covariance matrix is proposed. The variation of the sum of small eigenvalues of the covariance matrix is used to detect moving

targets which can avoid clutter suppression. The radial velocity of the moving target is estimated by two steps. Firstly, using the interferometric phase of two SAR images to get the coarse radial velocity estimation, then the more precise radial velocity is obtained by searching the space-domain steering vector of the moving target. It overcomes the sensitivity of the interferometric phase to clutter and noise. The performance of the approach is analyzed in detail. The merit of the presented technique is demonstrated by simulated and measured SAR data. [C1575]

"Moving target detection in airborne SAR by a combined wigner-STFT transform"

The detection and the motion parameters estimation of the moving targets is a key problem in imaging the moving target for Synthetic aperture radar (SAR). In this paper, a new method based on the combination of the Wigner-Ville distribution (WVD) and the short-time Fourier transform (STFT) has been proposed and applied to moving target detection for airborne SAR. It is demonstrated that the proposed method can eliminate the cross-terms of the WVD and improve the time-frequency resolution of the STFT simultaneously. Its performance is demonstrated by both simulation and experimental examples. Our results suggest that the proposed method provides a efficient technique in detecting the moving target for airborne SAR. [C1576]

"Moving target location of VSAR based on maximum likelihood method"

Based on the pixel vector sampled among multi-images, VSAR may effectively suppress the strong ground clutter and realize the moving target detection and locating. In this paper, the Cramer-Rao bounds (CRBs) are derived for the estimation of a proposed VSAR model parameters, as well as the azimuth locations of moving targets, and the maximum likelihood (ML) methods are further proposed to reach these CRBs. Finally, some detailed numerical experiments are also provided to show the effectiveness of the proposed methods. [C1577]

"Ground slow-moving target adaptive processing for Airborne Radar"

Airborne fire-control radar is mainly equipped with forward looking antenna, which is characterized by high flight velocity, short wavelength and low PRF. Consequently, on one hand, ground clutter of airborne fire-control radar is non-homogeneous in range and multi-ambiguous in Doppler frequency; on the other hand, Doppler frequency spectrum of the clutter varies quickly with the cone angle and the bandwidth of the mainlobe is much spread. We focus on the features of the clutter and the ground slow-moving target for airborne fire-control radar at first Then it is pointed out that the mainlobe clutter is the most important factor which influences the detection performance. Finally, an adaptive processing algorithm, which is named FS-AMTI, is presented based on the frequency shift of the center of mainlobe clutter by adopting segmentation strategy. Experimental results with real data illustrate the good detection performance for slow-moving target of the proposed algorithm. [C1578]

"Motion compensation for SISAR based on contrast maximization"

The shadow inverse synthetic aperture radar (SISAR) can obtain the shadow image of the object for target detection, classification and identification. The precise motion compensation is the key problem for the accurate shadow image. A novel method for motion compensation based on the contrast maximization is proposed in this paper. The value of the estimated motion parameter is adjusted continuously until the contrast of the image is maximized. This method is simple and apt for actualization as well as precise motion compensation. Computer simulations are given to illustrate the effectiveness, and the performance of the proposed method with different SNR is also discussed. [C1579]

"A new wall compensation algorithm for through-the-wall radar imaging"

The signal will encounter refraction, changing in speed and get attenuated as passing through the wall in the through-the-wall radar. In this paper, by analyzing the echo signal model, the relationship among the transmit signal, target position function and the wall system function in view of the system concept will be achieved, a new wall compensation algorithm based on the inverse system and a method of estimating the wall system function using the real data will be proposed. Proof of concept is provided using real data collected in a laboratory environment. The results show that the new wall compensation algorithm can eliminate the effects of unknown wall parameters very well. [C1580]

"An airborne GMTI radar simulator based on space-time adaptive processing"

Space-time adaptive processing (STAP) has proved to be one of the best techniques capable of detecting weak moving targets in strong clutter environment and has been widely applied in airborne ground moving target indication (GMTI) radar. This paper introduces our work on establishing an airborne GMTI radar simulator, which can be used to test and evaluate existing STAP algorithms and develop new algorithms. Currently, the basic

functional frame of simulator has been completed. In practical application, many necessary real-world refinements to the model are discussed and analyzed based on the simulation results. [C1581]

"SAR detection of moving targets based on matched fourier transform"

Firstly, the echo model of moving target for SAR is constructed in this paper. According to this model, the method of detection of moving targets based on Matched Fourier Transform is discussed. Compared with the bilinear time-frequency distribution algorithms, the Matched Fourier Transform will not be affected by the cross-terms when multiple moving targets exist. Moreover, because of remaining Doppler frequency, the spectrum of strong target is widened, and then weak target will be shadowed by strong one. To solve this problem, the method of the CLEAN technique in the Matched Fourier domain is proposed to SAR detection of moving targets. The simulation results validate the effectiveness of this method. [C1582]

"Data fusion of multiple polarimetric SAR images based on combined curvelet and wavelet transform"

Data fusion is a very effective technique which can be applied to many remote sensing areas such as battle awareness, monitoring of environmental surveillance and man-made target detection. In this paper, we test fusion of multiple polarization (HH, HV, VH and W) SAR images, which is performed using multiscale image fusion technique based on combined curvelet and wavelet transform. Curvelet transform provides a flexible multiresolution, anisotropy and directional expansion for SAR images. Compared with wavelets, it can afford more efficient presentation of image edges. The fusion approach exploits the advantages of both curvelet and wavelet in multiscale domain. The example result of four polarimetric SAR image fusion show that the proposed method has a good performance. [C1583]

"Optimal polarimetric interferometry coherence analysis in detection and location of moving target with SAR"

This paper mainly deals with the problem of the optimal polarimetric interferometry coherence in detection and location of moving target with SAR. The coherence is closely related with the estimated accuracy of the interferometric phase between the residual images which are obtained from clutter cancellation. A novel method for improving the estimated accuracy of the interferometric phase is presented. Using the echo model of moving target, the procedure of clutter cancellation in frequency domain is derived. The optimal polarimetric interferometry processing for residual images is proposed with detailed analysis. Finally, the interferometric coherences of the residual images with different polarization are analyzed by simulation to validate the theory. [C1584]

"Channels equalizing and calibration technology of moving target detection for multi-phase centers receive system"

With the rapid developing of synthetic aperture radar (SAR) in recent year, multi-channel receive technology is widely applying in wide-swatch SAR, high resolution SAR, GMTI, InSAR, multi-band and multi-polarization SAR. In this paper, have a deeply discussion on equalizing between channels in wideband multi-receive aperture system when amplitude imbalance and phase non-uniform. Take a three receive aperture GMTI system as example, detail process is present, step by step from GMTI system design block diagram to final processing result. Measured data processing results validate effectiveness of the method. [C1585]

"Single-channel UWB SAR ground moving targets detection method using change detection based on single-pass sub-aperture images"

Ultra-wide band synthetic aperture radar (UWB SAR) operating in VHF/UHF band has the capabilities in high resolution imaging and foliage penetration. In this paper we exploit its large beamwidth and propose a new ground moving target detection method for single-channel UWB SAR using change detection based on single-pass sub-aperture images, which is called sub-aperture SAR images change detection (SASICD). When we select several sub-apertures with appropriate size to form images, the moving target can focus on different positions in accordance with the centers of the sub-apertures, while the stationary one remains the same. The SASICD attempts to distinguish this difference and estimate the target's position and velocity precisely. The effectiveness of the method is illustrated when we process the UWB SAR real raw data. [C1586]

"A novel approach to three-channel SAR-GMTI channel equalization and moving target detection and location based on real data"

Aiming at airborne three-channel SAR-GMTI system and its real data, a novel channel equalization method is presented, furthermore, in virtue of the method's good performance on compensating the clutter differences between different channels, a technique for moving target detection (MTD) and location is further proposed. This method first realizes signal equalization between inner channels utilizing the leaking signals, then implements range and azimuth time calibration and compensates the channel differences via iteration after range compression, after that, it realizes MTD by clutter cancellation and imaging, finally obtains target parameters by estimating moving target doppler shift. The technique proved its good performance in real data processing with the advantages of high channel equalization precision, little computations, good clutter cancellation and MTD performances and easiness to implement. [C1587]

"A novel ground moving target detector in dual-channel SAR images based on the covariance matrix"

Concerning the detection of ground moving targets in dual-channel SAR images, a novel detector based on sample covariance matrix is proposed. The method makes use of the principle of orthogonal projection, for obtaining the component of the sample covariance matrix energy vector that is perpendicular to the clutter covariance matrix energy vector, then construct effective metric by this orthogonal component. Compared with traditional DPCA, this new metric can achieve better clutter rejection, eliminate influences from moving targets' sidelobes, set threshold more easily and get lower false alarm probability. The simulated results prove the effectiveness of this metric. [C1588]

"Change detection of concealed targets using repeat-pass SAR images"

This paper proposes a novel change detection algorithm for locating target concealed by foliage using multi-pass low-frequency SAR images. Having registered the image pair, an intensity ratio detector is used to detect the potential changes due to disturbance in local mean backscatters with an computed threshold according to a given probability of false alarm. Once a local change is reported, CFAR detection is used to confirm it. The background estimation is operated on one of the local patch pairs according to the change style. Finally, the algorithm is tested on the benchmark image pairs from CARABAS-II data collected during the flight campaign in Vidsel 2002, which has show good performance in detection the arrival targets and departure targets while keep a rather low false alarm rate. The algorithm is also less time consuming. [C1589]

"A wavelet based targets detection method for high resolution airborne SAR data"

A wavelet based automatic targets detection method for high resolution airborne SAR data is described in this article to receive faster and more accuracy detection. This method is based on the assumption that man-made objects are easily detectable at low resolution because their scattering is more persistent than that of natural objects. The algorithm involves an improved wavelet soft threshold filter (IWSTF) and a wavelet based RCCFAR detector. In order to retain the target feature, the wavelet soft threshold filter is improved by the strategy used in the enhanced Lee filter. Instead of using a global threshold, we adopted an adaptive threshold calculated according to the detail coefficients in each scale. To accelerate the RCCFAR detector, two RCCFAR detectors are used. One is first applied to the approximate coefficients to make a coarse detection. The other one is applied to the filtered images in those regions which are regarded as candidate targets. Performance of the algorithm is assessed by some high resolution airborne SAR image and it shows that the algorithm can effectively reduce false alarms caused by speckles. [C1590]

"Point target interferometry for natural and artificial scatterers"

The Coherent Targets Monitoring technique is providing superior ground deformation mapping compared with standard interferometry based on one pair of Master/Slave scenes. This is because using a larger data set it is possible to estimate and correct for additional phase error sources. Also the point targets detected as coherent targets are generally characterized by stronger signal that provides more accurate phase information than the clutter present in the rest of the scene. This paper reviews previous work in SAR noise estimation and shows the advantages of point targets versus distributed targets. Results from the Turtle Mountain/Frank Slide site show that the measured phase/deformation errors at the point target positions are within the estimated range. Corner reflectors with a high SNR are expected to improve the accuracy of the method. [C1591]

"Comparison between MARSIS & SHARAD results"

MARSIS (Mars advanced Radar for subsurface and ionosphere sounding) is a low frequency nadir looking sounding radar selected by ESA as a payload of the Mars Express mission, whose primary Scientific Objective is to map the distribution of water both solid and liquid, at global scale on the Martin crust. MARSIS is the first instrument to be able to detect what lies beneath the surface of Mars (up to about 5 km). MARSIS operates with

a very high fractional bandwidth: 1 MHz bandwidth allows a vertical resolution of 150 m in vacuum which corresponds to 50-100 m in the subsurface, depending on the electromagnetic wave propagation speed in the crust. The center frequency of the pulses transmitted by MARSIS can be set to 1.8 MHz, 3 MHz, 4 MHz and 5 MHz. On day side operations, it operates only in 4 MHz and 5 MHz due to the ionosphere plasma frequencies of Mars cutting of all frequencies lower than 3 MHz. All the four carrier frequencies are available for subsurface sounding on night side. The Mars Shallow Radar Sounder (SHARAD), a facility instrument provided by the Italian Space Agency (ASI), is embarked on board the NASA Mars Reconnaissance Orbiter spacecraft. SHARAD began science operations on October 3rd 2006: it has been collected data from surface and subsurface. This instrument penetrates to roughly half a kilometer below Mars' to search for information about underground layers of ice, rock and, perhaps, melted water. SHARAD operates with a center frequency of 20 MHz and 10 MHz bandwidth. These parameters allow vertical resolution on the order of 10-20 m. The carrier frequency of 20 MHz guarantees the capability of SHARAD to operate in day side as well as in night side. Both MARSIS and SHARAD use the principle of a Synthetic Aperture Radar (SAR) to achieve a fine along-track resolution. In particular,MARSIS is an un-focused SAR with best along-track resolution of 2 km; data coming from SHARAD can be processed with focusing algorithm (Chirp Scaling Algorithm), risi- ng a best horizontal resolution of 300 m. This paper provides a comparison between MARSIS and SHARAD images in different zones of the Mars' surface. From the preliminary analysis it has been evident that MARSIS detects signals from subsurface interfaces at 3 km of depth, while the signals received by SHARAD in the same zone and at the same depth are much weaker compared with the background noise. However,SHARAD radar-grams show subsurface interfaces at 100-200 m of depth: these interesting targets can not be discriminated by MARSIS because of its coarse vertical resolution. At the same time,SHARAD data add to MARSIS data scientific information about the upper portions of the crust of Mars. [C1592]

"Ship detection with the fuzzy c-mean clustering algorithm using fully polarimetric SAR"

A fuzzy c-mean clustering algorithm to detect ships is proposed using fully polarimetric SAR data. The algorithm is unsupervised. It does not need the statistical decision and the performance is not data specific, as often arises with CFAR methods. A distance measure, based on a complex Wishart distribution, is applied using the fuzzy c-means clustering algorithm. The algorithm makes use the statistical properties of polarimetric data, and takes advantage of a clustering algorithm. It is thus expected that the algorithm could include fully polarimetric backscattering information for ship detection. Its effectiveness is demonstrated by applying it to detect the targets in a set of AIRS AR data. [C1593]

"Semi-Analytic Mode Matching (SAMM) algorithm for efficient computation of nearfield scattering in lossy ground from borehole sources"

The 3D semi-analytic mode matching (SAMM) algorithm is used to determine nearfield scattering from underground targets in lossy soil, where the source is a dipole placed within a borehole in the ground. Scattering is described by moderately low-order superpositions of spherical modes placed at multiple user-specified coordinate scattering centers (CSCs); the mode coefficients are found numerically by least-squares fitting all boundary conditions at discrete points along the relevant interfaces while at the same time obeying radiation conditions. SAMM results are compared with a completely different method: the Half-Space Born Approximation (HSBA). Good agreement between methods serves as algorithm validation. [C1594]

"Distributed target detection in SAR images using improved chaos-based method"

Detection of distributed targets such as internal wave or ship wake on sea surface in Synthetic Aperture Radar (SAR) images is an important application of ocean microwave remote sensing. The chaotic characteristic of sea clutter gives some clues to targets detection on sea surface. Speckle, the inherent noise of SAR image, will affect the predictive accuracy of sea clutter adversely and reduce the detection performance of radar. In order to apply the chaotic characteristic of sea clutter to targets detection in SAR images more effectively, an improved chaos-based detection method is proposed in this paper. First, speckle noise is suppressed by undecimated wavelet transform (UWT), and then targets are detected on the basis of the chaotic characteristic of sea clutter from the denoised SAR images. Experimental results prove that the method proposed in this paper is effective for the distributed targets detection in SAR ocean images. [C1595]

"POLINSAR for FOPEN using flashlight mode images along circular trajectories"

The airborne radar system RAMSES collected data over the Sweden forest to investigate the capabilities of detection at P-band and influences of different SAR parameters like resolution, central frequencies, and look angle. During this campaign, circular trajectories have been performed in order to analyze the presence of anisotropic scattering from the targets at P-band. We show the treatment of two circular trajectories using the

Flashlight imaging mode and its ability to collect several SAR data with different look angles. The scope of this paper includes a general description of the operating mode of flashlight SAR images in the interferometric mode and the use of it for FOPEN purpose. The capabilities of detection of such polarimetric images have already been investigated, but without using the interferometric mode [1]. It had been shown that using circular trajectories at P-band was necessary to detect targets: first in our configuration detection was very difficult because the forest was very dense, secondly the targets were very sensitive to the orientation angle of the radar, which should not be the case at lower frequencies. Moreover, polarimetry and polarimetric interferometry are useful tools once the acquisition conditions ensure that detection is possible. Now, the full polarimetric and interferometric information are used in order to explore the potential of the POLINSAR circular mode to yield high detection rate. [C1596]

"Preliminary quantitative analysis of S-band FNCW radar data from atmospheric observation"

For more than three decades, S-band, frequency-modulated, continuous-wave (FMCW) radars have been used to study the structure and dynamics of the atmospheric boundary layer (ABL). With tremendous sensitivity and spatial resolution compared to their pulsed counterparts, these systems have been successfully applied to detection of clear-air turbulence in the lower atmosphere. In this study, data collected during field experiments by the University of Massachusetts' high-resolution S-band FMCW radar is used to illustrate and discuss system performance. S-band FMCW radar is sensitive to both Bragg scatterers (from spatial variations in radio refractive index of air) and Rayleigh scatterers (strong point-like echoes from nonatmospheric targets), and in the convective boundary layer Rayleigh echo appears to dominate the observed vertical profile of mean reflectivity. A postprocessing technique, which is based on single-lag covariance differences between the clear-air echo and Rayleigh echo, is applied to time-series of backscattered power to estimate clear-air component of the backscatter and remove the influence of Rayleigh scatter on the vertical profiles. The preliminary results of a quantitative analysis (mean and statistical distribution) of radar reflectivity are presented and compared with theoretical predictions about the convective ABL. [C1597]

"Polarimetric analysis of maritime SAR data collected with the DSTO ingara X-Band radar"

Fine resolution spotlight synthetic aperture radar (SAR) imagery collected on a circular flight path is used to investigate the variation in ship detection performance with respect to three fundamental radar parameters: the transmit/receive polarisation combination, the incidence angle and the azimuth angle. The polarisation combinations examined are HH, HV, VV, RR and cross-slant 45deg. Three different incidence angles are considered-50deg, 60deg and 70deg-corresponding to collection geometries for high altitude maritime surveillance systems. Performance is assessed using a simple target-to-background contrast measure. Results are compared with preliminary results from a four component decomposition of the Mueller matrix. While the latter and cross-slant 45deg show promise, in general HH is shown to have the best performance. [C1598]

"First results of ground moving target analysis in TerraSAR-X data"

Summary form only given. The advanced high-resolution German SAR satellite TerraSAR-X is scheduled to be launched at the end of May 2007. Due to its daylight and weather independent applicability in combination with a large spatial coverage and a short acquisition time, SAR has become a promising tool for traffic monitoring in recent years. Ground moving target indication (GMTI) techniques shall be applied to TerraSAR-X data in order to demonstrate the capability of a space borne SAR sensor to monitor traffic flows on highways. A series of GMTI experiments were to be carried out during the commissioning phase of the TerraSAR-X satellite. In first trials, cars, which are equipped with special radar reflectors and GPS receivers, were to be used as moving target references that are imaged in TerraSAR-X data takes. In a follow on experiment, arbitrary cars on motorways were to be imaged simultaneously by TerraSAR-X and by an airborne high-resolution camera. Car tracks extracted from the series of the optical images shall serve as a reference for the evaluation of the TerraSAR-X moving target data in this case. The paper presents first results of the data evaluation. An experimental GMTI processing system is used to detect and measure moving targets in both single-channel and dual-channeldata. The dual-channel data, which enable the application of well established GMTI methods like the along-track interferometry (ATI) or displaced phase centre array (DPCA) techniques, are acquired either in the so-called "aperture switching" mode with virtual multiple receiving channels or in the dual-receive antenna (DRA) mode with physically separated receiving channels. The paper reports on the analysis of the first experimental GMTI data by using different detection and measurement strategies. This includes the adapted processing of the SAR raw data with respect to the moving target signals, the incorporation of GIS data in the detection and measurement process and the application of- different detectors for across- and along-track velocity components of the moving cars. The quality of the data is thoroughly analyzed and conclusions are drawn for the development and the performance of a fully automatic GMTI processing system for TerraSAR-X. Furthermore, an outlook on the planned experiments is given. [C1599]

"Focusing problems of subsurface imaging by a low-frequency SAR"

ONERA radar RAMSES was recently upgraded with low frequency band (P-band, 435 MHz). In P-band, frequencies penetrate through the ground and through forest canopy. Unfortunately, the formation of the subsurface radar images presents a number of new specific challenges that include algorithm validity, calibration methods, radio-frequency interference, and image focusing and analysis. This paper addresses the aspects of focusing images from an airborne low frequency SAR of buried targets in a lossy and dispersive soil. The hydrological model (Richards' equation) was used to model the multilayer case. [C1600]

"Very high resolution interferogram acquisition campaign and processing"

The ONERA RAMSES system is a flexible SAR system in constant evolution, developed mainly as a test bench for new technologies and to provide specific data for TDRI (Target Detection, Recognition and Identification) algorithm evaluation. It is flown on a Transall C160 platform operated by the CEV (Centre d'Essais en Vol). This paper gives an overview of the latest upgrading to acquire large data set without on board deramp-on-receive mode and then present the acquisition campaign at X band for very high resolution single pass interferometric multi-baseline mode. The multi- baseline mode used is a ping-pong mode where four antennas are used. The goal of this campaign was to acquire interferometric data in very high resolution mode, better than 0.3 m along slant range axis with a large slant range swath of 2400 m. [C1601]

"Detection of foliage-obscured vehicle using a multiwavelength polarimetric lidar"

Foliage obscured man-made targets detection and identification is of great interest to many applications. In this paper, the backscattered laser signals from a multiwavelength polarimetric lidar were used to detect a vehicle hidden inside a vegetated area. The polarimetric reflectance data from the lidar at two separate laser wavelengths at 1064 nm and 532 nm revealed distinct target characteristics from both the vehicle and the vegetation. The results from this case study demonstrated the validity of the proposed lidar detection technique. Furthermore, the results could potentially lead to a lidar detection and identification technique for a wide variety of foliage-obscured man-made targets under various application scenarios. [C1602]

"A comparison of the methods for the urban land cover change detection by high-resolution SAR data"

The land cover change detection method using the standard deviation of the backscattering coefficient was suggested. Comparing with the previous method using spatial information such as correlation coefficients, it reduced the commission errors in the agricultural areas. It was found that the detection accuracy increased when the target area was large, but each changed target was difficult to detect for crowded and complex urban areas, even though high-spatial resolution airborne SAR data was used. [C1603]

"Wide area traffic monitoring with the PAMIR system"

This paper presents some Scan-MTI results, which were obtained with the SAR-GMTI system PAMIR developed at FGAN-FHR. The Scan-MTI mode was designed to rapidly monitor wide areas for ground moving targets. The scan operation enables detection of targets from different aspect angles with a high revisit rate. This mode is particularly adapted to perform an efficient traffic monitoring, as well. [C1604]

"On distance measurement using band-limited noise"

In many engineering fields, distance to target is fundamental and very important information, and often estimated or measured by using sound. To measure the distance to the target, time delay between reflected wave from transmitted wave is often used. However, it is difficult to measure short distance. Actually, ultrasonic range finders and ultrasonic level meters have minimum detectable range. Meanwhile, in the research field of microwave radar, a range finding method using standing wave is known for measuring short distances. It seems effective to use the standing wave of sound wave for measuring short distances. Moreover, in an actual situation of acoustic measurement, a random noise is very often utilized as well as a pure tone. Therefore, we focus our attention on audible sound and examine the distance estimation method using standing wave in audible sound. Specifically, we perform a computer simulation when audible sound, e.g., white noise, is used as a transmitted wave. [C1605]

"Modeling of local search for track updates in phased array radar tracking"

A distinctive aspect of a phased array radar is that its beam can be positioned repeatedly, if necessary, in an allocation for a track update. When the first beam of the allocation fails to detect a return, a local search process

is enforced by successively positioning the beam toward the predicted target position and its neighborhood until a successful track update is made. The local search can be characterized in terms of the events that can occur in the process and the probabilities of those events. In predicting the event probabilities, it is required to evaluate the expectation of a product of target detection probabilities of successive illuminations. In this paper, approximate but analytic and efficient expressions are presented for the expectation of a product of detection probabilities and angular measurement accuracy of detection for repeated beam-positioning. [C1606]

"A kind of trading off algorithm of object classification based on intelligent data fusion"

A kind of trading off algorithm of target classification combined with double mode intelligent fusion is presented, Applying neuron-fuzzy technique to the synthesis of the complementary information between radar and infrared, through combining neuron-fuzzy technique with D-S evidence fusion theory, the ability of target classification could be improved. At the same time, according to the effective detection range of sensors, reasonably select the target features that can ensure the accurate target classification so that the computation load of the algorithm can be largely decreased compared to the infrared single model fusion. Simulation results illustrate that the trading off algorithm is effective. [C1607]

"Automatic extraction of power transmission tower series from PolSAR imagery based on MRF model"

This paper describes a three-step algorithm for automatic extraction of power transmission tower series in full polarimetric SAR imagery. Firstly, the method uses a polarimetric whitening filter to combine the information in different polarimetric channels and reduces the speckle. Then the point-like targets are detected by an adaptive region classification CFAR detection approach, among which only a few are the potential power transmission towers. Finally, a graph linked the potential point targets is constructed and a Markov random field is defined on the constructed graph, the extraction result is obtained through an energy minimization process. The experimental result verifies the effectiveness of this algorithm. [C1608]

"The detection of multi moving targets for the airborne SAR"

In the airborne SAR system, the echo signal is modulated by the moving target's velocity and acceleration. A method based on the fractional Fourier transform and "clean " technique to detect multi moving targets is presented, and a fast auto-search algorithm is proposed. The results of simulation proved the multi targets resolution of this method. It can eliminate the influence of cross terms in time-frequency domain and identify the multi targets correctly as the detection SNR below -8 dB. [C1609]

"A SAR image registration algorithm based on target detection"

This paper presents an algorithm about SAR image registration based on target detection. This method detects the strong scatterers target firstly, secondly calculates the centroids of the targets, then these centroid points are used to generating Delaunay triangulation, after triangulation, the centroids-incenters, circumcenters of the corresponding similar triangles are used to establishing the maping function between master-image and slave-image. Finally, the test carried out with SAR images of ERS-I satellite, comparing with the methods based on cross-correlation, the experimental result confirms the effectiveness of the proposed approach. [C1610]

"Adaptive CFAR detection of range-spread targets based on SAR raw data"

Conventionally, SAR automatic target detection (ATD) are often performed in SAR image domain. A novel scheme of SAR target detection in the state of non-imaging is presented. More precisely, this paper addresses adaptive detection of SAR possibly extended targets when implemented on range-compressed but azimuth-uncompressed SAR raw data, rather than the processed SAR image. The SAR target detection is established in the context of space-time adaptive processing (STAR) and the spatial-temporal steering vector of an airborne stripmap SAR is first derived by exploiting signature diversity, namely of the fact that SAR can change the transmitted signal as the azimuth varies. The generalized adaptive subspace detector (GASD) is employed to detect range-spread target from SAR raw data. Performance analysis of the proposed scheme is carried out via Monte Carlo simulation which shows the validity of the new scheme in possible realistic scenarios. [C1611]

"Polarimetric feature fusion in GPR for landmine detection"

A polarimetric multi-feature framework for the detection of antipersonnel landmines with ground penetrating radar (GPR) is suggested. The features result from independently acquired and processed GPR measurements in co- and cross-polar configurations. The initial detection in the confidence maps is made independently after which the coordinates of the detected targets are co-located. The marginal feature distributions are normalized via

Johnson's transform prior to the fusion process and a Maximum Likelihood based linear-quadratic classifier is used as a fusion rule. The framework makes use of secondary data acquired from an open test site to train the classifier. The framework performance is illustrated on the data acquired over a specifically designed test- site. [C1612]

"Evaluation of the single and two data set STAP detection algorithms using measured data"

Traditional space time adaptive processors for radar target detection require a training data set which is usually drawn from adjacent range gates. Clutter heterogeneity, however, can severely limit the available training sample support and consequently degrade the detection performance. The SDS algorithms, on the other hand, overcome this problem by operating solely on the test data without recourse to training data. In this paper we evaluate both of these approaches, in particular the AMF and MLED, using the MCARM data set. We illustrate the performance degradation of the AMF that results from the clutter heterogeneity and the corresponding advantage of the MLED. We also show that a calibration step of the spatial steering vectors results in significant performance improvement of all of the algorithms considered here. [C1613]

"ISAR imaging of targets with moving parts using micro-doppler detection on the range profile image"

In ISAR imaging, most works have assumed the target to be a rigid body, a body without any rotating, vibrating or moving parts. The rotation of structures in a target, such as the rotor of a helicopter or the turret of a tank target, may induce frequency modulation on the returned signals and generate sidebands about the center frequency of the target's body Doppler frequency, known as the micro-Doppler phenomenon. In this paper we present a new method based on range grouping of the target's range profile for the separation of the rotating or moving parts from the target's body. The method is carried out on the Range Profile Image, different from other methods that do the separation at the signal level. [C1614]

"Region feature extraction based on improved regularization method in SAR image"

The noise existed in synthetic aperture radar (SAR) image weakens the detailed features of region of interest (ROI) such as target and shadow. It also leads to the serious performance reduction of subsequent target detection, classification and recognition. The conventional regularization method could enhance target features in SAR image; however, the high computation complexity limits the real-time application of it. An improved regularization method is introduced in this paper, which increases processing speed of region feature extraction for SAR image significantly. It is theoretically proved that, by optimizing SAR projection operator, computation complexity could be reduced from O(M3N3)to O(MN) without ability losing of the region-based feature enhancement. MSTAR SAR image data is employed for algorithm experiment. The result shows that our method can increase target-to-clutter ratio significantly while restraining the noise in ROI, and then extract target and shadow from background clutters in SAR image more accurately. [C1615]

"Application of 3D-SAR nearfield imaging algorithms to GPR data"

This contribution addresses the utilization of near field 3D-SAR imaging algorithms applied to radar data from an ultra wideband (UWB) ground penetrating radar (GPR) system. The measured data were collected at the test field of the multi sensor mine signature (MsMs) group at the European Joint Research Centre (JRC) in Ispra/IT. The layout of this test field was designed for the more difficult problem of detecting targets representing anti-personnel mines. The 3D-SAR imaging algorithms can be implemented in time-domain or frequency domain. This contribution focuses on the time-domain implementation. The influence of the quality of the 3D-SAR imaging algorithm on the performance of an automated detection process is evaluated. [C1616]

"Space-based moving target positioning using radar with a switched aperture antenna"

Ground moving target indication (GMTI) by space based radar can effectively only be performed with a multi-aperture / multi-channel system or a satellite cluster [1]. To keep weight, power consumption, data rate and costs low, the technique of switching subapertures from pulse to pulse has been proposed. While the detection performance using STAP (space-time adaptive processing) has been analysed in several publications, the estimation performance and the mechanisms leading to good or bad aperture switching strategies, have not yet been treated sufficiently. In fact, aperture partitions well suited for detection must not necessarily be good for estimation. This paper is thought as a contribution to fill the knowledge gaps concerning repositioning algorithms and performance analysis. [C1617]

"Performance results of the SHARAD instrument"

SHARAD (SHAllow RADar)is a subsurface sounding radar provided by ASI as a Facility Instrument to NASA's 2005 Mars Reconnaissance Orbiter for the characterization of the upper part of the Martian crust. The design of the instrument reflect a balance of scientific requirements versus SHARAD mission and Hardware constraints. One of the most difficult point in SHARAD design was the choice of the radar wavelength, since longer wavelengths have the potential for deeper subsurface penetration at the expense of depth resolution. Shorter wavelengths enhance the ability to generate surface images and accurate profile. A radar sounder needs a system requirements for large dynamic range and precise sidelobe control. Very low range side-lobes are mandatory to allow detection of weak sub-surface echoes in presence of the strong surface return. The approach of limiting to the minimum the amount of processing performed on-board was selected in order to allow the pulse compression process (critical from the point of view of range side-lobes) to be performed on ground, using the computed instrument Point-Target-Response (PTR) as correlation reference waveform. One of the main goal of this paper is to describe the design of the experiment design of SHARAD and the selection of the instrument parameters. An assessment of radar performance has been obtained by using both on-ground and on- flight measurements. Some preliminary results from the mars mission have been reported. [C1618]

"Polarimetric phase gradient autofocus"

In the past decade the use of fully polarimetric SAR (polSAR) systems has increased significantly due to their effectiveness in target classification and detection applications. While polSAR imagery has been extensively used to distinguish between different scattering mechanisms in a scene, there has been a lack of research in the exploitation of polarimetry to assist in image formation and in particular autofocus for fine resolution SAR. In this paper an extension of the phase gradient algorithm (PGA) for polSAR imaging is proposed and its effectiveness is tested on simulated and real data. [C1619]

"Developing High Brightness Semiconductor Lasers for Homeland Security and Defense Applications"

We present recent advances in high brightness, high power semiconductor lasers and their applications in homeland security and defense including countermeasures, bio-chemical agent detection, rangefinding, targeting, and directed energy weapons. [C1620]

"Copyright"

The following topics are dealt with: radar systems; multistatic radar; detection and tracking; synthetic aperture radar; target recognition; waveform design; ECCM; antennas; passive radar; and space-time adaptive processing. [C1621]

"A normalized Fractionally lower-order moment algorithm for Space-Time Adaptive Processing"

A new space-time adaptive processing algorithm is proposed for clutter suppression in phased array radar systems. In contrast to the commonly used normalized least mean square (NLMS) algorithm which uses the second order moments of the data for adaptation, the proposed method uses the lower order moments of the data to adapt the weight coefficients. The normalization is also performed based on the data sample dispersion rather than the variance. Processing results using simulated and measured data show that the proposed algorithm converges faster than the NLMS algorithms in Gaussian and non-Gaussian clutter environments. It also provides better clutter suppression than the NLMS algorithm under heavy-tailed, impulsive, non-Gaussian environments. It in turn improves the target detection performance. [C1622]

"Demonstration of a Novel Man-Portable Magnetic STAR Technology for Real Time Localization of Unexploded Ordnance"

We report results of field tests of the first prototype of a novel man-portable Magnetic Scalar Triangulation and Ranging (STAR) technology. The new magnetic sensor system technology is being developed with support from the Strategic Environmental Research and Development Program (SERDP) to provide an easily deployable magnetic sensor system for real-time, point-by-point Detection, Localization and Classification (DLC) of magnetic targets such as Unexploded Ordnance (UXO) and buried mines. The STAR technology is based on a multi tensor gradiometer approach that uses magnetic gradient tensor magnitudes, i.e., "gradient- contraction-type" parameters to perform DLC of magnetic targets. The magnetic STAR sensor uses the scalar functions to triangulate a magnetic UXO-type target's position vector and to calculate the target's magnetic signature vector. The vector components of an object's magnetic signature provide a basis for real time classification of its type, i.e. UXO-like or not. In order to provide proof of principle of the STAR concept and demonstrate its advantages for high mobility magnetic sensing applications, we designed, constructed and field-tested a prototype man-

portable STAR Gradiometer. The portable gradiometer's hardware and software are completely self- contained and provide a practical and user friendly capability for real time DLC of magnetic targets. Target DLC parameters: e.g., range, bearing, elevation and magnetic signature are correlated with Global Positioning System time and position data and displayed in near real time (total delay < 3 seconds) on a heads-up display that clips onto the operator's safety glasses. Interactive software controls data acquisition, performs signal processing to remove residual motion noise effects and runs the STAR Algorithm to generate and display the target's DLC parameters. Field tests have demonstrated proof-of-principle of the STAR concept and conclusively demonstrated that the technology has uniqu- e advantages for DLC by highly mobile sensing platforms. While being carried and operated by a single individual, the portable sensor has demonstrated very robust, motion noise resistant performance even while undergoing rotational motion of more than 40 degrees per second. The field test results very strongly indicate that the man-portable STAR technology can provide a wide variety of highly maneuverable sensing platforms (including Autonomous Underwater Vehicles) with uniquely effective, motion-noise-resistant magnetic sensing modalities for DLC of magnetic targets such as UXO and underwater mines. [C1623]

"Wrapper approach for feature subset selection using GA"

In this paper, wrapper based approach is presented to feature subset selection of ground penetrating radar (GPR) echo signal using genetic algorithm in conjunction with constructive learning algorithm. GPR echo signal inherently has the non- stationary characteristic and the target echo signal is deteriorated by the clutter. Firstly, WP-based preprocessing algorithm is used to clutter reduction and feature extraction. Then wrapper based approach is adopted to find optimal feature subset, and at meanwhile obtain the result of classification. Experiment result based on GPR landmine data shows the feasibility and advantage of the presented algorithm. [C1624]

"The arm detection based on Rao test method"

Firstly, aim at the different radar echo characteristic of anti-radar missile (ARM) and its aircraft, a correlative canceller is proposed to restrain the aircraft signal through estimating its Doppler frequency. Then based on the assumption of autoregressive (AR) process noise, a detection algorithm is derived to implement the ARM target detection through Rao test. Simulation experiments show that the correlative canceller can restrain aircraft signal and the ARM signal is lossless; the Rao test method is simple and realizable, however, it almost has the same performance as that of generalized likelihood ratio test (GLRT). Lastly, the boundary of error rate for choosing reference signal is obtained through simulation. [C1625]

"Airborne SAR passive radar imaging algorithm based on external illuminator"

In this paper, we propose an airborne SAR passive radar imaging algorithm which makes use of the regular circular motion by an airplane to form a synthetic aperture in the case of only one external illuminator available. Due to collected data is non-uniform and sparse in the Fourier space, the target scattering function can be reconstructed from the echo data through coordinate conversion, interpolation and two-dimensional Fourier transform. Theory analysis and computer simulation confirm the effectiveness of the algorithm. [C1626]

"Collaborative Multi-Target Detection in Radar Sensor Networks"

In many military and civilian applications, estimating the number of targets in a region of interest plays a primary role in performing important tasks such as target localization, classification, recognition, tracking, etc. Such an estimation problem is however very challenging since the number of targets is time-varying, targets' states are fluctuating, and various kinds of targets might appear in the field of interest. In this paper, we develop a framework for estimating the number of targets in a sensing area using Radar Sensor Networks (RSN): (1) the multi-target detection problem is formulated; (2) signals, interference (e.g., clutter, jamming, and interference between radars), and noise at radar sensors are modeled; and (3) a Maximum Likelihood Multi-Target Detection (ML-MTD) algorithm is proposed to combine received measurements and estimate the number of targets present in the sensing area. We evaluate multi-target detection performance using RSN in terms of the probability of miss-detection Pmd and the root mean square error (RMSE). Simulation results show that multi-target detection performance of the RSN is much better than that of single radar systems. [C1627]

"Comparison of Shape Imaging between Pulse Integration, Correlation and Adaptive Filter"

Detecting a target of interest is the primary focus of microwave imaging but once detected an additional useful property to have is some measure of the target shape. This is a comparison between a wideband Gaussian pulse with integration along the pulse length to a correlation approach and an adaptive filter for the purposes of seeing how finely a target shape is preserved. It shows improvements in shape preservation at the cost of higher

strengths of detection. [C1628]

"A Clutter Reduction Technique for Microwave Reconstruction of Shallow Underground Targets"

This paper presents a signal pre-processing technique for the stepped-frequency ground penetrating radar that is aimed at suppressing clutter related to antenna effects and variation of the ground surface response. Both the ground bounce and the clutter can obscure shallow underground objects such as landmines making difficult their detection. At the preprocessing stage, the measurement system has been calibrated using a free space and metal sheet as standards. Both the modulus and the phase of the signal obtained for metal sheet have been approximated by polynomials, and this synthetic signal is used to derive approximate transfer functions of the antenna. This technique utilizes calibration measurement for only one position of the metal sheet and yet reduces clutter related to the antenna effects. Besides, the calibration simplifies further subtraction of the ground surface response. The 2-D image of the subsurface is built then using B-scan data from which the ground bounce is eliminated. The performance of the method is demonstrated in several examples employing the frequency-domain data collected by a transmitting-receiving antenna pair. [C1629]

"Target of Imaging Observation Based on The Wavelet Transform and GPR"

A data analysis methods for frequency modulation continuous-wave ground penetrating radar targets near-fields images using wavelet transform are proposed. And discussing the instant characteristic of zero intermediate frequency detected from frequency modulation continuous-wave ground penetrating radar echo signals using wavelet transform. Based on the wavelet transform algorithm features: constant Q, fit algorithm and fit mother wavelet improved the accuracy of echo signals' time- difference detecting and the image bound of target. And obtained the better results from the computing simulation. [C1630]

"Design, Simulation and Implementation of UWB Antenna Array and it's Application in GPR Systems"

Most of the shallow buried object detection techniques by ground penetrating radar (GPR) use a monostatic type radar system. The shallow target is difficult to be detected by the conventional GPR due to its low range resolution. Recently, we have developed GPR system based on single-plate monopole antennas operating in the frequency range between 1 GHz and 20 GHz. A total of seven monopole elements have been used to form an antenna array. The antenna and the array have been designed and simulated using CST microwave studio. Their impedance and radiation characteristics have also been simulated and measured. By using the designed antenna array, the GPR system has been constructed. The developed GPR system is able to acquire, save and analyse the data measured in frequency domain. Common source or wide-angle reflection and refraction (WARR) technique has been used for acquiring and processing the data. This technique is effective for the rejection of the ground surface clutter. The system has been tested in the laboratory. It shows its ability to detect metallic objects by using A-scan technique. Furthermore, we could localize a mine-like target buried in dry soil by applying the B- scan technique. Further details of the antenna simulation results and the application of the system in buried object detection will be discussed. [C1631]

"Detection Probability of WCDMA Based Cellular Radar System"

Cellular radar is basically a kind of passive radar system. It uses the signal of a base station in a wireless communication system as an 'opportunity of illumination' to detect a target. The meaning of detection in cellular radar is slightly different from other conventional radar systems. It means, we must consider not only the detection criterion of radar system but also that of wireless system to constitute the concept of detection for cellular radar. A radar system regards that the signal is detected if the received signal voltage exceeds the threshold, while in WCDMA system the received signal is said to be detected when PN acquisition succeeds. It is obvious that the cellular radar system fails to obtain sufficient information of targets without guarantee of those two detection criterions. Therefore, we widely need to combine them and consider simultaneously. It is also important to measure how well a system can detect a target, so we define the detection probability. In this paper, we analyze necessity of two detection criterions and provide a novel definition of detection for the cellular radar. Computation of the detection probability in a certain radar environment is also involved. [C1632]

"Vehicle centroid estimation based on radar multiple detections"

Automotive radar application is a focus in active traffic safety research activities. And an accurate lateral position estimation from the leading target vehicle through radar is of great interest. This paper presents a method based on the regression tree, which estimates the rear centroid of leading target vehicle with a long range FLR (Forward Looking Radar) of limited resolution with multiple radar detections distributed on the target vehicle. Hours of radar log data together with reference value of leading vehicle's lateral offset are utilized both as

training data and test data as well. A ten-fold cross validation is applied to evaluate the performance of the generated regression trees together with fused decision forest for each percentage of the training data. As a result, compared with the current approach which calculates the mean of lateral offset, the regression tree and decision forest approach yield more accurate position estimation of the lateral offset from a single leading target vehicle with radar multiple detections. [C1633]

"Improvements of radar clutter classification in air traffic control environment"

The use of adaptive technologies may prove useful in the processing of radar signals. The proposed radar clutter classificator is aimed to improve the detection of snow clutter presence in data acquired by a ground radar system in an air traffic control environment. Each plot detected in the radar image is processed in order to extract a series of features which are then used to discriminate between targets or snow clutter. The data set used in simulations has been extracted from a measurement campaign carried out in presence of snow in Italian airports, with the help on an expert operator who manually classified a set of plots as target, or clutter. Two sets of features have been tested, one of which is derived from moments of inertia, and the second one is a specifically designed feature vector, which has been selected as to follow the reasoning scheme of a trained human observer. Three different classifiers have been tested and compared in the final stage: a Bayes classifier, a multilayer perceptron and a radial basis function network. Results indicate the best configuration exhibits a correct classification rate of about 95%. [C1634]

"Coherent-stable scatterers detection in SAR multi-interferograms: Feature fuzzy fusion in Alpine glacier geophysical context"

SAR interferometry (InSAR) performs two acquisitions (spatially separated by the baseline) of the signal back-scattered by the resolution cell which contains height and/or displacement information. Repeat pass spaceborne interferometry provides multi-interferograms which can be used to extract such information either by combining the multi-temporal results of conventional interferometry or by a different approach based on specific targets: the coherent stable scatterers (CSS). In this paper a two-step approach is proposed to obtain specific features from multi-temporal InSAR data sets. The first step consists in extracting image attributes related to the useful information. The second step consists in merging the attributes using an interactive fuzzy fusion technique. The interactive fuzzy fusion is proposed to provide end-users with a simple and easily understandable tool for tuning the detection results. The method is applied on a data set of five co-registered ERS 1/2 tandems from the French Alps (the Mont-Blanc region), including two temperate glaciers: the Argentiere and the Mer-de-glace. The results illustrate how the end-user can combine the proposed attributes to detect the presence of CSS or distributed stable scatterers usefull for multi-temporal analysis. [C1635]

"Numerical simulation of electromagnetic-wave propagation for land mine detection using GPR"

The ground penetrating radar (GPR) has demonstrated good potential for the remote imaging of surface-laid or shallow-buried landmine-like objects (typically ~ 5-30 cm) and its use is currently receiving much attention. It has turned out to be a promising alternative technology for low dielectric contrast objects, a difficult detection situation that is often encountered in practise (e.g. detection of plastic mines in dry or sandy soils environment). This paper examines numerically the imaging of buried objects using ultrawide-band (UWB) time domain radar. We develop a simplified model to characterize the system, air-ground-buried targets-antennas and simulate the electromagnetic wave propagation and scattering at a bandwidth of 0.5-2.5 Ghz. All the elements need to be modelled simultaneously in order to obtain an accurate estimation of our radar performance and surface response to the incoming radar pulses. The final goal is to improve the detection rate of plastic antipersonnel mines, reducing the false alarm level. We show some simulated results in 2D and 3D assuming plane waves and afterwards we introduce a model for our GPR antennas to characterize the real source. [C1636]

"An improved time-frequency phase adjustment technique for ISAR"

The time-frequency method is a promising phase adjustment technique for inverse synthetic aperture radar (ISAR). Usually, the time-frequency method estimates the translational Doppler frequency and thus the translational Doppler phase by detecting the peaks of the time-frequency representation at different times. Unfortunately, it has some defects, such as the sensitivity to noise and target scintillation, and the aliasing of the time-frequency representation due to undersampling. In order to remove these limitations, we develop an improved time-frequency method. It estimates the translational Doppler frequency from the envelope correlation of the instantaneous slices of the time-frequency representation. Compared with the traditional time-frequency method, this technique can estimate the translational Doppler frequency more accurately. Moreover, we develop a preprocessing method to avoid the aliasing of the time-frequency representation due to undersampling. [C1637]

"Detecting moving targets in dual-channel high resolution spaceborne SAR images with a compound detection scheme"

Traffic data acquisition from space has evolved to an important task over the last years. Future SAR satellite missions will provide high resolution dual-channel SAR data and therefore a possibility to collect traffic parameters of a large area from space. In this paper a detection approach for vehicles will be presented, which considers simultaneously the effects moving objects suffer from in the SAR image. The performance of the proposed detection scheme is analyzed using experimental airborne SAR data. [C1638]

"Bistatic foliage penetration modelling"

This paper aims at presenting a model able to study the impact of the target presence under vegetation and to assess the detection feasibility. In a first part the model is described. We will then get at the analysis of results for several set of radar configurations to illustrate the potentiality of detection by means of shadows. [C1639]

"Development of a baseband signal ATI-SAR simulator for ground moving target indication"

Along-track SAR interferometry has long been used to measure ocean surface currents with small velocities. There is a significant potential to employ this technique to detect slow ground moving targets with small radar cross-sections. In this paper, we present the development of a baseband signal simulator on ground moving target indication with along-track SAR interferometry. We summarize current state-of-the-art along-track SAR interferometry techniques and algorithm developments for ground moving target detection, and consider the case of an airborne SAR operated in the stripmap mode. And then we propose to investigate and develop advanced techniques for potential civilian and military applications in Australia. [C1640]

"A new method for moving target indication and detection in multi-channel SAR data"

A new and fast algorithm for MTI/MTD processing is presented. This algorithm is based on a formation of SAR images from each channel and using these for separation between moving and stationary targets. First, the problem is described by means of a generalized model. Then, an inverse problem is formulated and some of its approximate solutions by means of the Fourier transform are given. The approximate solutions are used to show how one can resolve stationary targets and moving ones completely regardless their distribution in space or reflectivity. The only criterion used is the velocity of a target. Further, it is shown how moving targets and stationary targets can be separated from processed, that is focused, SAR images. [C1641]

"Radiation, scattering and receiving of pulse signals for subsurface object identification"

In many papers there are approaches for solving subsurface sensing and identification of subsurface objects based on FDTD methods with original method of identification (Pockok et al., 1998, Rao et al., 2002). There are not efficient for complex objects and lengthy object (its geometrical size is larger than pulse longitude). In this paper a numerical model for calculating far field scattered by complex objects is described. An evaluation is based on analytical evaluations. The results for some testing objects are represented. [C1642]

"A time-domain beamformer for UWB through-wall imaging"

A time-domain beamformer using ultra-wideband short-pulse (UWB SP) signal for through-wall imaging (TWI) applications is proposed in this paper. The impact of the wall on the performance of through-wall radar imaging, such as wave refraction and velocity change, is considered in the design of the beamformer. Proof verifying the proposed beamformer is provided using the finite-difference time-domain (FDTD)-simulated high fidelity through-wall radar data. Simulation results demonstrate that hidden targets behind the wall can be located accurately in both range and angle by using the presented time-domain beamformer. [C1643]

"Developing high brightness semiconductor lasers for homeland security and defense applications"

We present recent advances in high brightness, high power semiconductor lasers and their applications in homeland security and defense including countermeasures, bio-chemical agent detection, rangefinding, targeting, and directed energy weapons. [C1644]

"On the Capability of a Radar Network to Support Communications"

Recent achievements in wireless technology could promote a new generation of radar networks, where the communication message for instance the reports on the detected targets, is embedded into the OFDM radar waveform. In this paper, the performance of a four-station network is assessed at the physical layer, in terms of

bit error rate (BER) and throughput rate. On the one hand, we analyse the system performance w.r.t. the antenna pattern on reception and on the other hand we study the effects of different network or antenna set-ups. We consider 2 different design cases: (i) same directional radar antenna for transmission and reception and (ii) an additional omni-directional antenna at reception to support communications. Hints for an intelligent data fusion are provided. None of the traditional radar specific issues have been addressed. [C1645]

"Extended neural network solution of radar tracking problems"

Data association is the key technique to solve the multiple-target tracking problems. A new approach to tracking algorithm for radar system based on the neural network is investigated in this paper. The proposed algorithm will solve both the data association and the target tracking problems simultaneously. With this approach, the matching between radar measurements and existing target tracks can achieve a global consideration. Moreover, one simple detection and estimation algorithm denoted adaptive procedure will be applied when tracking targets with maneuvering situations. [C1646]

"Wavelet-Based ECG and PCG Signals Compression Technique for Mobile Telemedicine"

One of the emerging issues in telehealth care system is how effectively the limited and well established mobile technologies that are now almost globally usable are exploited. The main challenge is to develop a mobile telemedicine system to transmit biosignals directly to a specialist in an emergency medical care unit for monitoring/diagnosis using an unmodified mobile telephone which provides the patient's information on the spot without unnecessary delays in seeking care, access to health facility and provision of adequate care at the facility. To provide a practical mobile telemedicine in GSM/GPRS/EDGE/UMTS limited capacity for transmitting the cardiac data for the diagnosis of cardiovascular diseases (CVD) which are widespread health problems with unpredictable and life-threatening consequences in most regions throughout the world, the implementation of biosignals compression technique is focused in this paper. Therefore, a new and simple target data rate (TDK) driven Wavelet-threshold based cardiac signals compression algorithm is presented for mobile telemedicine applications. The performance of the compression system is assessed in terms of compression efficiency, reconstructed signal quality and coding delay. This algorithm is tested using MIT-BIH ECG databases and qdheart PCG database records and the experimental results are compared with other Wavelet based ECG coders. The presented algorithm is less complex because it does not require QRS detection, amplitude and period normalization and period sorting. [C1647]

"Evaluation of Edge Detection Techniques towards Implementation of Automatic Target Recognition"

The vision of Automatic Target Recognition (ATR) is through an integrated command identification architecture that combines non-cooperative and cooperative identification sensors and systems. The ATR implemented shall support development of situational awareness i.e., overall, general knowledge of the tactical battlefield environment, including the location of friendly, neutral, and enemy forces and plan of action for battle. The required operational capability will then be achieved by combining onboard data from multiple sensors and systems with indirectly supplied off board information. Edge Detection is one of the major image-processing requirements for achieving efficient and accurate target recognition in difficult domains. The on-board sensors used on combat aircraft are Electro-optic Targeting Sensors (EOTS), Infra-red (IR) sensors, Radar, Synthetic Aperture Radar (SAR) and Inverse SAR (ISAR) providing vast amount of images with different characteristics helpful for detecting targets. This paper concentrates on the assessment of advanced edge detection techniques on all types of sensor input images obtained for the implementation of automatic target recognition for air-to-air, air-to-sea and air-to-ground applications. This paper also describes the approach towards implementation of automatic target recognition for the entire range of sensor inputs. The proposed algorithm for automatic target recognition is for implementation on airborne systems with potential use on ground stations. [C1648]

"Reconstruction of Super-resolution Spectra for the Beamformed Data in HF Skywave Radar"

For economy, the digital beamforming(DBF) is used to transform a huge array outputs into the bearing ones at several expectable directions in HF skywave radar. However, as the target signal phases on the different array elements are mixed in the beamformed data, the resolvable super-resolution spatial spetra of the coherent targets within a beamwidth can not be directly constructed by the existing algorithms any more. Therefore, in this paper, an improved method for the reconstruction of these spatial spectra is investigated to solve the underlying problem. A so-called pseudo-inverse processing is used to transform the beamformed data to the equivalent array data on the peak of the detected target range-velocity spectra. Then, combined with the Toeplitz construction and the multiple signal classification (MUSIC) algorithm, the coherent targets are resolved and the azimuth estimates are improved. Since the window weighting is usually used in the beamforming, the different

weighting effect on the pseudo-inverse processing is also discussed. [C1649]

"Adaptive censored cell-averaging CFAR detection in distributed sensor networks"

This paper present a new distributed CFAR (constant false alarm rate) detector based on the adaptive censored cell-averaging CFAR technique. In the scheme, every local decision of individual detector, resulting from the comparison between its sample in test cell and the estimate of clutter power level of its reference samples, takes the value zero or one. In local processor, the CCA-CFAR (censored cell-averaging) technique is utilized to get the local decision, Then, the fusion center makes the global decision based on the total local decisions, which are transmitted from each local sensor. The overall decision, which is zero or one, is obtained at the data fusion center grounded on "k/N" fusion rule. The results show that for the nonhomogeneous background caused by multiple interfering targets, this approach is more reality. Particularly in multiple target situations, it exhibits robustness than MOS (maximum order statistic), mOS (minimum order statistic), and OSOR (ordered statistics), ORAND in distributed sensor networks. Under Swerling 2 assumption, the analytic expression of false alarm and detection probability are derived. [C1650]

"The Scheme and Key Components Design of W-band Coherent Doppler Velocity Radar Front-end"

This paper presents a scheme of W-band coherent Doppler velocity radar front-end, which can be used to measure the velocity of target ranging from 10m/s to 2000m/s. After the comparison of the advantage and disadvantage of several schemes, the scheme using the phase-locked dielectric resonator oscillator (PLDRO) and direct digital synthesis (DDS) is chosen. The two coherent X-band signals are produced by mixer and power-divider mechanism of the PLDRO and DDS. Then, transmitting signal and receiver LO is obtained by the 8th-order multiplier from the two X-band signals. The superheterodyne receiver is adopted to increase the system signal-to-noise ratio (SNR). The finished key components have good performance, indicating that the scheme increases the sensitivity and the resolution of the radar. [C1651]

"Super-Resolution of Polarimetric SAR Images for Ship Detection"

Polarimetric SAR images are used for aerial and space imagery applications, such as target detection, tracking, and resource exploration. However, spatial resolution is limited due to the signal bandwidth and the antenna dimension. Super-resolution reconstruction is the process to reconstruct a high-resolution image from multiple low-resolution images. Polarimetric SAR provides multiple images of the same scene at the different channels (HH, VV, HV and VH). In this paper, the POCS method is applied to extract the information from LR images in different channels to generate the HR image. The multiplicative characteristics of noises in SAR images are utilized to construct the convex sets in POCS method. Ship targets are selected as detection object for super-resolution. Results from simulated and real data have validated the effectiveness of proposed method. [C1652]

"Optimal Acoustic Search Path Planning Based on Genetic Algorithm in Continuous Path System"

The design of efficient search path to maximize the Cumulative Detection Probability(CDP) is mainly dependent on experience and intuition when the searcher detect the target using SONAR in the ocean. Recently with the advance of modeling and simulation methods, it has been possible to access the optimization problem more systematically. In this paper, a method for the optimal search path calculation is developed based on the combination of the genetic algorithm with detection algorithm. We consider the continuous system for search path, space, and time, and use the movement direction of the SONAR as a gene of the genetic algorithm. The developed algorithm, OASPP(Optimal Acoustic Search Path Planning), is shown to be effective, via a simulation, in finding the optimal search path for the case where the intuitive solution exists. [C1653]

"Footprint Adjustment On SFCW-GPR With Modified Dipole Array"

Antennas footprint is an important parameter for good detection result in ground penetrating radar(GPR) survey. The various condition of soil under which a target is buried may change the footprint of an antenna. An antenna with a capacity to adapt, with different soil condition is therefore needed. This type of antenna is capable of keeping the footprint constant in different soil condition. The footprint of an antenna is related to the antennas dimension. In this paper, Modified dipole array is proposed as an adaptive antenna for GPR. With RF Switch circuit, we choose the element on the antenna that will be fed considering to footprint that will be produced. If coupling between element in the array is significant, the array for GPR application will fail to create its adaptation capability. Resistive loading is used to reduce coupling level between elements in the array. [C1654]

"Target Detection Method of the LFM Radar Signal with Multiple Polarization Agility"

This paper discusses a linear frequency modulation (LFM) radar signal with multiple polarization agility for the full polarization radar system. The LFM signal is adopted inside each transmitted pulse and the range resolution can be improved through pulse compression technique. The polarization state of the transmitted signal can be changed among several polarization states, and the target can be discriminated from the interference signal through polarization estimation and detection. The signal processing method is introduced. The research results reveal that the target can be effectively detected based on their difference in polarization domain after the target and interference are separated in the range. [C1655]

"The Region-Exhaustive Fault Model"

Device failure mechanisms of today's deep sub-micron processes are not well-modeled by single stuck-at faults, and hence several advanced fault models have been proposed in the past. Gate-exhaustive fault models were proposed to exercise a gate completely and then observe the resultant response at an observable output. This paper extends the gate-exhaustive fault model to target bigger regions (a collection of gates) with the hypothesis that exercising a region with an exhaustive pattern set can yield coverage on a larger proportion of unmodeled defects. To test out this hypothesis, we use the logic proximity bridge (LPB) fault model as a surrogate for unmodeled defects and grade the region and gate exhaustive patterns against the LPB fault model to gauge their efficacy. We show that region exhaustive patterns are better at detecting untargeted LPB faults compared to patterns obtained using gate exhaustive or traditional stuck-at fault models. [C1656]

"Identification of Hidden Mines"

This paper reviews the state of knowledge concerning the identification of buried mines and unexploded ordnance using techniques based on the singularity expansion method, supplemented by symmetry. It includes a list of important references which, in turn, give a very large list of references. This is supplemented by some more recent specific references. [C1657]

"Automotive Ultrasonic Array Emitter for Short-range Targets Detection"

We consider an application of a ultrasonic array emitter to automotive targets detection systems for short-range. Ultrasonic sensors are low cost and widely used. However detectable ranges do not meet the requirements for short-range applications, such as parking aid systems. In this paper, we propose a method which may achieve the emission to a desired area within limited time. We evaluate the expected accuracy of target position estimations by computer simulations. As a result, we show the ability of the ultrasonic sensors for parking aid systems. [C1658]

"A Geometrical Feature Based Sensor Fusion Model of GPR and IR for the Detection and Classification of Anti-Personnel Mines"

The Ground penetrating radar (GPR) and Infrared (IR) imaging have become two established sensors for detecting buried anti-personnel mines (APM) which contain no or a little metal. The paper introduces the GPR and IR techniques briefly and compares the two sensors with respect to their strengths and weaknesses for target detection and emphasizes the necessity of fusion to harness the advantages of each of the methods. We propose a geometrical feature based sensor fusion framework, combining GPR and IR, as an effective technique for detection and classification of APM, which will reduce the false alarm rate significantly. We consider the basic geometrical shape descriptor features of an object and construct a feature vector for each of the objects. These feature vectors are used to train a Probabilistic Neural Network (PNN) for the classification of APMs. The method gives almost perfect detection accuracy. [C1659]

"On the feasibility of using GPR technology for the UXO detection and discrimination in the volcanic soil of Hawaii"

In this paper we describe the recent results from an ongoing project at the University of Hawaii to use advanced GPR technology for the detection and discrimination of UXO in the high iron content volcanic soil of Hawaii. To help determine a suitable frequency range for detecting targets at two feet depth from the surface, a soil characterization effort has been implemented. Both the dielectric and magnetic properties of the earth soil are being measured using a unique shunt capacitance terminating a transmission line method and a recently fabricated TEM cell. Both the reflection and transmission S-parameters are being measured to determine both the complex permittivity and permeability of the soil. Furthermore, a TLS-Prony method together with FDTD 3D simulations of typical detection environments are being used to extract the complex natural resonance frequencies (CNR) of targets from the late arrival signals associated with the scattering mechanisms from these targets. A UXO testbed has been development to help experimentally validate simulation results and provide data

to check and improve the accuracy of the detection/discrimination algorithm. Results from this study including dielectric and magnetic characterization of the volcanic soils, and CNR of typical UXO targets encountered in Hawaii will be presented. [C1660]

"A multi-band UWB radar for sensing objects"

Development of a new multiband UWB radar for object-sensing is described. The radar transmits pulses with duration varying from 450 to 1170 ps and peak power from 200 to 400 mW and detects signals with a conversion gain of 6.5-9.5 dB over a 5.5-GHz bandwidth. It has a range resolution of around 1 inch. The radar performs well through tests of various samples, demonstrating its success for sensing objects. The multi- pulse/multi-band feature allows the radar to achieve both fine range resolution and long operating range, and enhanced target detection and classification. [C1661]

"An Experimental and Theoretical Investigation into Capabilities of a UWB Microwave Imaging Radar System to Detect Breast Cancer"

An experimental and theoretical study concerning capabilities of an ultra wideband (UWB) microwave radar to detect breast cancer is presented. A simple phantom, consisting of a cylindrical plastic container with a low dielectric constant material imitating fatty tissues and a high dielectric constant object emulating tumour, is scanned over a circular cylindrical surface with an UWB probe antenna. Following the collection of an experimental data, spatial images of the breast phantom are formed using two different approaches. One neglects and the other one compensates for the signal drop with distance. The approach compensating for the received signal drop enables a successful detection of tumour targets with a diameter as small as 5 mm just by visual inspection of the produced image. In the theoretical investigations, a finite difference time domain (FDTD) method is applied to obtain a further insight into the experimental results. [C1662]

"Vehicle tracking using stochastic fusion-based particle filter"

In this article, we propose a new observation model combination approach under particle filtering scheme, which allows robust and accurate visual tracking under typical circumstances of real-time visual tracking. This scheme stochastically selects single observation model to evaluate the likelihood of some particle. Since only one single observation likelihood is evaluated for any one particle, the time-cost can be reduced dramatically. To verify its performance, this particle Alter is used for vehicle tracking, by stochastically selecting color histogram or edge orientation histogram. The accuracy and robustness of the stochastic fusion approach are evaluated using real sequences. Furthermore, we demonstrate through these experiments that the stochastic fusion scheme performs almost as well as the deterministic fusion approach. [C1663]

"Electromagnetic scattering from complex targets located in a four-layer medium model of a densely forested environment"

In this paper, a simple four-layer configuration has been developed from the physical point of view for modeling a densely forested environment in the VHF/UHF band. In the model, the first layer, i.e. the uppermost layer, is air, where the incident and scattered fields are considered, while the canopies of the trees are modeled as a homogeneous medium in the second layer. The third layer is again air where the conducting and non-metallic objects are located. The fourth layer is a semi-infinite half space. Based on this, a MoM model has been developed for analysis of electromagnetic scattering from complex targets located in the third layer of the four-layer configuration. [C1664]

"Performance analysis on subsurface target depth detection using the E-Pulse Technique"

Numerical models of a hip prosthesis model sited within two different realistic human tissue models have demonstrated that the E-Pulse technique is capable of detecting target depth changes inside a frequency dependent lossy halfspace. The performance is highly related to the dielectric properties of the half space and the excitation frequency. The dispersive attenuation factor of the halfspace and the frequency response of the same target below two different halfspaces were also studied and it is concluded that the attenuation factor, the resonance frequency of the target and the Q factor of the resonant peaks are all closely related and directly affect the E-Pulse detection performance. [C1665]

"A high-resolution imaging algorithm without derivatives based on waveform estimation for UWB pulse radars"

UWB pulse radars are promising as high-resolution imaging techniques, which are required for target positioning systems of rescue robots moving in a dark smoke, for example. It can be also applied to a non-destructive

measurement for industrial products (e.g. antennas and vehicles), in order to detect small surface defects. These applications require a fast, robust, and high-resolution imaging algorithm. We have already proposed a robust and fast imaging algorithm with an envelope of circles. This method utilizes the principle that the target boundaries are expressed as the envelopes of circles with the radius corresponding to the time delays. Our method can realize robust imaging even in a noisy environment. However, the error of the estimated image is at least about 1/10 of the center wavelength of the pulse because the image is distorted especially around sharp edges. This is because we assume that the scattered waveform is the same as the transmitted one. In this paper, we utilize the shape estimation method together with a waveform estimation in order to enhance the resolution of the image. An imaging algorithm based on this idea has been published. However, the earlier study utilizes a parametric approach and can be applied only to a simple polygon. In this paper, we extend this idea to general convex targets including smooth curves and edges. Numerical simulations and experiments show that the proposed method accomplishes a high-resolution imaging. [C1666]

"Polarization Sensitive time reversal SAR imaging in an environment filled with trees"

In this paper, we present a time reversal SAR (TR-SAR) algorithm to improve the target images and reduce the ghost images by utilizing different polarizations in an environment filled with trees. [C1667]

"Investigations into an uwb microwave radar system for breast cancer detection"

Recent years have shown a considerable interest in using a wideband microwave radar technique for detecting and locating breast cancer. The basis for microwaves to detect and locate tumour is the difference in the electrical properties of normal and malignant breast tissue. Normal breast tissue is largely transparent to microwaves while lesions, which contain more water and blood, scatter them back towards the probing antenna. The scattered signal can be recorded by radar and analysed using a computer. This technique is considered as a viable alternative to X-ray mammography, which is currently considered as the "gold standard" for breast cancer diagnosis. The reason is that it involves the propagation of very low levels (1000 times less than a mobile phone) of microwave energy through the breast tissue and is thus is non-ionizing. Also it is of low cost and thus has potential to be used by masses. The microwave radar approach requires generating and receiving short pulses for various locations of a probe antenna or alternatively by an array antenna. As a result, it requires the use of an ultra wideband (UWB) source and receiver forming microwave radar. In this paper we look at the capability of a UWB microwave radar technique to detect breast cancer by performing a number of experiments with a simple breast phantom. In particular, we investigate the effect of compensating the received signal drop due to the distance between a target and a receiving antenna to enhance the target detection by visual inspection of a generated image. [C1668]

"Ad hoc receive sensors aimed at enhancing multistatic radar operation for surveillance of limited critical areas"

Possible advances of multistatic radar systems are considered for surveillance of limited and critical areas for homeland protection. New enabling technologies are highlighted by referring to the use of multiparametric multichannel multistatic radar receivers densely distributed over the area of interest. In such a framework, specific focus is given to evaluating target visibility as well as to the possible application of an "ad hoc" network (AHN) of smart and adaptive radar-communication antennas. [C1669]

"Design Considerations For An Atmospheric Imaging Radar"

This paper describes the design requirements, tradeoffs and simulations involved with the design specifications of an Atmospheric Imaging Radar (AIR). Design constraints are discussed including size and portability. Radar details include the range of meteorological targets detectable, maximum range, and other criteria needed for the weather radar equation. A dual pulse repetition time waveform is used to improve the maximum unambiguous velocity and range. The trade-offs in volume, sensitivity and pulse integration are described in the radar design. Calculations are made and and initial plots showing at least 15 dBZ sensitivity at 10 km are shown for a radar that will image a cone 16.5deg wide and 40 km long. [C1670]

"Radar Polarimetry for Target Discrimination"

Discrimination of targets vs. clutter is critical to many radar identification problems. For the purpose of Improvised Explosive Device (IED) detection, radar range profiles and images are valuable to capture the target of interest; it remains a big challenge to differentiate the target from the surrounding man-made clutter. The goal is to reduce the clutter. It is well-known that vector wave scattering is sensitive to both wave polarization and target orientation. This work makes use of ultra-wide-band (UWB) radar technology and polarization diversity to

characterize targets with polarimetric signatures. The results were based on both radar measurement and electromagnetic simulation. This research demonstrated the effectiveness of radar polarimetry for improved target identification. [C1671]

"UWB measurement, complex-amplitude texture, and Walled-LTSA array in plastic landmine visualization"

We describe the importance of ultra wideband (UWB) reflection measurement in the adaptive target visualization. We use a complex-valued self-organizing map (CSOM) to deal with complex-amplitude texture obtained by stepped-frequency UWB reflection measurement. We distinguish targets from clutter by paying attention to the difference in texture in space and frequency domains. In the technique, a wideband measurement is desirable to obtain precise texture. We employ a newly developed antenna, walled LTSA, with which we can construct a wideband, dense array for high-resolution imaging. [C1672]

"Detection and recognition of radar objects at sounding by high-power ultrawideband pulses"

By present, ultrawideband (UWB) radiation sources with megavolt efficient potential have been created. This is technical basis for development of UWB radars for remote object sounding. The paper gives special attention to analysis of investigation results of methods for detection and recognition of remote radar objects at sounding by high-power UWB pulses. To detect UWB signals at the noise and interference background, an approach based on the joint use of matched filtering and inter-period correlation processing is suggested. A genetic function method and parametric methods were developed for object recognition. Compression of the data bank is of importance in the latter methods. [C1673]

"Digital Implementation of Pulse Compression Technique for X-band Radar"

The performance of conventional pulsed radars is limited by its "time-bandwidth" product. In order to get high range resolution, a narrow pulse is required to be transmitted. However, this reduces the average transmit power resulting into shorter detection range. To mitigate this limitation of "time-bandwidth" problem, pulse compression technique is used. Pulse compression technique can be broadly classified as, FM chirp and phase coded. In FM chirp method, a longer duration frequency modulated pulse is transmitted, and on the receiver side matched filter is used to compress the echo signal. This also resolves the targets which may have overlapping returns. Earlier implementation of pulse compression was done using analog circuitry, which has its own limitations. With the availability of high speed digital equipment, it is now possible to implement it in digital domain. This paper presents a digital implementation of LFM pulse compression technique in X-band. Here, we used an arbitrary waveform generator to generate LFM pulse (chirp) at lower frequency band, which is up-converted to X-band by mixing with a carrier of 9.375 GHz for transmission. On receiver side, after translation to lower frequency band, data is acquired by analog to digital converter card and pulse compression algorithm was implemented in computer using MATLAB tool. Various tests were performed to verify pulse compression technique. [C1674]

"A Fuzzy Adaptive Fusion Algorithm for Radar/Infrared Based on Wavelet Analysis"

In order to improve tracking ability, a fuzzy adaptive fusion algorithm based on wavelet analysis for radar/infrared is proposed, which combines the merits of fuzzy logic and wavelet analysis. Fuzzy adaptive fusion algorithm is a powerful tool to make the actual value of the covariance of the residual consistent with its theoretical value. To overcome the defect of the dependence on the knowledge of the process and measurement noise statistics of Kalman filter, wavelet analysis is introduced, which needs no prior knowledge of the process and measurement noise. And fuzzy inference system is applied for its simplicity of the approach and its capability of processing imprecise information. The simulation experiments on the novel adaptive fusion algorithm have been performed. The computational results show that the proposed algorithm can effectively strengthen the system robustness and improve the tracking precision. It is obvious that the algorithm has significant advantages over the traditional Kalman filter algorithms in tracking application. [C1675]

"Radar Detection Through Wavelet Transform"

In this paper we intend to unite the wavelet theory with radar detection. To join both theories, we will use the connection between the wideband signal model and the wavelet transform. Once the wavelet transform is applied the echo signal received, we compare the wavelet coefficients of a scale j with a fixed threshold for a defined false alarm probability in that scale. From that comparison, the existence of target will be decided. [C1676]

"Research on Data Association in Three Passive Sensors Network"

In this paper, it is concerned with the static data association problem in the three distributed passive sensors network, in which each sensor can observe 2-dimensional angles (azimuth and elevation) of each target. A new fast data association approach is proposed in a multiple target dense environment with noise, missed detections, false alarm, and unknown number of the targets. Firstly, the data association of three sensors is transformed into the data association of two sensors about three groups, and the possible correct pairs of association are achieved by the statistic test. Secondly, the pairs of association which are detected by three sensors are got by the analysis method proposed in this paper, which is instead of m-D assignment. Lastly, the pairs of association which are detected by two sensors are got. The simulation results show that the proposed approach has higher association accuracy than the other conventional approaches. [C1677]

"Application of neural network in Infrared-Radar Dual-mode Guidance System"

In this paper a novel target tracking information differentiating system with the capability of real time tracking and accurately identifying is developed in infrared-radar dual-mode guidance system. We take advantage of neural network's well known capability of learning to perform the required classification without the assumption of probabilistic models for the input models to substitute the fuzzy rules in the information differentiating system. Since the neural network training based on expert knowledge database is conducted off-line, significant benefits of developing real time tracking capabilities are possible. Her supervising trained neural network is applied in the dual-mode guidance system, which outputs the confidence degree denoted as the weight value of target information in data fusion center according to the two input variables of measure noise and tracking error. The validity of this method is proved by simulation. [C1678]

"Closed-Loop Radar with Adaptively Matched Waveforms"

Adaptive and knowledge-based radar focus on improving the performance of the radar receiver through signal processing However, rather than develop transmission waveforms and signal-processing techniques independently, it is useful to consider a closed-loop system complete with an adaptive radar transmitter. In this paper, we summarize and demonstrate a framework being developed at the University of Arizona for implementation of closed-loop radar with adaptive waveforms. This framework integrates a Bayesian channel representation, matched illumination techniques, and sequential hypothesis testing. The result is a closed-loop system that modifies its understanding of the channel based on measured data, customizes waveforms to hasten understanding of the channel, and draws conclusions (such as target classification) when sufficient understanding of the propagation channel is achieved. [C1679]

"Cross-Channel Interference in Multi-User Radar Systems"

In this paper we evaluate the impact of the presence of interfering radar on the target direction of arrival (DOA) monopulse estimation performed by the reference radar. The importance of the use of codes in multi-user radar system is highlighted in a simple scenario of two cooperating radars. [C1680]

"Applying the Fourier-Modified Mellin Transform (FMMT) to Doppler Distorted Waveforms"

The magnitude spectrum of a time domain signal has the property of delay-invariance. Similar to the delay-invariance property of the Fourier transform, the Mellin transform has the property of scale-invariance. By combining these two transforms together one can form the Fourier-Mellin transform that yields a signal representation which is independent of both delay and scale change. Due to the undesired low-pass property of the Mellin transform (MT), the modified Mellin transform (MMT) which is also scale-invariant is applied in our approach. Therefore the Fourier-modified Mellin transform (FMMT) of the original signal and the Doppler-distorted signal will be identical. This signal representation is useful in signal detection and target recognition. Several examples dealing with different waveforms have been simulated to illustrate the applicability of this approach. The performance of the Fourier-modified Mellin transform under different levels of noise in the signal are also illustrated in this paper. [C1681]

"Target prediction in Forward Scattering Radar"

This paper describes aspects of ground target detection using a Forward Scattering Radar (FSR). The problem of extracting the Doppler signature in different interference environments is addressed. Hilbert Transform and Wavelet have been used to predict the existence of target. The paper begins with a brief description of the system, followed by a more detailed analytical study of predicting the presence of target in FSR. A practical experimentation has been realised to evaluate the proposed algorithm. [C1682]

"Footprint Adjustment On SFCW-GPR With Modified Dipole Array"

Antennas footprint is an important parameter for good detection result in ground penetrating radar (GPR) survey. The various condition of soil under which a target is buried may change the footprint of an antenna. An antenna with a capacity to adapt with different soil condition is therefore needed. This type of antenna is capable of keeping the footprint constant in different soil condition. The footprint of an antenna is related to the antennas dimension. In this paper, modified dipole array is proposed as an adaptive antenna for GPR. With RF switch circuit, we choose the element on the antenna that will be fed considering to footprint that will be produced. Resistive loading is used to reduce coupling level between elements in the array. The simulation results show that different active element produce different near field area. The size of near field area is proportional to the dimension of the element. [C1683]

"Experimental Verification of Human Being Detection Dependency on Operational UWB Frequency Band"

The study investigates the effect of bandwidth and centre frequency of UWB radars on detection and resolvability of trapped victims. The study is limited to two person-under-test (PUTs) and does not set forth to perform statistical evaluation, but instead provides rough figures on appropriate frequency band to be used for human being detection purposes. It has been shown that for all considered cases, SNR increases with operational bandwidth and centre frequency and reaches its optimal values between 2-2.9 GHz and 4.5-6 GHz, respectively. HH antenna co-polarization is the preferred one, since it generally produces equal or higher SNR values than VV antenna co-polarization. The results show that it is easier to detect a standing victim; however such scenarios are not very likely occur in real-life conditions. It has been found that if a breathing human is blocking the propagation path of the human target response of another breathing human, the human target response of the latter is heavily attenuated (around 17 dB) and thus only the closer breathing human is detected. This study could, thus, not perform the down-range resolution assessment, as intended. Nevertheless, it demonstrated clearly that there is a need for multi-static radar configuration for increased probability of detection of trapped victims. [C1684]

"Narrowband Interference Suppression in UWB Impulse Radar for Human Being Detection"

Narrowband interference (NBI) is a major source of performance degradation in human being detection applications using impulse radar and stroboscopic samplers. Implementation of notch filters results in undesired ringing of the target response. Four methods are developed and their performance analysed: two variations of the approach that extracts the NBI and subtracts its contribution and two variations of the approach that filters the NBI out and restores the missing spectrum. NBI is modelled as modified GSM signal. It is shown that latter methods perform better both in terms of NBI suppression, but also in terms of signal waveform and energy preservation. [C1685]

"A Wave Front Extraction Algorithm for High-Resolution Pulse Based Radar Systems"

The resolution of a pulse based radar system is restricted by the pulse width. Overlapping echoes in time domain of adjacent objects make a wave front evaluation of B-scans difficult. In this paper, a new algorithm for the wave front detection is proposed. Based on a reference impulse response of a large metal plate, the algorithm is able to determine the number of targets. Furthermore, two narrow adjacent spheres were detected as two different objects although the pulses of the two targets were overlapping. In the resulting radar image their shapes could be reconstructed. [C1686]

"A Double Stage IPCP Detector for UWB Radars"

Among ultra wide band (UWB) detectors have been introduced yet, single pulse detectors don't have good performance as two or multiple pulses detectors. Multiple pulses and multi-channel detectors increase calculation load and need faster processors than single or double-pulse detectors. Since they don't have equal detection performance for different number of target bright points, they are used in multi-channel architecture. In this paper, a double stage detector consisted of an Inter-Period Correlation Processing (IPCP) as first stage followed by another stage to detect targets missed in the first stage is proposed. The proposed detector improves IPCP detection performance without having multi-channel computational load. [C1687]

"Ultra-wideband radars for high-resolution imaging and target classification"

UWB technology in radar allows for a very high accuracy ranging, rigidity to multi-path propagation and external EMI. If added to high-cross range resolution capabilities, ultra-wide operational bandwidth can be also used to obtain high-resolution images of targets. As a next step, image-based classification of detected targets can be done. In this paper different approaches to high-resolution imaging with UWB radars are discussed and compared. Examples of system architecture are given. Possible image-based features of targets are discussed

and examples of image-based target classification are presented. [C1688]

"An improved CFAR detector using wavelet shrinkage in multiple target environments"

In constant false alarm rate (CFAR) detection, the noise level in the cell under test (CUT) is estimated by combining the outputs of reference cells. In nonhomogeneous environments, estimator should be immune to the presence of nonhomogeneities among the reference cells. Here, we propose a wavelet CFAR detector that can automatically censors nonhomogeneities of reference cells. This detector is a combination of a pre-processor for denoising of input signal and a conventional CA-CFAR detector. The detection performance of WT-CA-CFAR processor is compared with the CA- and CML-CFAR detectors for homogeneous and multitarget situations. The results show that the WT-CA detector acts like the CA-CFAR in a homogeneous background and performs robustly in presence of interfering targets. [C1689]

"Functional requirements of future automotive radar systems"

Automotive radar systems are starting to divide into two groups: Highly specialized stand alone low-cost sensors targeting high volume markets and high-performance multi purpose sensors used in sophisticated data fusion architectures. While the first group focuses on ultimate cost reduction, the latter provides the basis for future high-performance driver assistance functions which might be deployed in middle-to luxury-class cars. This paper addresses both sensor groups and lists OEM requirements resulting from the specifications of future driver assistance functions and from upcoming perception system architectures. The second part of this contribution addresses recent trends in automotive radar sensing technology. [C1690]

"Adaptive ML-CFAR detection for correlated chi-square targets of all fluctuation models in correlated clutter and multiple target situations"

The problem of adaptive CFAR detection of a pulse-to-pulse partially correlated target with 2 K degrees of freedom in a pulse-to-pulse partially Rayleigh correlated clutter and multiple target situations is addressed. The target and the clutter covariance matrices are modeled as first-order Markov processes. The probability of detection for the mean level (ML) detector is shown to be sensitive to the degree of correlation of the target returns and the degree of correlation of the clutter returns as well. [C1691]

"Urban target classifications using time-frequency micro-Doppler signatures"

Moving target indicators (MTI) find important applications in urban sensing. While motion detection can be achieved using simple CW radars, characterization of moving targets can be provided by estimating the key parameters of the target micro-Doppler signature. For indoor sensing, this signature has underlying instantaneous frequency features, which may depend on the radar viewing angle. This paper considers typical animate and inanimate moving objects and presents time-frequency motion classifiers using quadratic time-frequency distributions. The distinctions between the different target micro-Doppler parameter values and bounds are delineated. [C1692]

"Multi-range and multi-pulse radar detection in correlated non-Gaussian clutter"

This work presents a multi-range cell and multi-pulse approach to radar detection problem. The derived detector performs clutter estimation using the neighboring range cells, clutter cancellation, threshold setting simultaneously and it eliminates the need for a separate CFAR operation. The radar clutter is modeled as compound-Gaussian and assumed to have fully-correlated unknown texture among the range cells in the window of interest. The target signal is composed of an unknown complex return and known Doppler steering vector. Generalized likelihood ratio test (GLRT) is derived by means of estimating the clutter texture parameter and complex target return. Performance of the detector is investigated by means of numerical analysis and Monte-Carlo simulations. [C1693]

"A hybrid MOMFD-FDTD ground penetrating radar modeling technique to detect multiple buried objects"

A hybrid method is presented for modeling realistic ground penetrating radar systems to detect multiple underground conducting or dielectric targets. The model combines the method of momentpsilas solution of the frequency domain thin-wire electric field integral equation to treat the dipole antennas and the finite difference time domain technique to handle medium stratification and buried targets. The capabilities of the moment method solution of the thin-wire electric field integral equation and general finite difference time domain solution of Maxwellpsilas equations regarding the scattering of arbitrary shape objects in multilayered media are combined to efficiently simulate the electromagnetic behavior of the system. Some problems of practical interest

are simulated using the proposed method and the capabilities of this technique to detect multiple buried arbitrary shape targets are discussed. [C1694]

"A Monte Carlo simulation for two novel automatic censoring techniques of radar interfering targets in log-normal clutter"

In this paper, we present two novel algorithms for automatic censoring of radar interfering targets in log-normal clutter. The proposed algorithms consist of two steps: removing the corrupted reference cells (censoring) and the actual detection. Both steps are performed dynamically by using a suitable set of ranked cells to estimate the unknown background level and set the adaptive thresholds accordingly. The proposed detectors do not require any prior information about the clutter parameters nor do they require the number of interfering targets. The effectiveness of the proposed algorithms is assessed by computing, using Monte Carlo simulations, the probability of censoring and the probability of detection in different background environments. [C1695]

"Range Doppler detection for automotive FMCW radars"

The FMCW-radar-principle is widely used for automotive radar systems. The basic idea for FMCW-radars is to generate a linear frequency ramp as transmit signal. The difference frequency between the transmitted and received signal is determined after downconversion. In order to detect range and velocity together, the information, extracted from one frequency ramp, is not enough, because it is ambiguous. Several subsequent ramps have to be generated to remove the ambiguity between the frequency portion produced by range and the Doppler frequency. In this paper two methods are presented to perform this basic signal processing step. The two methods have the Fast Fourier Transform as basic calculation step in common, but the number of FFTs and their length are different. The requirements on bandwidth for the IF-Hardware and A/D-Converters are also determined by the algorithm for Range-Doppler-Detection. The CFAR (constant false alarm rate)-algorithm for target detection must also be adapted to the chosen method. Both methods have been verified with a 24 GHz radar prototype. The radar-frontend has been built with a newly developed SiGe-radar-chipset on inflneon's B7HF200-process with a transition frequency of 200 GHz. [C1696]

"Performance analysis of RADARSAT-2 multi-channel MODEX modes"

It has been recognized that a two-aperture approach to ground moving target indication is sub-optimum and that target parameter estimation is often compromised by clutter interference or poor signal-to-clutter ratios. This paper investigates the Ground Moving Target Indication (GMTI) performance of several virtual channel concepts proposed for the RADARSAT-2 moving object detection experiment (MODEX). These are capable of increasing the spatial diversity of RADARSAT-2 by exploiting its very flexible antenna programming capabilities and allowing the two-channel SAR system to operate like a three or four channel radar. A high fidelity space-based radar moving target indication simulator (SBRMTISIM) is used to generate virtual channel raw GMTI data for analysis. Moving targets are detected using a combination of the Factored Space-Time Adaptive Processing (Factored STAP) and the cell-averaging constant false alarm rate (CA-CFAR) detector. The detection performance of virtual multi-channel MODEX modes are analyzed and compared with those of the standard two-channel MODEX mode and a true three or four channel space-based radar system. [C1697]

"A simple robust detection of weak target in noise radars"

This paper presents a concept of the simple robustification of correlation detector in the noise radar. The simulation results show that it is possible to increase the radar sensitivity in the non-Gaussian (impulsive noise) environment by several dB using nonlinear signal processing. Suggested method introduces only moderate losses (0.5-1.5 dB) in the case where input noise is purely Gaussian. [C1698]

"Modification of resonance poles of a conducting target by a dielectric coating"

In resonance domain, the radar scattering response of any object can be modelled by natural poles of resonance with the formalism of the Singularity Expansion Method. The mapping of these poles in the complex plane, gives useful information for the discrimination of radar targets, as the general shape, the characteristic dimension and the constitution of the target. In this paper, we propose to study the effect on the resonance poles of a dielectric coating on a conducting target. For that, we present results of mapping of poles as a function of the thickness and the permittivity of the coating. [C1699]

"Adaptive algorithm for moving target detection and velocity estimation"

This paper presents new radar algorithm for detecting moving targets and measuring target velocities. The algorithm is based on calculating spectrum estimates by using the signals reflected from the adjacent range bins.

Statistical hypothesis checking is fulfilled on the difference between the adjacent spectra. The decision-making on distinction between different spectral components is used for estimating velocity of the target. Efficiency of the algorithm is investigated by using statistical modeling. The algorithm is checked by processing a real radar data containing a signal on the background of reflections from rain. [C1700]

"W-band substrate integrated waveguide radar sensor based on multi-port technology"

A 94 GHz collision avoidance radar sensor based on multi-port technology is proposed. This sensor makes use of substrate integrated waveguide (SIW) multi-port circuit fabricated on alumina substrate. The use of integrated waveguide allows for a full integration of the radar sensor front-ends. A specific base-band circuit generates in-phase and in-quadrature signals used to obtain the relative speed of target (including the moving direction) and the distance by elementary signal processing. Simulation and measurement results validate the operating principle of the proposed sensor and also indicate excellent results for relative velocity measurement together with good accuracy of distance measurement. [C1701]

"Modification of resonance poles of a conducting target by a dielectric coating"

In resonance domain, the radar scattering response of any object can be modelled by natural poles of resonance with the formalism of the singularity expansion method. The mapping of these poles in the complex plane, gives useful information for the discrimination of radar targets, as the general shape, the characteristic dimension and the constitution of the target. In this paper, we propose to study the effect on the resonance poles of a dielectric coating on a conducting target. For that, we present results of mapping of poles as a function of the thickness and the permittivity of the coating. [C1702]

"Adaptive algorithm for moving target detection and velocity estimation"

This paper presents new radar algorithm for detecting moving targets and measuring target velocities. The algorithm is based on calculating spectrum estimates by using the signals reflected from the adjacent range bins. Statistical hypothesis checking is fulfilled on the difference between the adjacent spectra. The decision-making on distinction between different spectral components is used for estimating velocity of the target. Efficiency of the algorithm is investigated by using statistical modeling. The algorithm is checked by processing a real radar data containing a signal on the background of reflections from rain. [C1703]

"A Detection Method of Radar Signal by Wavelet Transforms"

In this paper, an effective detection method of radar signal is presented based on the wavelet analysis. The purpose of this paper is to provide the review of the wavelet analysis research and to detect radar target from radar echo. The theory of wavelet analysis is presented including continuous and discrete wavelet transform. Then specific application, namely radar target detection is presented. In this paper, using wavelet transform to preprocess the radar echo, we are able to obtain multiple data series at different scales of the wavelet transform. These multiple data series can then be used as input to sensors of independent component analysis for detection of a single independent source. The proposed method is applied to radar target detection using a real signal series. It is demonstrated that the method in combination with wavelet transform is effective with feasible result. It has greater theoretical significance and actual applied value in regarded to radar signal processing and target identifying in our aerial defense weapon system. [C1704]

"Multi-range and multi-pulse radar detection in correlated non-Gaussian clutter"

This work presents a multi-range cell and multi-pulse approach to radar detection problem. The derived detector performs clutter estimation using the neighboring range cells, clutter cancellation, threshold setting simultaneously and it eliminates the need for a separate CFAR operation. The radar clutter is modeled as compound-Gaussian and assumed to have fully-correlated unknown texture among the range cells in the window of interest. The target signal is composed of an unknown complex return and known Doppler steering vector. Generalized likelihood ratio test (GLRT) is derived by means of estimating the clutter texture parameter and complex target return. Performance of the detector is investigated by means of numerical analysis and Monte-Carlo simulations. [C1705]

"Functional requirements of future automotive radar systems"

Automotive radar systems are starting to divide into two groups: Highly specialized stand alone low-cost sensors targeting high volume markets and high-performance multi purpose sensors used in sophisticated data fusion architectures. While the first group focuses on ultimate cost reduction, the latter provides the basis for future high-performance driver assistance functions which might be deployed in middle- to luxury-class cars. This

paper addresses both sensor groups and lists OEM requirements resulting from the specifications of future driver assistance functions and from upcoming perception system architectures. The second part of this contribution addresses recent trends in automotive radar sensing technology. [C1706]

"A simple robust detection of weak target in noise radars"

This paper presents a concept of the simple robustification of correlation detector in the noise radar. The simulation results show that it is possible to increase the radar sensitivity in the non-Gaussian (impulsive noise) environment by several dB using nonlinear signal processing. Suggested method introduces only moderate losses (0.5-1.5 dB) in the case where input noise is purely Gaussian. [C1707]

"ML Estimation of true Height in 2-D Radar Network"

In this paper, a method based on maximum likelihood to estimate the target true height in 2-D radar network is presented, and it is mathematically proved that the estimator is unbiased The Cramer-Rao low bound (CRLB) of estimation error is also derived Some conclusions are drawn based on simulations. It's concluded that the bearing error only has a bounded influence on CRLB, however, the influence on CRLB exerted by ranging error is unbounded It's also found that CRLB is superlinear function of target-radar distance, and CRLB affected by target altitude or baseline length acutely as target altitude or baseline length is small. [C1708]

"A distributed stand-in EW hunter-killer system"

DSTO Australia concluded a two year research program in March 2006 that demonstrated distributed, autonomous, self-organising stand-in sensor and effector systems. This paper describes research activities from this program including the development of miniaturised sensor and effector payloads, the development of novel algorithms for the fusion of data from distributed sensor payloads and the development of novel aircraft control algorithms to enable near optimal geo-location of pop-up emitters. The paper also describes field trials in which information products from these systems were injected into command support systems for integration and visualisation with other data to support situational awareness. A follow-on program has been approved and is also overviewed in this paper. [C1709]

"Distributed adaptive CCAWCA CFAR detector"

In the sense of likelihood ratio test (LRT), a new type of distributed constant false alarm rate (CFAR) scheme-CCAWCA(censored cell-averaging -R-weighted cell averaging) CFAR detector is presented Its characteristic is that censored cell-averaging (CCA) CFAR algorithms are used in local processors to form the estimation of SNR of local observations, and then the estimation transmitted to the data fusion center (DFC). Finally, the fusion center makes the final decision based on the weighted cell averaging (WCA). Since the weights are adjusted according to different SNR adaptively, the proposed detector can be available in the case that the target echo and noise/clutter have different level for every sensor. In addition, it does not need a priori knowledge about the interference in order to perform well. Furthermore, unlike the OS-CFAF the tolerance of interfering targets is restricted in appointed k value's. Under Swerling 2 assumption, the analytic expression of detection probability and false alarm probability are derived. [C1710]

"Performance analysis of RADARSAT-2 multi-channel MODEX modes"

It has been recognized that a two-aperture approach to ground moving target indication is sub-optimum and that target parameter estimation is often compromised by clutter interference or poor signal-to-clutter ratios. This paper investigates the ground moving target indication (GMTI) performance of several virtual channel concepts proposed for the RADARSAT-2 moving object detection experiment (MODEX). These are capable of increasing the spatial diversity of RADARSAT-2 by exploiting its very flexible antenna programming capabilities and allowing the two-channel SAR system to operate like a three or four channel radar. A high fidelity space-based radar moving target indication simulator (SBRMTISIM) is used to generate virtual channel raw GMTI data for analysis. Moving targets are detected using a combination of the factored space-time adaptive processing (factored STAP) and the cell-averaging constant false alarm rate (CA-CFAR) detector. The detection performance of virtual multi-channel MODEX modes are analyzed and compared with those of the standard two-channel MODEX mode and a true three or four channel space-based radar system. [C1711]

"Range Doppler detection for automotive FMCW radars"

The FMCW-Radar-Principle is widely used for automotive radar systems. The basic idea for FMCW-Radars is to generate a linear frequency ramp as transmit signal. The difference frequency between the transmitted and received signal is determined after downconversion. In order to detect range and velocity together, the

information, extracted from one frequency ramp, is not enough, because it is ambiguous. Several subsequent ramps have to be generated to remove the ambiguity between the frequency portion produced by range and the doppler frequency. In this paper two methods are presented to perform this basic signal processing step. The two methods have the Fast Fourier Transform as basic calculation step in common, but the number of FFTs and their length are different. The requirements on bandwidth for the IF-Hardware and A/D-Converters are also determined by the algorithm for Range-Doppler-Detection. The CFAR (Constant False Alarm Rate)-Algorithm for target detection must also be adapted to the chosen method. Both methods have been verified with a 24 GHz radar prototype. The Radar-Frontend has been built with a newly developed SiGe-Radar-Chipset on Infineon's B7HF200-Process with a transition frequency of 200 GHz. [C1712]

"Determination of resonance poles of radar targets in narrow frequency bands"

In resonance domain, the radar scattering response of any object can be modelled by natural poles of resonance with the formalism of the singularity expansion method. The mapping of these poles in the complex plane gives useful information for the discrimination of a radar target, as its general shape, its characteristic dimension and its constitution. However, the full frequency band corresponding to the resonance domain of a radar target is not always available, thus it is often necessary to look for a compromise. In this paper, we propose to show that it is possible to extract resonance poles one-by-one in tuning a reduced frequency band to the frequency of each wanted pole. This avoids the use of ultra wide band (UWB) data and allows to extract at least some dominant poles of resonance in available narrow frequency bands. [C1713]

"UWB FSR for air targets detection: Preliminary analysis"

This paper is dedicated to the preliminary analysis of the utilisation of an ultra wideband (UWB) signal in forward scattering radar (FSR) for air target detection. Some advantages of the wide spectrum ranging signal use are shown: ground clutter reduction, target resolution, altitude and direct target position evaluation. [C1714]

"Detection Probability of WCDMA Based Cellular Radar System"

Cellular radar is a kind of passive radar system. It uses the signal of a base station in a wireless communication system as an 'opportunity of illumination' to detect a target. We must consider not only the detection criterion of radar system but also that of wireless system to constitute the concept of detection for cellular radar. It is obvious that the cellular radar system fails to obtain sufficient information of targets without guarantee of those two detection criterions. Therefore, we widely need to combine them and consider simultaneously. It is also important to measure how well a system can detect a target, so we define the detection probability. In this paper, we analyze necessity of two detection criterions, provide a novel definition of detection for the cellular radar and compute the detection probability. [C1715]

"Four-dimensional discretization for detection of moving objects in Wide Band SAR"

This paper addresses four-dimensional ground moving target indication (GMTI) using a multi-channel wide band (WB) synthetic aperture radar (SAR) system. With no acceleration attached to the target the motion of the target is related to two ground and two speed coordinates. However, four other dimensions are used in WB SAR GMTI processing during the detection phase: azimuth, range, bearing, and the relative speed between the object and the SAR platform. In the detection phase, blind hypotheses are used, and the discretization steps between the hypotheses are a trade-off between the number of hypotheses tested and detectability. As the integration angle increases, the step size in the image dimensions and in the relative speed has to be reduced. In this paper we determine the discretization step in all four dimensions for moving target detection, and relate it to radar system parameters. The discretization is derived from the moving target impulse response, assuming independency between the dimensions. In the paper the number of hypotheses per square meter is given for an airborne low frequency and a microwave GMTI WB SAR system. [C1716]

"Multiple-Hypothesis Trilateration and Tracking with Distributed Radars"

A novel algorithm to associate and trilaterate detections from multiple distributed radars is presented. The algorithm provides for flexible track state representations. The coordinate system of a track is switched from the measurement coordinates (range-Doppler) to cartesian coordinates when a detection from another sensor is associated to the track. In the case of multiple targets and false alarms we run into the complication of multiple association possibilities. These can be resolved by using a multi-hypothesis algorithm. In general, correctly formed tracks will have more likely associations. Therefore, hypotheses describing these tracks will be favored. Simulations with one or two targets and different false alarm rates show the need to preserve multiple hypotheses of the world state. Tracking performance for various false alarms rates is evaluated [C1717]

"The GPR Response of a Subsurface Objects and its Use for Target Detection"

The present work reports the results of laboratory measurements of the real part of dielectric permittivity epsiv' and dielectric loss tangent tg(delta) of sandy and clayey soils as a function of soil moisture (X) uniformly distributed throughout the volume and of electromagnetic field frequency. Also, the theoretical research of the dependence the reflected signal shape on the humidity profile was realized [C1718]

"Estimation of the Target Detection Radar Noise Stability at the Ultrawideband Jamming Influence"

The field structure formation of an ultra wideband signal on the input of the target detection radar receiver device with working frequency 1 GHz is considered. The algorithms of the fields temporary structure definition based on the equations Kirghoff-Kothler with the subsequent estimation of the ultra-short impulse accidental jamming power characteristics necessary for specification of accepted signals processing algorithms are offered [C1719]

"Adaptive Target Tracking in Slowly Changing Clutter"

False track discrimination performance of a target tracking algorithm in a heavy clutter environment depends on the track confirmation and the track termination thresholds. The optimum value of these thresholds depends on the environment, in particular on the given probability of detection and on the existing clutter density. When tracking ground targets the probability of target detection is nominally constant, whereas the clutter measurement density varies significantly. Previously it was shown that, for a wide range of target signal to noise (+clutter) ratio in a uniform clutter density environment, and given the opportunity to set signal detection thresholds, the optimum value of clutter measurement density is almost constant (and the probability of detection will vary). We propose a scheme where the feedback from the target tracking system corrects the detection thresholds for each sensor resolution cell to obtain the constant and optimal clutter measurement density in each cell, when the clutter statistics changes slowly. This results in better false track discrimination capabilities of the tracker and also replaces the CFAR block in the signal processing unit [C1720]

"Detecting Small Slow-moving Sonar Targets Using Bottom Reverberation Coherence"

The detection of small targets that appear suddenly or are moving slowly in strong bottom reverberation is a challenging problem for sonar surveillance in shallow water. Based on a new reverberation model, this paper proposes a target detection scheme that provides target sub-clutter visibility in the presence of reverberation. Experimental evidence shows that the bottom reverberation as seen by a stationary sonar is coherent, or at least partially coherent from ping to ping. Therefore, the bottom reverberation from a particular range cell is modeled as a complex signal composed of a stationary or slowly varying coherent component, plus a rapidly varying diffuse component. The coherent component is easily estimated using a recursive mean estimator and then removed by a simple subtraction so that the target need only compete with the diffuse component. Experimental results show a detection gain, as measured by the coherent-to-diffuse ratio, as high as 30dB [C1721]

"Study on Algorithms of Sensor mode Management"

Bused on hypothesis testing, methods of sensor management used in target detection and localization are studied. The detector used in this problem can operate in "focused mode" and "broad search mode". The former offers higher detection and localization accuracy but less coverage area than the latter. It is supposed that a signal source is to be detected and localized with a sequence of tests, each may use different mode. The goal of sensor management is to build an object function for selecting proper mode in the sequence of tests in order to improve the detection performance. In this contribution, A method of maximum a posteriori probability is presented! methods of maximum correct detecting probability and minimum cost function based on Bayesian Reasoning are discussed. The performance of the three methods are analyzed and compared. The method of maximum correct detecting probability is modified through the simulating process. [C1722]

"UWB Radars for Chalenging Applications"

A number of challenging radar applications (such as antipersonnel mine detection and human being detection) has been discussed. In these applications UWB technology has a number of advantages of over the traditional narrow-band approach, in particular very high positioning accuracy, rigidity to multi-path propagation and target classification abilities. On a number of examples recent advances of UWB technology in radar have been demonstrated and remaining challenges have been discussed [C1723]

"Integrated Marine Mammal Monitoring and Protection System (IMAPS): Gray Whale Target Strength Measurements and the Analysis of the Back-Scattered Response"

The central IMAPS objective is to establish a global solution for systematic assessment and protection of the marine environment for the Navy, offshore industry, and scientific research community, through the development and implementation of a comprehensive, modular tool. The limitations of current technologies are that they are individually inadequate to fully achieve mitigation objectives. Visual monitoring, passive location, high frequency active sonar, and radar all have their inherent limitations such as weather conditions, a necessity for vocalizations, maximum detection range, and sea state limitations. Therefore, there is a need for all the sources of information related to the detection and classification of marine mammals to be fused and to operate in real-time in order to provide a robust protection, assessment, and research system. The other IMPAS direction is concentrated on the design and development of the active sonar modality representing just one component of the global system. The active sonar was designed, built and tested during the Marine Mammal Active Sonar Test (MAST 04), producing whale detections and whale tracks. The experiment was conducted in January 2004 off the coast of California. One of the objectives is to distinguish whale backscattered responses from the ones generated by the environmental clutter in a waveguide. Furthermore, it aims to identify and analyze the target signature features that are necessary for enhanced active sonar detection and classification of marine mammals. Over the years there have been very few documented attempts to capture and analyze the backscattering response of whales using an active sonar system. Nevertheless, whales, mostly owing to their size, their motion, and the aspect dependence of their backscattered field, possess desirable properties that help distinguishing their scattered response from clutter and other environment related false alarms. As an initial step, data collected during the MAST04-- experiment is presented, and gray whale target strength measurements are obtained. Results are compared to the previously published whale target strengths. Additionally, an investigation is conducted in an effort to provide whale feature identification points suitable for automated detection and classification, as means of relating gray whale active acoustic signatures to their inherent characteristics and their motion. During the MAST04 experiment, the active sonar component feasibility has been demonstrated, while the second generation system is being developed for the MAST 07 experiment. Tracking and classification algorithms are being further developed and they will be implemented and tested during the upcoming MAST 07 experiment. MAST 07 will feature a lighter, autonomous, fuel cell powered active sonar system, implementing real time marine mammal detection, tracking and classification algorithms [C1724]

"2D Imaging Algorithm for the Evaluation of UWB B-Scans"

This paper proposes an ultra-wideband imaging radar system using B-scans for the target identification. The two dimensional inverse boundary scattering transform was successfully applied for through-wall imaging applications. Using this algorithm it is not only possible to detect the target but also to reconstruct the surface curvature of a cylinder behind a wall. Moreover, it is shown that only 24 different positions of the antennas are sufficient to estimate the target shape which results in a low computation time [C1725]

"Enhancement and implementation of a localization and communication system dedicated to guided transports"

Nowadays, in maritime and airway domains, many intelligent systems are used for the localization and to exchange data information. However, in guided transports domain, no system is able to ensure these two functionalities. This paper presents a new system called CODIBT (communication, detection and identification of broken-down trains) allowing multi-user access and combining the two main functionalities: localization and high data flow rate communication. Such systems are developed in order to improve exploitation inside guided transport networks. Our laboratories designed an original radar system that allows inter-vehicle communication. This system is based on the principle of a co-operative radar using a transponder inside targets. It is made of a couple of transmitter/receiver which equips respectively the front and the rear of two successive vehicles. It uses a numerical correlation receiver and has a broad band of about 100 MHz which could be exploited to establish high data flow rate communications. The aim of this paper is to describe the mock-up realized and present some improvements of the coding methods developed using spreading spectrum techniques. Some simulations aimed to evaluate system performance in terms of BER together with main experimental results will be reported [C1726]

"Receiving Signal Processing of MIMO Radar Based On Transmitting Diversity"

Multiple input multiple output (MIMO) radar is a new emerging radar technique developed recently. The principle of MIMO radar based on transmitting diversity is described and the method of receiving signal processing also is presented. Simulation results show that the proposed receiving signal processing method can simultaneously form multiple receive beams and surveillance multiple targets. It also can improve Doppler resolution [C1727]

"Pulse-Doppler UWB Radar"

The paper contains measurement results of moving targets by pulse-Doppler UWB radar. The description of a radar, principle of operation and technical specification are presented. Conditions and results of measurements are described. Feature of the presented measurements: Doppler signals of linear moving targets whose linear sizes exceed resolution of radar [C1728]

"KUPS: Knowledge-based Ubiquitous and Persistent Sensor networks for Threat Assessment"

In this paper, we propose a knowledge-based ubiquitous and persistent sensor networks (KUPS) for threat assessment, of which "sensor" is a broad characterization concept. It means diverse data or information from ubiquitous and persistent sensor sources such as organic sensors and human intelligence sensors. Our KUPS for threat assessment consists of two major steps: threat detection using fuzzy logic systems and threat parameter estimation using radar sensor networks. Our fuzzy logic systems can combine the linguistic knowledge from different intelligent sensors. We propose a maximum-likelihood (ML) estimation algorithm for target RCS parameter estimation, and we show that our ML estimator is unbiased and the variance of parameter estimation matches the Cramer-Rao lower bound. Simulations further validate these theoretical results [C1729]

"The Research of Collision Avoiding System Based on Millimeter Wave and Image Processing Technique"

A novel approach for vehicles collision-avoiding is described. This approach combines the techniques of millimeter wave with image processing. The relative speed and position information of the object is detected by utilizing millimeter wave radar and the width information of it is obtained by a CCD camera, which fixed in the vehicle. The object's width is detected by difference method with the image background rebuilt. In order to satisfy the request of the real time of the collision-avoiding system, this paper proposes a present position estimation algorithm of the motional objects so as to make up the lag of hardware processing. The simulation result shows that the collision-avoiding system based on millimeter wave and image processing makes up the deficiency of either detects by millimeter wave or image processing, it can realize the vehicle's real time and online avoiding collision and reduce the possibility of false alarm [C1730]

"Structural Similarity-Based Object Tracking in Video Sequences"

This paper addresses the problem of object tracking in video sequences. The use of a structural similarity measure for tracking is proposed. The measure reflects the distance between two images by comparing their structural and spatial characteristics and has shown to be robust to illumination and contrast changes. As a result it guarantees robustness of the tracking process under changes in the environment. The previously used Bhattacharyya distance is not robust to such changes. Additionally, when a tracker is run with the Bhattacharyya distance, histograms should be calculated in order to find the likelihood function of the measurements. With the new function there is no need to calculate histograms. A particle filter (PF) is implemented where this measure is used for computing the distance between the reference and current frame. The algorithm performance has been tested and evaluated over real-world video sequences, and has been shown to outperform methods based on colour and edge histograms [C1731]

"Parameter Optimization for Bistatic PCL Radar"

In this paper the accuracy of measurement with respect to some parameters like baseline variance and DOA estimation and bistatic RCS is considered. The radar designer can find the appropriate parameters to having the minimum error in target localization and maximum coverage range [C1732]

"Fast and High Resolution Statistical Based Algorithm for PCL Radar Detection in Noisy Environment"

This paper presents a new statistical based clean algorithm for multiple target detection in noisy environments. For this purpose the variance and average of the ambiguity function as the output of matched filter will be computed. This information used for separating the real targets from the false ones, in noisy environment and heavy clutter up to -13 dB [C1733]

"Road Recognition in High Resolution SAR Image Based on Genetic Algorithm"

Road recognition from SAR image is a very important problem. In this paper, a new method is proposed which can detect multiple roads in an image. Firstly binary edge image is gained by Canny operator and edge refining. Secondly, edge curves are encoded by reversible chained list, and fitness function is constructed based on SAR image road models, and optimal road boundary curves are linked by improved genetic algorithm. Thirdly, complete road boundaries are detected by curve fitting. At last, mated long road edge curves are found out and

road surface are stuffed. The experiment shows that this algorithm can realize roads recognition and eliminate influence of other non-road. [C1734]

"Track Score and Target Existence"

Automatic target tracking in clutter initiates and updates both true tracks and false tracks. True tracks follow targets, and false tracks do not. False track discrimination is the procedure which confirms (vast majority of) true tracks, and terminates (vast majority of) false tracks. False track discrimination requires a measure of track quality to distinguish between true tracks and false tracks in a statistical sense. This paper compares two powerful track quality measures; the track score, as used in multi hypothesis tracking (MHT) and the probability of target existence, as used in integrated track splitting (ITS) filter. Both theoretical and simulation comparisons are presented in a single target tracking situation [C1735]

"Combined Unscented Kalman and Particle Filtering for Tracking Closely Spaced Objects"

Tracking closely spaced objects with resolution limited sensors is a difficult problem. One way to address this issue is to track these targets individually, and employ relatively complex data association approaches as a means of pairing detections and tracks. The algorithm outlined in this paper takes a different approach, and instead estimates the group velocity using an unscented Kalman filter (UKF). The UKF state estimate is then employed within a particle filter, which estimates the distribution of objects within the group. It is shown that this approach can be very effective, especially for groups of irregularly spaced objects [C1736]

"Data Association for Infrared Search and Track System"

Data association is one of the key techniques on bearing-only tracking with infrared search and track (IRST) system. A new data association algorithm based on information fusion is proposed in this paper. Firstly, by considering the special feature of IRST system, the new method constructs several kinds of evidences that are based on the multi-type information, such as angular measurement, intensity level and so on. And then all results from different aspects are fused by utilizing Dempster combination rule. Finally, the association decision is obtained by maximizing the final mass function. The simulation results show that the proposed approach has better performance than the traditional ones. As observation conditions deteriorate, the advantage of new method becomes obvious. For uncertain data, this new data association algorithm based on evidence theory is excellent by utilizing reasonably the measurements [C1737]

"A Track Before Detect Approach for Extended Objects"

This paper deals with target tracking for extended objects in a track before detect context. In the scope of this paper a target is called extended if its physical size is large enough to occupy multiple (radar) resolution cells, e.g. in range and/or azimuth. We show how the existing track before detect approach can be amended in order to deal with extended targets. The algorithm, that we propose, will jointly estimate on-line both the standard kinematic parameters of the target, i.e. position and velocity, as well as the size or extent of the target. The estimation is performed by means of a particle filter. It is shown that the extended target approach is significantly superior in terms of performance to a point target approach in case the target is extended [C1738]

"Bias Estimation of Multiple Radars by Quasi-Recursive Filtering"

This paper presents a method for estimating bias in radar measurements used in tracking aerospace targets. The bias-free and less noisy radar measurement is critical as it would provide correct information of target kinematics which is a necessity of the guidance law to generate the tracking commands. In a typical interception scenario, multiple radars are employed to detect and track target kinematics. Bias estimation is often difficult because of limited observability of sensor biases as there may not be a unique set of biases that explains the relative errors between measurements. The sensors involved may be dissimilar, and their corresponding bias parameters may differ in magnitude and type. The various sources of biases are sensor bias, alignment error (tilt error), and radar position uncertainty. Radar measurements are to be debiased and noise filtered effectively before they can be used singly or in conjunction with any onboard sensor for generating tracking commands. The formulation of bias estimator described here is designed for tracking systems, such as aircrafts, ships, with multiple sensors as radars, jam strobe detectors, GPS, ESM and wider variety of targets and sensors. The paper concisely states the algorithm which addresses the above mentioned problems and illustrates its performance capabilities through results obtained by applying it to a realistic ballistic target tracking scenario [C1739]

"Covert Netted Wireless Noise Radar Sensor: OFDMA-Based Communication Architecture"

We address the need for covert situational awareness by the effective use of random waveforms in ad-hoc

networks, wireless communication, and radar sensors. UWB random noise radar is well-known for its LPD and LPI properties. Notch filtering is used to fragment this radar's band-limited random noise transmit signal and the intermediate bandwidth so obtained is used for establishing a covert wireless multi-user communication platform between the radars. This being the primary goal of this paper, we prove that the radar's detection and ranging function can occur simultaneously with data communication. Our results also show that embedding OFDM symbols into the intermediate bandwidth not only preserves the random nature of the transmitted signal but also lets the receiver retrieve the embedded data from the noise-data radar received signal. Next, the CDF of the camouflaged noise-data signal can be made to look very similar to the CDF of a Gaussian random noise signal, by proper adjustments to the number of carriers used in the OFDM symbol. This CDF can be used as a metric to measure the covertness of this system. Further, the effect of this tradeoff on the BER of the system can be brought into allowable limits with the use of OFDM-based data redundancy technique. Now, using this deterministic ally fragmented noise spectrum as the communication channel and OFDMA/FDD as a multiplexing technique, a number of such noise radars can be configured to form an ad-hoc multi-radar wireless network. An algorithm in this regard is also presented. Thus, as seen by any hostile target, the transmitted noise-data waveform appears random and noise-like. However, for the radar sensors in the network, this noise-like signal contains camouflaged information [C1740]

"The GM-PHD Filter Multiple Target Tracker"

The Gaussian mixture probability hypothesis density filter (GM-PHD Filter) was proposed recently for jointly estimating the time-varying number of targets and their states from a noisy sequence of sets of measurements which may have missed detections and false alarms. The initial implementation of the GM-PHD filter provided estimates for the set of target states at each point in time but did not ensure continuity of the individual target tracks. It is shown here that the trajectories of the targets can be determined directly from the evolution of the Gaussian mixture and that single Gaussians within this mixture accurately track the correct targets. Furthermore, the technique is demonstrated to be successful in estimating the correct number of targets and their trajectories in high clutter density and shows better performance than the MHT filter [C1741]

"Tracking Through Jamming Using Negative Information"

Advances in characterizing the angle measurement covariance for phased array monopulse radar systems that use adaptive beamforming to null out a jammer source allow for the use of improved sensor models in tracking algorithms. Using a detection probability likelihood function consisting of a Gaussian sum that incorporates negative contact measurement information, four tracking systems are compared when used to track a maneuvering target passing into and through standoff jammer interference. Each tracker differs in how closely it replicates sensor performance in terms of accuracy of measurement covariance and the use of negative information. Only the tracker that uses both the negative contact information and corrected angle measurement covariance is able to consistently reacquire the target when it exits the jammer interference [C1742]

"Automatic SAR Image Registration by Using Element Triangle Invariants"

Due to the presence of speckle in synthetic aperture radar (SAR) image, the existing registration algorithms, which are successfully used in optical remote sensing image, are usually not applicable to it directly. An automatic SAR image registration algorithm is proposed in this paper. Firstly, the element triangles are constructed from the point targets detected from the SAR images; then they are matched by integrating triangle moment invariance proposed in this paper and region invariant moments; finally, the LMSE algorithm is used to estimate the affine transformation parameters, thus the SAR images can be registered automatically. The proposed algorithm is evaluated and compared with the existing methods by means of invariant moments (IM) and affine moment invariants (AMI). It is shown from Monte-Carlo simulations that the proposed algorithm is robust to detection error and partial correspondence of control points (CPs), and has higher ratio of correct matching than the methods using IM or AMI. Experimental results show that the proposed new algorithm is not only valid in the automatic registration of SAR images, but also can avoid the influence caused by speckle in feature detection and feature matching process [C1743]

"Interpretation of high-resolution optical imagery with evidential fusion of spectral information and object attributes"

Since the past five years Lockheed Martin Canada is developing an advanced image interpretation system integrating classification tools and target detection operators for multispectral, hyperspectral and polarimetric SAR imagery. Improved classification maps and superior object detection and identification performances have been obtained with a pixel-driven evidential fusion of textural measurements and end-member respectively extracted from polSAR and HIS imagery. As in many applications objects to be extracted occupy several pixels in the

image, the objective of current developments is to supplement the pixel-based fusion already performed with radiometric, textural, spectral features by adding specific object topological attributes (shape, size) and contextual description (spatial relationships). This paper presents a description of the new primitives and the results obtained on Ikonos imagery [C1744]

"Orthogonal Waveform Design and Performance Analysis in Radar Sensor Networks"

In radar sensor networks (RSN), radar members are likely to interfere with each other if their waveforms are not properly designed. In this paper, we propose an orthogonal waveform model for RSN, which eliminates interference when no doppler shift is introduced. Additionally, we design both coherent and noncoherent RSN detection systems applying equal gain combination technique performed by clusterhead to take the advantage of spatial diversity. The latter scenario is more challenging as doppler-shift uncertainty results in more complicated implementation. Also, we analyzed the performance of both systems under the environment of doppler shift and interference. Monte Carlo simulation illustrates that our technique provides much better detection performance than that of single radar for fluctuating targets, in terms of probability of false alarm and miss detection. Conclusions are drawn based on our analysis and further related research areas are discussed. [C1745]

"Multisensor Vehicle Tracking with the Probability Hypothesis Density Filter"

In this contribution we apply the probability hypothesis density (PHD) filter algorithm for joint tracking of an unknown varying number of targets to automotive environment sensing systems. We use data from a vision and a lidar sensor as well as the vehicle ESP system. After deriving a method to parametrise the algorithm systematically from detection performance statistics we proof the applicability of the method for automotive tracking based on real sensor data [C1746]

"SeeCoast: Automated Port Scene Understanding Facilitated by Normalcy Learning"

SeeCoast is a prototype US Coast Guard (USCG) port surveillance system that provides automated scene understanding support for watchstanders. A major SeeCoast objective is to reduce operator workload while maintaining optimal domain awareness by shifting operators' focus from having to detect events to being able to analyze and act upon the knowledge derived from automatically detected anomalous activities. Analyst-defined vessel activities are recognized from pre-scripted patterns and anomalous vessel activities are detected using machine learning techniques. The baseline SeeCoast system interfaces to the USCG Hawkeye prototype and uses (a) machine vision technology to produce target tracks from streaming video data; (b) multi-INT fusion technology to correlate radar, automatic identification system (AIS), and/or video track data into a single coherent track picture; (c) vessel activity analysis and learning technology to provide alerts for events of interest according to user-defined criteria; and (d) visualization of those alerts embedded within the common operating picture. The video processing component tasks and controls Hawkeye cameras to detect vessels in motion and generates vessel track and classification (based on vessel length) information. SeeCoast detects unsafe, illegal, and threatening vessel activities using a rule-based pattern recognizer and detects anomalous vessel activities on the basis of automatically learned behavior normalcy models. Operators can optionally guide the learning system in the form of examples and counter-examples of activities of interest, and refine the performance of the learning system by confirming alerts or indicating examples of false alarms. This paper focuses on the learning-based activity analysis capabilities of SeeCoast [C1747]

"Benchmark Evaluation of Multistatic Trackers"

This paper provides an overview of the special session on multistatic sonar and radar tracking at FUSION 2006. This includes background on the multistatic tracking working group, a brief description of the datasets and trackers that compose this working group at present, and a detailed discussion of a proposed set of tracker performance metrics. We identify a number of issues associated with performance assessment for target tracking. We conclude with recommendations for continued performance assessment of multistatic trackers [C1748]

"Contact-Level Multistatic Sonar Data Simulator for Tracker Performance Assessment"

This paper provides an overview of a multistatic sonar contact-data simulation approach and a dataset generated specifically for tracker algorithm evaluation by the multistatic tracking working group (MSTWG). A brief description of the simulation approach is given, which includes simple sonar equation modeling, resulting in sensor-to-sensor target fading effects, as well as contact localization modeling. We describe the methodology by which a single data set generated using this approach is suitable to evaluate multistatic tracker performance over a range of multi-sensor detection redundancy levels [C1749]

"Random Set Tracker Experiment on a Road Constrained Network with Resource Management"

This paper describes the application of finite set statistics (FISST) to real-time multiple target road constrained tracking problems. We studied specific test problems where multiple modality wireless sensor networks monitored road networks of interest. Acoustic and radar detections updated a global density that tracked the number and positions of targets. The global density determines "information states" that form the basis of a closed-loop Markov decision process resource management procedure that controls sensor operation [C1750]

"Spatial-Temporal-Frequency Diversity in Radar Sensor Networks"

In this paper, the spatial-temporal-frequency diversity to improve the detection performance of Radar Sensor Networks (RSN) in the presence of certain types of interference (clutter, jamming, noise and interference between radar sensors) is studied. In order to reduce the interference between radar sensors and maximize the signal-to-interference-plus-noise ratio (SINR), we propose a method using the orthogonality criterion to design waveforms for radar sensors in the network. Besides the interference between radar sensors, performance of the network depends largely on other interference, especially clutter, which is extended in both angle and range, and is spread in Doppler frequency. By using the spatial-temporal diversity, we can suppress effects of these interference. In this paper, we also propose a receiver for diversity combining in RSN. As an application example, we apply the spatial-temporal-frequency diversity scheme to improve the detection performance or reduce the missdetection probability at a low false alarm probability. Simulation results for both non-fluctuating targets and fluctuating targets show that the performance of our proposed scheme is superior to that of the single radar with the spatial-temporal diversity only. [C1751]

"Decision Tree Based FPGA-Architecture for Texture Sea State Classification"

The target detection process in sea clutter background involves the use of different types of CFAR (constant false alarm rate) algorithms. These algorithms and their parameters should be configured to obtain the maximum detection probability and minimum false alarm probability at the current sea state (Beaufort scale). This paper present an FPGA-architecture for automatic classification based on texture recognition of sea states. The sea state texture classification allows select the appropriate CFAR algorithm and its parameters for the target detection process. The paper is centered in the hardware implementation for sea state texture classification, based on decision tree. The rules for decision tree are obtained from the analysis of the grey levels co-occurrence matrix features applied in an image of the sea state obtained in a radar scan. Results with simulated and real data are presented and discussed [C1752]

"Data Level Fusion of Multilook Inverse Synthetic Aperture Radar (ISAR) Images"

Although techniques for resolution enhancement in single-aspect radar imaging have made rapid progress in recent years, it does not necessarily imply that such enhanced images will improve target identification or recognition. However, when multiple looks of the same target from different aspects are obtained, the available knowledge base increases allowing more useful target information to be extracted. Physics based image fusion techniques can be developed by processing the raw data collected from multiple ISAR sensors, even if these individual images are at different resolutions. We derive an appropriate data fusion rule in order to generate a composite image containing increased target shape characteristics for improved target recognition. The rule maps multiple data sets collected by multiple radars with different system parameters on to the same spatial-frequency space. The composite image can be reconstructed using the inverse 2-D Fourier transform over the separated multiple integration areas. An algorithm called the matrix Fourier transform is created to realize such a complicated integral. This algorithm can be regarded as an exact interpolation, such that there is no information loss caused by data fusion. The rotation centers need to be carefully selected in order to properly register the multiple images before performing the fusion. A comparison of the IAR (Image Attribute Rating) curve between the fused image and the spatial-averaged images quantifies the improvement in the detected target features. The technique shows considerable improvement over a simple spatial averaging algorithm and thereby enhances target recognition. [C1753]

"Pure Target Detection Based on Eigenvector Decomposition Using H-α Method in Radar Polarimetry"

In this paper a new decomposition scheme (H-α method) for analysis of pure targets echo around distributed targets (random targets) is presented. Pure targets have deterministic scattering matrix. In random targets scattering matrix, noise components is existed that must be omitted with applying ensemble averaging method. For this objective, eigenvector analysis technique in the H-α method is used for calculating eigenvector as well as probability of them from coherency or covariance matrix. Also a simulation scheme is developed for

calculating entropy (H) and scattering mechanism (α) for spheroid targets. In this work drop size distribution (DSD) is considered for stochastic process of oblated or prolated spheroid rain droplet. Results of pure target simulation are presented and these results are compared with radar data set. [C1754]

"Medeling of propagation of electromagnetic waves in forest media Application to detection and localization of targets"

In this paper, we study the propagation of electromagnetic waves in forest media in UHF and VHF frequency bands. We propose a full wave coherent method that allows computing the electric field everywhere in the medium and for any kind of transmitting antenna. Using the data given by the model, we develop two methods in order to detect and localize a metallic target in the medium. The first one is based a monostatic SAR imaging algorithm, the second one is based on a DORT method associated with MUSIC algorithm [C1755]

"Realtime Vision Based Multi-Target-Tracking with Particle Filters in Automotive Applications"

In the following we present a multi-instance-based multi-target-tracking method using particle filters. We developed a robust and flexible system capable of tracking an unknown and changing number of objects (vehicles) using early-vision image features. The system works in real time [C1756]

"A New Method for Indoor Tracking and Tracing System."

The indoor tracking and tracing system is a new method that allows indoor tracking and tracing. The system is able to follow up the movement of the tracked object and determines the exact location. It can be widely used in prisons, secured companies and monitored closed areas. The indoor tracking and tracing system is composed of a small mobile system that can be traced using fixed stations, the object being traced is plotted on a map on the screen of a computer using intelligent software [C1757]

"A Design Method of Parameters for Airborne Conical Scan Pulsed Doppler Radar Seeker"

The look-down mode of an airborne pulsed Doppler radar seeker is important for the detection of a moving ground target. The performances of airborne pulsed Doppler radar seeker operating in look-down mode are strongly influenced by the presence of ground clutter. In this paper the different clutter characteristics of airborne conical scan pulsed Doppler radar seeker in searching and tracking mode are analyzed, and a novel design method of parameters for the seeker is proposed. Then a design instance is given to validate the practicability of this method [C1758]

"Approaches of Single Channel SAR Combining ATI for GMTI"

This paper investigates a detector based on polynomial curve fit for slow ground moving target indication (GMTI) with a single channel synthetic aperture radar (SAR) multi-look along track interferometry (ATI). In addition to the steps of constructing multi-look using overlapped or unoverlapped windows, imaging, phase compensation and performing interferometric processing involved in common techniques of ATI used for single channel clutter suppression, the approach in this paper farther divides real parts of single channel ATI signals into numerous regions, calculates histograms of imagery parts of signals and adjudges threshold for special region by predetermined probability of false alarm (Pfa), and finally the detector is obtained by higher order polynomial curve fit throughout the data area. Another new method of moving target validation via multi-look sample covariance matrix is also proposed. Simulation results show the effectiveness of these methods in the detection of moving targets submerged in strong clutter [C1759]

"An Improved Target Detection Method on Wavelet-Based Fractal Scaling Analysis"

Wavelet-based fractal scaling analysis is a new method based on fractal geometry for detecting small targets within sea clutter. But the fractal dimension of sea clutter is affected by not only the presence of a target but also sea wave propagation directions, which will degrade accuracy of detection under various sea and weather conditions. An improved method using spatial Hurst parameter differences is provided to overcome the above drawback. Experiments with IPIX real-life radar data have shown that the novel method is more robust and accurate than wavelet-based fractal scaling analysis method [C1760]

"Design and Implementation of the Pulse Tracker Based on FPGA"

Many jammers can generate transmitting jamming at present. How to capture radar pulses entirely is one of the crucial factors which impact the jamming effect ultimately. A pulse tracker based on FPGA is introduced in this paper, which can track radar pulses when radar works in the fixed PRI (pulse repetition interval) pattern or

staggered PRI pattern. It strongly supports the jammer to capture radar pulses entirely. It's shown that the pulse tracker can capture radar pulses exactly and improve the jamming ability of the jammer effectively [C1761]

"Research on Applications of Chaff"

Through the analysis of the mechanism and motion characteristics of chaff, mathematic models are built for threaten target and chaff. To support strategy making, the applications of chaff are studied in various environments, with aspects of chaff's usage methods, timing of jamming, strength of jamming etc [C1762]

"FPGA Implementation of Embedded Cruise Control and Anti-Collision Radar"

The ModEasy project seeks to develop techniques and software tools to aid in the development of reliable microprocessor based electronic (embedded) systems using advanced development and verification systems. The tools are to be evaluated in practical domains such as the automotive sector for reactive cruise control and anti-collision radar. We choose to define specific IPs using FPGA techniques to cover this application domain. This paper presents the implementation of such a complex and safety application on a single FPGA. The target system is composed of a reactive cruise control, a detection radar and the associated treatments [C1763]

"Sea Clutter Suppression Based on Radon Transform at High Grazing Angles"

During final guidance, as radar working over sea surface at a very high grazing angle, it is hardly to distinguish target from clutter background due to the strong reflection of the sea surface. A novel method is presented to suppress the sea clutter in this paper. The proposed method based on Radon transform utilizes edge detection technique to find a boundary to separate the target and sea clutter in range-Doppler map. Simulations for sea clutter suppression and target three-dimensional imaging on the sea are conducted. Results show the effectiveness of our method [C1764]

"A Method to Remove Rebound Jamming against Bistatic Synthetic Aperture Radar"

Rebound jamming, a kind of main-beam jamming, is effective to resist BiSAR. Due to simultaneous coherence between interferences and target echoes in both down-range and cross-range, it is difficult to remove the interference from received signal. Based on the principle of two-channel cancellation using for moving target detection, the paper proposes a method to remove rebound jamming against BiSAR, which can give satisfactory interference cancellation when interference parameters are known either completely or partially. The estimation of interference parameters is presented, too. Validation is confirmed by simulations [C1765]

"A Multipath Viterbi Data Association Algorithm for OTUR"

Target tracking of sky wave OTHR inevitably faces the problem of multiple propagation modes, through modeling target movement in ground coordinate and implementing data association in radar coordinate, a multipath viterbi data association (MVDA) algorithm is proposed, which extends viterbi data association (VDA) from association between measurement and track to association among measurement, propagation mode and track. The simulation results show that MVDA is superior to multipath probability data association (MPDA) [C1766]

"Analysis on Rank of Channel Matrix for Monostatic MIMO Radar System"

Multiple-input multiple-output (MIMO) radar has shown its great potential on. combating with target fades by averaging the target RCSs on many decorrelated channels, and hence significantly improves the system performance. The amount of decorrelated channels is mathematically represented by the rank of channel matrix. In this paper, an analysis on the rank of channel matrix for monostatic MIMO radar is given. It is found that the rank can be approximated by the bandwidth-aperture product. The sufficient condition to obtain a full-rank channel matrix is presented. As well, the effect of array structure on the rank is investigated. Sequentially, some suggestions are proposed to keep a large rank while using relatively small inter-sensor spacing. Finally, some simulations are given to verify the analysis [C1767]

"Range Migration Compensation and Doppler Ambiguity Resolution by Keystone Transform"

In pulsed Doppler radar, when wideband signals are used and the target radial velocity is high, linear range migration occurs and cannot be neglected. The migration misaligns the range profiles within a coherent processing interval and degrades the coherent integration gain eventually. On the other hand, Doppler ambiguity must be resolved when the radar uses low or medium pulse repetition frequency. In the paper, Keystone transform is used for range migration compensation. Also, a parallel searching scheme of Doppler ambiguity resolution is proposed based on Keystone transform. The simulation shows the advantages of the algorithm

[C1768]

"Bistatic Ambiguity Function and DOA Estimation for PCL Radar"

In this paper detection and the accuracy of measurement of range, velocity and DOA in PCL radar for optimized parameters is considered. It is shown that, in order to measure the bistatic characteristics of a target, the monostatic ambiguity function can be processed and extract the bistatic factors by proposed algorithm [C1769]

"Performance Analysis of Track Initiation Algorithm"

Su Feng presented the modified logical track initiation algorithm in his paper, however, the development of the algorithm has not been proved in theory. In this paper, the track detection probability and false track probability of the algorithm is deduced by statistics methods. The simulation test verifies the results [C1770]

"Reduced-Dimension Single Data Set Detection Algorithms"

The detection of a signal in coloured Gaussian interference is relevant in many fields such as radar, communications and biomedical technology. In practice, the interference covariance matrix is estimated from training data, which must be target free and statistically homogeneous with respect to the test data. These conditions are often not satisfied, which degrades the detection performance. Single data set algorithms have been proposed to circumvent this problem. In this paper, the issues associated with applying reduced-dimension techniques to them are studied and these reduced-dimension detectors' probabilities of false alarm and detection are derived. They have the highly desirable CFAR property and theoretical results are verified by simulations, which also show that they are comparable to traditional detectors [C1771]

"Bistatic Radar DPCA Technique"

This article gives the spatial geometry model of bistatic radar displaced phase center antenna (DPCA) technique based on two-antenna. The bistatic radar DPCA technique requires that the distance between the two transmitting antenna phase centers (d), the pulse repetition interval (PRI) and the speed of the moving platform (Va) are strictly associated, just as the monostatic case. When the speed of the moving platform fluctuates, we can suppress clutter and detect moving target by interpolating and registering. The validity of the theoretic analysis is proved by simulation [C1772]

"Detection of Ultra-High Speed Moving Target Based on Matched Fourier Transform"

Ultra-high speed moving target is a new case falls across in modern radar target detection. The echo model of the ultra-fast moving target is founded in this paper, and its effect on pulse Doppler processing is analyzed. Then we propose a new algorithm of pulse Doppler processing based on matched Fourier transform (MFT). According to the characteristic of the echo, we propose an algorithm to realize MFT-based target detection which has light computation load, clear physical meaning and strong searching range pertinence. The simulation results show the validity of the algorithm [C1773]

"A New Method of Integration and Detection for Continuous Range Profiles"

The problem of integration and detection of range spread target in colored Gaussian noise is studied. A new method of continuous range profiles' detection is proposed. As the fourth-order cumulant has a good function to restrain Gaussian noise, we regard the fourth-order cumulant's solution as a kind of nonlinear transform and get a new integration between frames. Both the analysis of theory and the result of simulation show that this algorithm has a better performance than usual algorithm of energy integrating detection for the integration of continuous range profiles [C1774]

"High Resolution Radar Imaging of the Sea Surface"

Applications are reviewed of high resolution radar sea surface imagery to remote sensing, wide area surveillance, target detection and tracking. The limitations imposed by sea surface motion on SAR imaging are discussed and illustrated, along with methods to exploit the motion such as along track interferometry. Ships on the sea are subject to roll, pitch and yaw motions, which defocus SAR imagery; analysis and signal processing to characterise and overcome the difficulties are described. Real aperture images of the sea are shown to contain detailed information on the propagation of surface waves, which may be used in algorithms to detect anomalies such as small surface vessel; these are also described and demonstrated [C1775]

"Passive Radar Tracking"

PCL radar in particular examining the detection and tracking of air targets when only Doppler bearing information is available. A demonstration of target acquisition and subsequent tracking will be given [C1776]

"Target Recognition in Synthetic Aperture and High Resolution Sidescan Sonar"

The accurate detection and identification of underwater targets continues as a major issue, despite, or perhaps as a result of, the promise of higher resolution underwater imaging systems, including synthetic aperture sonar and high frequency sidescan. Numerous techniques have been proposed for computer aided detection to detect all possible mine-like objects, and computer aided classification to classify whether the detected object is a target or not. The majority of existing techniques employ supervised classification systems which are reliant on training data. The success of these systems can be highly dependant on the similarity of the test data to the training data, which includes the effect of the background region on which the target was located. This paper will briefly discuss and compare two possible solutions to this problem. The first is a model based system for classification and the second utilises an augmented reality simulator to produce training data [C1777]

"The IEEE Seminar on Target Tracking: Algorithms and Applications"

The following topics are dealt with: distributed air target tracking; particle filtering; data association; Viterbi algorithm; Riccati equation; infrared image sequences; multiple object tracking and video sequence. [C1778]

"Range Resolution Improvement in Passive Coherent Location Radar Systems Using Multiple FM Radio Channels"

Passive coherent location (PCL) radar systems that use single FM radio channel signal as illuminator of opportunity have limited range resolution due to low modulation bandwidth and high dependence on the content that is being broadcasted from the FM station. An improvement in range resolution is obtained by using multiple adjacent FM channels, emitted from co-sited transmitters, which is often the case in large towns in countries, where the FM channel allocations are relatively weakly regulated. The proposed scheme computes the autocorrelation function of the signal directly received from the FM co-located transmitter, and compares it to the cross-ambiguity function, obtained from direct and target scattered signals. The geometry of the problem is like in the case of monostatic radar. The range information is obtained by the delay between the cross-ambiguity function and the autocorrelation function. It is shown that down to -37dB signal to noise ratio (SNR) the autocorrelation function of 7 FM channels with different contents can be successfully extracted from the cross-ambiguity function. The detection of the time delays is a linear estimation problem. The issue of time-delay estimation is a known topic of research. A powerful estimator can be found [C1779]

"Discerning Objects from Ground and Target Pose Estimation in ladar Data using Robust Statistics"

In this paper we present a novel way to analyze LADAR images and model its data. Having an aerial LADAR image as data source, our aim is to extract a parametric description of the ground of our scenario in order to discern between the data samples that belong to the ground and those that belong to vehicles, objects or clutter. In the second part of this paper we estimate the pose of the interesting objects by building its corresponding oriented 3D bounding box. Our method uses robust statistics in order to extract proper descriptions of both the ground and the oriented bounding boxes of the objects. Specifically, we use two robust parameter estimators: The least median squares and the Helmolth tradeoff estimator, part of our prior work, depending on the percentage of outliers that may be present in the different steps of our approach [C1780]

"Mobile Ravin: Intrusion Detection and Tracking with Organic Airport Radar and Video Systems"

Currently, airport perimeter intrusion detection primarily relies on visual surveillance by security personnel and is often augmented with video cameras. This approach is limited to day light hours and degrades with bad weather. We are developing a proof of concept system, mobile RAVIN, that detects intrusions as small as a human, works at all hours and all weather conditions, and provides rapid situational awareness to security personnel. The mobile RAVIN (radar and video integrated on mobile object architecture) system has been installed and tested at Seattle-Tacoma International Airport (SeaTac) in February 2006. It uses the airport security display processor (ASDP)-an integrated radar signal processor, track processor, and display processor system that derives threat information from the FAA's airport surface detection equipment (ASDE-3) ground surveillance radar systems. This approach leverages existing airport assets to provide a cost effective suite of security sensors. The mobile RAVIN system performs filtering and tracking on the ASDE-3 radar data, initiates and maintains video tracks of objects, and fuses radar and video tracks for operator display. It also allows operators to slew a video camera to a radar track location which reduces false alarms and nuisance alarms. Finally, we developed a display to show

the radar and video tracks overlaid on a map of the airport [C1781]

"A Novel Multiplexing Method for High Data Rate Communication Systems"

In order to improve exploitation in guided transport networks, many approaches have been investigated for the development of tools or systems able to provide needed information. Ours laboratories designed an original radar system that allows inter-vehicle communication. This system called CODIREP-communication detection and identification of broken-down trains-is based on the principle of a co-operative radar using a transponder inside targets. It is made of a transmitter/receiver couple, which equips respectively the front and the rear of two successive vehicles. It uses a numerical correlation receiver and has a broad band of about 100MHz which could be exploited to establish high data flow communications. A preliminary prototype was realized using a technical solution to multiplex communication data and localization code. The tests in free space and tunnel show that a range of 800 m in free space and 700 m in tunnel with a location precision of 1.5 m and a data rate of about 1.6 Mbps could be reached. This remains insufficient for some applications that require more resources. With the system, we intend to reach more than 5 Mbps. The aim of this work is to improve this system by proposing another original coding technique developed in order to increase the data flow rate. Simulations will be executed to evaluate the system's performances in terms of data flow, bit error rate (BER), computing time and complexity. [C1782]

"A New Data Association Algorithm for Multiple Passive Sensors"

This paper is concerned with the dynamic problem of associating measurements from S bearing-only sensors in the presence of clutter and missed detections. A new algorithm is investigated. Firstly, an S-D assignment method is utilized to partition LOS measurements and eliminate spurious measurements as possible. Then, the estimated positions of probable targets are sent to the following association algorithm (CJPDA) as the secondary measurements. Finally, iteration filter is implemented and the known tracks are maintained. Combining the two approaches reasonably, the proposed method generalizes the static S-D assignment to the dynamic S-D one and achieves good association performance. A simulation experiment is provided to compare the new algorithm with the wi-best S-D assignment by means of accuracies and the time requirements. The results demonstrate the effectiveness and efficiency of the proposed method. [C1783]

"On Scheduling a Single Machine to Minimize a Function of Distances Between Pairs of Tasks: Scheduling a Multifunction Radar"

Among several other tasks, the radar of a fighter has to search, track and identify potential targets. The waveforms used by the radar for each of these tasks are most often incompatible and hence, cannot be processed simultaneously. Moreover, these tasks are repeated several times in a cyclic fashion. Altogether, this defines a complex scheduling problem that impacts a lot on the quality of the radar's output. In this paper, we define a formal framework for this real time scheduling problem and we introduce several techniques to compute efficient schedules for the radar. We also describe a set of lower bounds for the scheduling problem. Experimental results are provided [C1784]

"ML-PDA track validation thresholds"

The maximum likelihood probabilistic data association (ML-PDA) algorithm, developed for very low observable (VLO) target tracking, will always provide a candidate track that must then be either validated or rejected. By comparing the value of the log likelihood ratio (LLR) at the parameter estimate to a threshold value, track validation is accomplished. Using extreme value theory, we show that in the absence of a target the LLR global maximum obeys approximately a Gumbel distribution and not the Gaussian distribution previously ascribed to it in the literature. It is shown that the Gaussian approximation yields inaccurate false track acceptance probabilities. Using a Gumbel distribution, the probability of false track rejection can be obtained for a given threshold value. The probability of true track detection is obtained assuming the LLR global maximum obeys approximately a Gaussian distribution in the presence of a target. A system operating characteristic (SOC) is developed that unifies the detection processing and track algorithm performance into a single performance metric. The performance of this test is demonstrated through simulations [C1785]

"Compounding segmentation method for SAR images"

Fast and accurate segmentation of synthetic aperture radar (SAR) images is important to SAR automatic target recognition (ATR). In this paper, a new compounding segmentation method is presented, based on the two-parameter CFAR segmentation method and Markov Random Field (MRF) -based segmentation approach. Following the initial segmentation obtained by the two-parameter CFAR method, the MRF-based approach is exploited only on the edge points of the targets and shadows. A comparative experimental analysis, using

MSTAR (Moving and Stationary Target Acquisition and Recognition) images, of the proposed method against the other two approaches showed that the compounding segmentation method can achieve faster and more accurate results, which can be of practical use in the process of SAR ATR. [C1786]

"Multi-targets miss distance measurement based on a sequence of image processing techniques"

Multi-targets miss distance measurement is studied in this paper based on a sequence of image processing techniques. Firstly, echoes from multi-targets are represented as a gray image with spectral intensity as its gray values by time-frequency transform. Then an adaptive threshold based on constant false alarm rate (CFAR) detection is devised to convert the gray image into a binary image. Further, a set of morphological operations is used to remove background noise from the binary image. Finally, miss distance parameters of multi-targets are obtained based on randomized Hough transform (RHT). The experimental results show the efficiency of proposed method [C1787]

"Detection of Laser Radar Target Based on Wavelet Decomposition"

A novel approach for detecting laser radar target based on wavelet decomposition has been proposed. Usually, wavelet analysis has been used to de-noise a digital signal corrupted by noise. In our approach, we applied the wavelet decomposition in a multi-resolution sense to only get the approximation of a signal and detect the target. Without reconstruction, it is easy to realize on real time. Experiments show that our approach leads to an effective method to detect the laser target in a clutter background [C1788]

"Detection, Location and Imaging of Fast Moving Targets Using Non-uniform Linear Antenna Array SAR"

In this paper, a new system called non-uniform linear antenna array SAR (NULA-SAR for short) is proposed. Using multiple complex images formed by multiple antennas with special configuration, NULA-SAR can not only suppress the stationary clutter, but also locate and image both slowly and fast moving targets accurately. Numerical experiments are presented to demonstrate the effectiveness of NULA-SAR [C1789]

"Detection of unknown nonlinear fm signals by time-frequency morphological filtering"

A new energy integration detection scheme is proposed to detect an unknown nonlinear frequency modulated (FM) signal buried in strong complex additive white Gaussian noise (CAWGN). In this scheme, the Smoothed-Pseudo Wigner-Vill Distribution (SPWVD) is used to realize local coherent integration of a signal and thresholding and mathematical morphological filtering are jointly used to extract the time-frequency (TF) support region of the signal from the time-frequency distribution (TFD) image of an observation. The simulated results show that the proposed scheme is effective in strong noise background. The scheme can be applied to the target detection in the over-the-horizon radar (OTHR), such as the sky wave OTHR and the surface wave OTHR. [C1790]

"Utilising signal absence in SAR imagery for moving target detection"

SAR images of moving targets are blurred, defocused and displaced from their true location making them difficult to detect from their direct energy returns. This paper presents an alternate technique for detecting such targets by exploiting the phenomenon that the shadow projected by the target produce a null in the SAR imagery. The target shadow is presented at its true location and tracks the target as it moves along in the scene. A change detection technique has been developed that processes a sequence of highly overlapped SAR images. Initial detections thus obtained then seed a shadow delineation process that simultaneously delineates the shadows of the moving targets over multiple images. The technique has been successfully demonstrated on real SAR imagery for detecting and locating moving targets [C1791]

"Development of advanced entry, descent, and landing technologies for future Mars missions"

Future Mars missions may need the capability to land much closer to a desired target and/or advanced methods of detecting, avoiding, or tolerating landing hazards. Therefore, technologies that enable "pinpoint landing" (within tens of meters to 1 km of a target site) will be crucial to meet future mission requirements. As part of NASA Research Announcement, NRA 03-OSS-01, NASA solicited proposals for technology development needs of missions to be launched to Mars during or after the 2009 launch opportunity. Six technology areas were identified as of high priority including advanced entry, descent, and landing (EDL) technologies. In May 2004, 11 proposals with PIs from universities, industries, and NASA centers, were awarded in the area of advanced EDL by NASA for further study and development. This paper presents an overview of these developing technologies [C1792]

"Wavelet Quasi-Superresolution in Marine Applications"

Possible marine applications of superresolution are in both military and civilian purposes, such as computer vision, target recognition, detection, identification, surveillance, synthetic aperture radar, etc. In this paper, a new algorithm for superresolution is proposed. The algorithm is based on wavelet theory and morphological structure of the image. Quasi-superresolution means usage of a single image for analysis instead of several. Wavelet quasi-superresolution can be applied with less complexity than standard superresolution, because wavelet interpolation of interlaced data and statistics of different images are skipped. New criterion for comparison of original and processed image is proposed. The result is single scalar which is easy to compare [C1793]

"Hip Prosthesis Detection based on Complex Natural Resonances"

Resonance based radar target detection has been applied to ground penetrating radar (GPR) applications for the detection and recognition of landmines. Target detection is achieved by searching for certain target dependent complex natural resonances (CNRs), which could be considered as a feature set for identification. In this paper, detection of a hip prosthesis under human tissues using resonance based target detection technique is investigated [C1794]

"A performance comparison of two time diversity systems using OS-CFAR detection for partially correlated chi-square targets and multiple target situations"

In radar systems, detection performance is always related to target models and background environments. In time diversity systems, the probability of detection is shown to be sensitive to the degree of correlation among the target echoes. In this paper, we derive exact expressions for the probabilities of false alarm and detection of a pulse-to-pulse partially correlated target with 2K degrees of freedom for the Order Statistics Constant False Alarm Rate (OS-CFAR) detector. The analysis is carried out for the "non conventional time diversity system" (NCTDS) and multiple target situations. The obtained results are compared with the "conventional time diversity system" (CTDS). [C1795]

"An Effective Method for the Suppression of Mirror Doppler Frequency Components in Airborne Pulsed Doppler Radar"

If the mirror Doppler frequency components not be suppressed well in airborne pulsed Doppler radar, which would bring on false target detection, how to suppress the mirror Doppler frequency is an important issue to enhance radar performance. This paper proposed an method for the suppression of mirror Doppler frequency based on Hilbert transform, the results of processing experiment data show the suppression degree improved about 4 dB more than conventional methods [C1796]

"An application of advanced spectrum estimation to multi-channel radar detection and location"

We explore the application of an advanced spectral estimation technique to target detection and localization in multi-channel space radar systems. Previous work had applied motion compensation and array calibration to produce SAR-like range-Doppler images for each channel, followed by a maximum likelihood angle of arrival (AOA) and alternating projections (AP) technique designed to optimally detect and locate targets in this representation. Moving targets in a given range-Doppler cell exhibit a channel-to-channel phase difference after the motion compensation and array calibration. This phase progression may also be detected and estimated using spectral estimation approaches. However, since the target and clutter phase ramps are very close, a super-resolution approach is needed. The reduced-rank linear predictor ROCKET is investigated in this role. It is shown that the original technique has a two-threshold capability that provides two opportunities to discard false alarms, whereas the pure ROCKET-based approach only has one. As a result, the two-threshold AOA+AP technique generally outperformed the ROCKET-based algorithm in Monte Carlo simulations. Furthermore, the two-threshold construct holds the promise for further performance improvements pending ongoing investigations [C1797]

"Comparison of soft and hard assignment ML trackers on multistatic data"

About 15 years ago the maximum likelihood probabilistic data association (MLPDA) tracking architecture was proposed; it was found to be a very effective (perhaps the only) way to track very low-observable contacts. The MLPDA is based on maximizing statistical likelihood according to a precise model in which there is no process noise: the target's trajectory is deterministic given the parameters (usually initial position and velocity) over which maximization is done. The MLPDA, as above, maximizes the likelihood based upon an assumption-the usual one in target tracking, but perhaps one that is biased toward radar surveillance-that each target can generate at

most one contact per scan of data. A dissenting view is from the PMHT (probabilistic multi-hypothesis tracker) perspective, that each contact may be taken as independent and a-priori equally-equipped to be target-generated. As opposed to the MLPDA, for whom associations between measurements and targets ought to be "hard" yes/no decisions, the PMHT have implicit associations that are actually the posterior probabilities of these associations: they are "soft". The original PMHT yields a modified Kalman smoother; here we use the PMHT likelihood function to optimize, as with the MLPDA, and call the resulting algorithm the MLPMHT ("ML" = maximum likelihood). Here we compare the MLPMHT to the MLPDA. Our results indicate that the MLPMHT is the better tracker in multistatic data. Not only is the concept of a "frame" of data less relevant for it than the MLPDA (to frame data over a long ping is suspect) since each measurement is treated independently, and not only is optimization simpler since an EM technique can replace direct optimization after the grid search; but it appears that it both works more robustly and is able to avoid contact starvation during periods of poor SNR. A further advantage of the MLPMHT is that optimal data association with multiple targets is easily incorporated, whereas in the MLPDA it is ap--proximated by excision of measurements that are "taken" by previously-discovered targets [C1798]

"A rate distortion method for waveform design in RF target detection"

Conventional RF image formation relies on a fixed waveform set that is based largely on obtaining maximum resolution for a given amount of bandwidth present in a waveform. However, the correlation process for a given waveform set varies widely depending on the cross correlation properties of the waveform and the geometry of the aperture interrogating the object to be detected. We propose a method that maximizes quality of the object being detected by first using an orthogonal basis to minimize the unwanted correlation response for the waveform. We then shape the frequency and temporal correlation response of the waveform for a given target using a rate distortion criteria and demonstrate the imaging and detection performance of the method [C1799]

"Visual tracking with probabilistic data association filter based on the circular hough transform"

This paper proposes a robust visual tracking framework to track circle-like objects in cluttered environment. Instead of using the resulting positions after circle detection and tracking in the image domain, we directly perform the visual tracking task in the parameter space which describes the measurement features. The visual tracking technique is combined with targets generation closely. We utilize the probabilistic data association filter (PDAF) to filter the detected measurements with noise and disturbance. The likelihood ratio through the Hough transform is employed to modify the evaluation of the association probability and make the estimate more reliable. Furthermore, the joint probabilistic data association filter (JPDAF) is used to deal with the multiple circle-like objects tracking. The likelihood variation of each target is introduced with JPDAF as a basis of the predictions for different targets. The overall performance has been verified in several challenging experiments [C1800]

"Fuzzy Logic Applications to Fire Control Systems"

The paper objective is to study and solve one of the problems encountered in the development of a fire control system. Fire control encompasses all operations required to apply fire on a target. We can not cover in this paper the whole set of mathematical problems in which fire control applications can be divided. Therefore, we will focus in one of the initial phases, the target detection problem. In general, the application of a segmentation algorithm to a data set as a preprocessing of the data previous to an unsupervised classification algorithm improves the probability of detection. The paper presents such a combination. Expert information about the encounter classes will be used for a supervised classification of the example picture. In the first place, we will use a segmentation algorithm to found the natural homogeneous classes in the data. These classes will be explored by an unsupervised clustering algorithm. The unsupervised classification will be performed on the segmented image. Once the classes have been determined that way the classification will be done over the original image. [C1801]

"Reinterpreting the CLEAN algorithm as an optimum detector"

This paper gives a short review of the CLEAN algorithm and shows how it can be implemented as a deconvolver in place of a correlator. The paper then derives an optimum detector (with appropriate assumptions) that provides detection of closely spaced Rayleigh distributed objects in the presence of additive white Gaussian noise (AWGN). These two processors are shown to both be deconvolvers for infinite signal to noise ratio. The range-time cut of the ambiguity diagram indicates that both algorithms have outstanding range-time sidelobes (under the condition of infinite signal to noise ratio). The optimum detector is not a uniformly most powerful test because it incorporates target amplitude into the detector. However, in many practical situations estimates of this parameter may be available. [C1802]

"Adaptive processor convergence improvement using reiterative projection statistics"

Adaptive radar processors form estimates of the statistics of the received interference (such as clutter and/or jamming) and receiver noise processes using measured samples (i.e., snapshots) of the signal environment. Snapshots that contain the signal of interest (i.e., targets) and/or other outliers are, in practice, frequently interspersed within a set of more homogeneous interference snapshots. This condition often results in poor convergence in terms of signal to interference-plus-noise ratio (SINR) and ultimately, probability of detection. In this paper, a previously developed projection statistics (PS)-based outlier detection technique is extended to a reiterative and prewhitened form, similar to a recent reiterative generalized inner product (GIP) technique. We compare SINR convergence performance of reiterative GIP and reiterative prewhitened PS, among other methods, in the presence of multiple outliers. The results show that reiterative prewhitened PS is superior to reiterative GIP and to the other methods in terms of SINR convergence criteria. [C1803]

"Surveillance area as a multiplicatively weighted Voronoi diagram"

This paper presents the surveillance area as an ordered order-k multiplicatively weighted Voronoi diagram in R2. The boundaries between adjacent radars are the edges of the diagram, defined by the range ratio of radars taken pairwise. The radar range equation is used to describe the proximity rule necessary to generate the diagram. The proximity between a target and a radar is determined by means of a Euclidean distance weighted by the radar range. The common coverage is represented by the Voronoi regions of order-k. [C1804]

"Detection of targets in bandlimited and spatially correlated clutter"

This paper describes the preliminary analysis of an unconventional approach for detecting targets in band limited clutter that exhibits some degree of spatial correlation from range bin to range bin. The receiver processing chain utilizes a lattice predictor (LP) filter to remove clutter at the output of a Doppler filter bank. Subsequently, an order-statistic (OS) constant false alarm rate (CFAR) processing stage is used to threshold the data and a binary integrator creates a binary image of threshold crossings accumulated over several coherent processing intervals (CPIs). A novel technique is applied for removing noise from the binary image using morphological filters, thereby exposing tracks created by any moving targets. Once a track has been detected, the corresponding target is declared present. Test results based on measured clutter data will be presented that suggest the proposed processing techniques may improve detection performance in a clutter environment. [C1805]

"Robust distributed detection fusion scheme under unknown time-variant signal-to-clutter ratio conditions"

A censored summation based weighted fusion scheme (CSWF) for multiradar distributed detection systems is presented to improve the detection probability of the fusion center where final decision is made by using the generalized sign test statistics (GSTS) formed and sent by every radar. It incorporates the direct summation fusion (DSF) and all kinds of the censored summation fusions (CSF) and regulates their relative importance by a weight vector. If any of them declares the presence of a target, the CSWF will accept it. The DSF fuses all the GSTSs by adding up them, while the CSF only adds up the remainder after discarding some of them. Under unknown time-variant signal-to-clutter ratio conditions, the result shows that the DSF and CSF can not always perform well and even have very poor detection performance; conversely, the CSWF has a quite good performance and behaves at least the second best among the three schemes. The CSWF is robust and high-performance. [C1806]

"An approach for multiple moving targets detection and velocity estimation"

The purpose of range tracking and velocity estimating for multiple moving targets is to accurately track the location of the targets and their differential changes. In this paper, an approach for multiple moving targets detection and velocity estimation in radar is proposed. By using transformable periods and symmetrical LFM (TPS-LFM) waveform, multiple moving targets detection is possible. Since this radar waveform will increase the complexity of signal processing. To resolve this problem, an effective algorithm based on discrete match Fourier transform (DMFT) is proposed for chirp rate estimation and used to overcome the difficulty of parameter estimation for multiple moving targets. The signal model and the detection method are discussed and some simulations are performed. Theoretic derivation and computer simulations show that multiple moving targets can be easily detected with high range resolution and high velocity resolution, and under certain conditions, the false detections of unnecessary targets and failures to detect necessary targets, which used to be major problems in detection performance, can be substantively reduced. Its usefulness in multiple moving targets detection and velocity estimation in various radar, such as automotive collision avoidance radar (ACAR) and moving target

indicator (MTI) radar, are confirmed. [C1807]

"Pulse transmission scheduling for a distributed system of cooperative radars"

We introduce a simultaneous pulse transmission scheduling scheme for a distributed wireless network of cooperative tracking radars. Rather than treat each of the radars as an independent system, we model the individual radars as part of a system-of-systems and coordinate simultaneous transmissions across the network to produce constructive pulse collisions at the target. It is shown that this scheduling algorithm couples improved target discrimination due to spatial diversity with a reduced per node power requirement due to increased signal-to-noise ratios at the receivers. This simultaneous scheduling strategy is combined with a detection and localization multistatic time-scheduled strategy in a two-phase hybrid approach. Algorithms are developed for both phases that minimize inter-pulse interference and communication overhead while maximizing pulse repetition rate. Potential error sources are identified and studied for both the radar transmissions as well as the underlying communication network [C1808]

"Cramer-Rao Bound Analysis on Multiple Scattering in Multistatic Point Scatterer Estimation"

The resolution improvements of time reversal methods through exploiting nonhomogeneous media have attracted much interest recently with broad applications, including the destruction of kidney stones, underwater acoustics, radar, detection of defects in metals, communications, and mine detection. In this paper, we analyze the effect of inhomogeneity generated by multiple scattering among point scatterers under a multistatic sensing setup. We derive the Cramer-Rao bounds (CRBs) on parameters of the scatterers and compare the CRBs for multiple scattering using the Foldy-Lax model with the reference case without multiple scattering using the Born approximation. We find that multiple scattering could significantly improve the estimation performance of the system. For the case where multiple scattering is not possible, e.g., where only a single target scatterer exists in the illuminated scenario, we propose the use of artificial scatterers, which could effectively improve the estimation performance of the target despite a decrease in the degrees of freedom of the estimation problem due to the introduced unknown parameters of the artificial scatterers. Numerical examples demonstrate the advantage of the artificial scatterer [C1809]

"Stap for Clutter and Interference Cancellation in a Hf Radar System"

An alternative skywave line-of-sight (SkyLOS) high frequency radar architecture has been proposed for early detection and tracking of ballistic missiles. It consists of a skywave over-the-horizon (OTH) radar augmented by one or more ground-based systems for line-of-sight reception in the illuminated region. The line-of-sight systems provide additional Doppler-time profiles of the target with different observation geometry to improve flight trajectory estimation. Targets compete for detection against powerful clutter and interference from manmade and natural sources. We introduce a practical STAP technique to deal with operational signal environments and demonstrate its performance on live SkyLOS data [C1810]

"DDD Method Based on Joint Target Cancellation for Circular Array Antennas"

Circular array antennas have three merits such as all-orientation space scanning, flexible search and track mode and good beam bearing etc. relative to common linear array antennas. However, when conventional space time adaptive processing (STAP) algorithms are used, there may be a small loss in performance when compared with a uniform linear array (ULA). With some care in the choice and implementation of the STAP algorithm, the majority of the degradation is at close ranges, where the target returns are relatively strong. At long ranges performance is barely affected. This paper proposes a novel direct data domain (DDD) method based on joint target cancellation, and the proposed method can enhance the ability of target detection in nonhomogeneous environment in comparison with conventional DDD methods, using a circular antenna array [C1811]

"Human and Object Detection in Smoke-filled Space using Millimeter-wave radar based Measurement System"

In recent years, crisis management's response to terrorist attacks and natural disasters, as well as accelerating rescue operations have become an important issue. In rescue operations of fire disaster, one of the biggest problems is that the firefighter's view is obstructed by dense smoke. We considered the most important task for firefighters is to understand the inside situation of the dense smoke space. Therefore, we aim to develop a system visualizing the situation of the space. First, we scanned target space by using millimeter-wave radar combined with a gyro sensor. Then, due to detect humans and objects, we construct a 3D map from signal-reflection datasets using 3D image processing techniques. In this paper, we introduce our system and report the results of the measurement experiment in the real smoke space situation. [C1812]

"Study on the Detection Algorithm of Bridge over Water in SAR Image Based on Fuzzy Theory"

Target detection and recognition is the ultimate aim in computer intelligence. Given an example of linear target, bridge over water in SAR image, the algorithm of denoise and segmentation is designed based on fuzzy theory, the detection of bridge edge is realized by minimum and Radon transform, and a measurement of judging parallel is proposed in this paper. In the process of designing algorithm, some problems have been considered and solved, including: (a) restrain furthest the multiplicative noise and enforce the feature of target; (b) obtain the area of bridge over water in complicated background; (c) get the edge of bridge, namely extraction of linear feature; (d) the final work in detection and recognition of bridge such as parallel judgment. The experimental results show that the algorithm is effective [C1813]

"A Monte-Carlo Method for Initializing Distributed Tracking Algorithms"

Distributed processing algorithms are attractive alternatives to centralized algorithms for target tracking applications in sensor networks. In this paper, we determine an initial probability distribution of multiple target states in a distributed manner to initialize distributed trackers. Our approach is based on Monte-Carlo methods, where the state distributions are represented as a weighted set of discrete state realizations. The filter state vector consists of the target positions and velocities on the 2D plane. Our approach can determine the state vector distribution even if the individual sensors alone are not capable of observing it. The only condition is that the network as a whole be able to observe the state vector. A robust weighting strategy is formulated to account for missed detections and clutter. To demonstrate the effectiveness of the algorithm, we simulate a network with direction-of-arrival nodes and range-Doppler nodes [C1814]

"Locating Subsurface Targets Using Minimal GPR Measurements"

This paper describes a novel approach which finds probable target areas in ground penetrating radars (GPR) with minimal number of measurements. A subsurface GPR target creates a hyperbolic signature in the space-time domain. Conventional algorithms use these signatures to image and detect subsurface targets. Our approach uses the time delay differences (TDD) in consecutive GPR A-Scan measurements to localize the target. For further reduction of measurement numbers regions of low target probability are determined to eliminate redundant measurements. Results from the experimental data from a model mine field show that the target positions can be found accurately using much fewer measurements than the conventional imaging algorithms [C1815]

"Splitting Algorithm for Cases with Single Detection from Sonar Data for Two Tracks"

The purpose of this paper is to analyze data association problem in sonar applications. Bearings only tracking algorithms are used because the range information is distorted in water. A method is proposed to associate detections with established sonar tracks using the distribution of the received signal. Using a single detection when two target's bearings are close to each other, may result in poor tracking capability. Splitting a single detection from two targets is a new method which has the potential to keep weaker target's track alive. This method is compared with PDA (probabilistic data association) filters. Monte Carlo simulation results are also given [C1816]

"Target Detection in Abruptly Non-Stationary Doppler-Spread Clutter"

This paper addresses the problem of target detection in the presence of Doppler spread clutter which is neither stationary during a coherent integration time (CIT) interval nor across different range bins. This phenomenology occurs, for example, in over-the-horizon skywave HF radar where propagation through moving ionospheric inhomogeneities spreads the surface clutter and the clutter statistics can change quite abruptly during a CIT and across range bins. In these cases, the performance of conventional adaptive techniques suffers from a lack of adequate training data. The method proposed here breaks the full CIT into smaller sub-CIT's which are then extrapolated using low order AR models. The Doppler spread clutter is thus effectively modeled as an abruptly time varying autoregressive (ATVAR) process. Subsequent Doppler processing and coherent combining of the extrapolated sub-CIT's is then performed with improved signal-to-clutter gain since only a small proportion of the sub-CIT's are corrupted by abrupt non-stationary behavior. Moreover, nearly full coherent signal gain against noise is maintained. Initial processing on experimental radar clutter data with injection of a simulated target illustrates that this approach can provide an SCNR improvement of more than 5 dB compared to conventional Doppler processing [C1817]

"Efficient Wideband Spreading Function Estimation Using Arbitrary Shaped LFM Signals via Hermite Decompositions"

In active imaging, information such as range and velocity of a target can be obtained by transmitting a signal and processing the received signals. Signal processing of acoustic signals scattered from distributed targets has become an increasing attention to the researchers. The delay-scale wideband spreading function (WSF) is often used to characterize the distributed targets environment. This paper presents an efficient technique for estimating WSF using Hermite decomposition. In realistic sonar and radar, it may be necessary to detect more than one target simultaneously. Under this scenario, resolution is a major concern to be considered to separate multiple targets. This paper focuses on the applications of Hermite decomposition to efficiently compute WSF and the use of multiple transmissions to improve resolution [C1818]

"Adaptive Radar Detection of Distributed Targets in Partially-Homogeneous Noise Plus Subspace Interference"

This paper addresses adaptive radar detection of distributed targets embedded in noise plus interference assumed to belong to an either known or unknown subspace of the observables. We assume that a set of noise-only data is available (the so-called secondary data). Detection algorithms have been derived modeling noise vectors, corresponding to different range cells, as zero-mean, complex normal ones, sharing the same structure of the covariance matrix up to possibly different power levels between primary and secondary data. The common structure and the power levels are unknown at the receiver. The performance assessment confirms the effectiveness of the newly-proposed detection algorithms also in comparison to previously-proposed ones [C1819]

"Design of test software for Over-The-Horizon Radar system"

Due to the relatively coarse resolution in range and azimuth, low detection probability, various clutters or interferences, and time-varying ionospheric propagation channel, the measurements of targets collected from Over-The-Horizon Radar(OTHR) has much uncertainty. Furthermore, ambiguity on target returns derived from the ionospheric multimode propagation effect makes data association and tracking more difficult. In this paper, according to the real requirements of data processing subsystem, a test software package has been discussed and developed for the design on data processing software. It provides an assistant platform for testing, debugging, and verifying some key techniques, such as data pre-processing, adaptive association and tracking, propagation mode identification, and multi-path cancellation. [C1820]

"Extraction of the signature of a buried object using GPR"

This paper deals with the possibility of remotely detecting buried objects using impulse radiating GPR. Most GPR systems involve the B-scan or the C-scan of the ground requiring the usage of advanced imaging techniques. Identification of a buried target is done using only a single snapshot of the ground. An electromagnetic pulse is sent into the ground from a transmitting antenna. The target reflects the pulse and the reflection is received by a receiving antenna. A single temporal scan of the ground is utilized for identification of the target characteristics. The antenna responses are deconvolved out from the receiver response. The deconvolution is carried out by using the conjugate gradient method. Finally, the target response is identified by extracting the natural resonance frequencies by applying the matrix pencil method on the transient waveform. Successful identification of buried targets is achieved through this methodology. [C1821]

"A novel approach for distributed maneuver detection"

Quickest and accurate maneuver detection is critical to modern tracking systems. In this paper, the target maneuver detection problem when using multiple sensors is investigated. The target dynamic model and measurement model may exhibit complex nonlinearity and non-Gaussianity. Therefore, particle filters are implemented at the local sensors to predict the target state. At each time step, local sensors transmit binary data to the fusion center, where decision fusion is performed to detect the potential occurrence of target maneuver. Since the sensors observe the same dynamic process, their measurements, and thus the local decisions, are correlated, which has to be taken into account at the fusion center. By considering correlation and using the Bahadur-Lazarsfeld expansion in the fusion rule, we can achieve better system design (local decision rules and fusion rule) than that achieved by assuming independence between sensors. Experimental results show that the distributed maneuver detection system achieves much better performance than using only a single sensor; the correlated design outperforms the independent design, and is very close to the optimal performance, especially for high correlation scenarios. [C1822]

"Effect of terrain modeling and internal clutter motion on space based radar performance"

This paper addresses the impact of Weibull-type terrain modeling and wind motion on target detection performance from a space based radar platform. For "site-specific simulation effects", a NASA map provides

terrain information that is used to generate scattered returns from the field of view. This land cover map categorizes the Earth into 16 land types (desert, lake, forest, etc.) with specific grazing angle dependent mean radar cross section values that can be characterized using Weibull-type distributions. Wind induced internal clutter motion (ICM) is modeled using the Billingsley spectrum. Depending on the carrier frequency and wind speed, it is possible to model the ICM as equivalent to a low-order sum of damped sinusoids and decaying exponentials. Performance analysis shows that increasing wind speed results in inferior performance in general, whereas for a given clutter-to-noise ratio, non-uniform terrain significantly affects performance. [C1823]

"Modeling sea clutter as a nonstationary and nonextensive random process"

Sea clutter is the backscattered returns from a patch of the sea surface illuminated by a radar pulse. It is of great importance to develop statistical models that properly characterize radar clutter returns. A lot of effort has been made to fit various distributions to the observed amplitude data of sea clutter. However, the fitting of those distributions to real sea clutter data is not excellent, and using parameters estimated from those distributions is not very effective for detecting targets within sea clutter. This may be due to the fact that sea clutter data is highly non-stationary. This non-stationarity motivates us to perform distributional analysis on the data obtained by differencing amplitude data of sea clutter. By systematically analyzing differenced data of 280 sea clutter time series measured under various sea and weather conditions, we show that differenced data of sea clutter are well fitted by the Tsallis distribution. The latter is obtained by maximizing the Tsallis entropy, a generalization of the Shannon (or Boltzman-Gibbs) entropy. Interestingly, we find that the nonextensitivity parameters estimated from the Tsallis distribution may be used to help detect low observable targets within sea clutter. [C1824]

"Cancellation of clutter and multipath in passive radar using a sequential approach"

The paper deals with the cancellation of direct signal, multipath and clutter echoes in passive radar, where the transmitted waveform is not under control of the radar designer and the sidelobes of the ambiguity function mask even targets largely displaced in range and Doppler from the disturbance. A sequential approach is presented for disturbance cancellation and target detection based on projections of the received signals in a subspace orthogonal to both disturbance and previously detected targets. Modeling the clutter spread on few Doppler bins allows complete clutter cancellation. The approach is shown to be effective against typical scenarios with a limited number of iterations. [C1825]

"Two-dimensional human tracking using a three-element Doppler and direction-of-arrival (DDOA) radar"

We investigate the use of a low-cost, three-element receiving array for two-dimensional direction-of-arrival (DOA) sensing of multiple movers. The concept entails resolving the Doppler frequencies of the returned signals from the moving targets, and then measuring the phase difference at each Doppler frequency component to calculate the DOA of the targets. The three-element receiving array is configured to provide simultaneous DOA measurements in both the azimuth and elevation planes. An experimental system is constructed to test the concept and measurement results of multiple movers are presented. [C1826]

"Classifying dielectric mine-like objects using the Huynen-Fork polarization parameters"

We present a polarimetric approach that can be used to characterize subsurface targets by means of ground-penetrating radar. Several quantities related to the Huynen-Fork parameters are basic to the study. These quantities are all expressible in terms of the elements of Sinclair matrix S, which in turn, can be determined as functions of frequency by an application of the method-of-moment (MoM). The method is applied to a mine-like object buried at various depths in a soil of specified dielectric and moisture properties. The quantities in question are the Stokes parameters, the elevation, azimuth, and polarizability angles, as well as the polarization ratios and the scattering eigenvalues which optimize the backscattered power. Some of these quantities are studied here and displayed in various graphs. These frequency dependent graphs exhibit useful symmetry properties. The plots of the polarizability angle (β) vs. frequency seem to remain invariant with target depth, and exhibit resonance features that are later shown to agree well with other standard methods to estimate resonances such as Prony method. A simple analysis of the early-time resonances thus estimated is used to obtain acceptable mine dimensions. The agreement found implies that polarimetric techniques, such as present one, can also be used in the arsenal of techniques yielding target-ID clues. [C1827]

"Data mining of GMTI radar databases"

An innovative data mining algorithm was developed by TSC for application to long-term, wide area ground moving target indication (GMTI) radar databases obtained from both airborne and space-based Intelligence,

Reconnaissance and Surveillance (ISR) systems. The algorithm can discover high-value targets of opportunity including convoys in dense civilian background traffic, and was recently demonstrated for a GMTI database collected by an operational Air Force ISR platform. Further investigations are using a realistic computer simulation of vehicle traffic. In the algorithm, vehicle detection sequences are linked over multiple scans and then analyzed by Hough transform (HT) processing. The HT can resolve closely spaced vehicles and characterize target kinematics to provide real-time operator cueing or support GMTI radar forensic analysis. These data mining algorithms have been successfully applied to actual and simulated GMTI radar databases with a per scan probability of target detection as low as 50%, false alarm rates as high as one per km of road, and civilian vehicle densities up to 10 per km. Thus they can complement conventional tracking algorithms in areas of dense background traffic where false tracks and data-to-track misassociation is a serious problem. [C1828]

"The analysis of wideband conformal microstrip array antenna with cosecant-squared beam shaping"

The characteristics of new ultra wideband (UWB) like fractal microstrip patch antenna element and 24Ч10 elements wideband conformal microstrip array antenna using non-uniform photonic bandgap (PBG) substrate structure whose gap positions enhance some modes and weaken others have been analyzed using a full 3D electromagnetic field inside a structure based on the finite element method (FEM). The cosec2elevation beam shape is ideal for the detection of small and large targets at both short and long range, including where the antenna is mounted on a high tower or hillside. The array antenna has wideband approximately in range of 5 GHz to 10 GHz and radar cross section (RCS) up to 0.00001 meter square for some frequencies and high gain up to 44 dB depend on the operating frequency. The proposed antenna element is constructed on ground plane of thickness 0.1 mm and FR-4 glass epoxy substrate of thickness 1.6 mm with relative permittivity 4.4. The radiation characteristics for the designed antenna element and array antenna such as return loss, input impedance, near field, gain, RCS, 3D-polar and E-plane radiation patterns are obtained using numerical simulations. [C1829]

"A STAP approach to estimate drift angle and aircraft velocity"

Space-time adaptive processing (STAP) is a powerful two-dimensional filtering algorithm for moving target detection and clutter suppression. However, most previous studies of STAP theory have focused on side-looking array radar (SLAR). This paper addresses the issue of non-sidelooking array radar from a STAP point of view. From the pattern of the minimum variance distortionless response (MVDR) spectra, we can accurately estimate the drift angle by applying some fitting algorithms. We also exploit the fact that the Doppler and spatial frequencies are almost proportional to estimate the aircraft velocity in the same manner as the drift angle. The merits of these methods are studied by using the real data from multi-channel airborne radar measurement (MCARM) system. [C1830]

"Linear prediction of range-dependent inverse covariance matrix"

In this paper, we study issues associated with applying linear prediction theory to the range-dependent inverse covariance matrix (PICM) in bistatic airborne radar systems. For bistatic ground moving target indication radar, the clutter Doppler frequency depends on range for all array geometries. This range dependency leads to problems in clutter suppression through STAP techniques. An analysis of a new technique, proposed to obtain an estimate of the inverse covariance matrix using least squares estimation, is provided in this paper. Simulation results show a significant improvement in processor performance, as compared to conventional STAP methods. [C1831]

"Optimum target detection using illuminators of opportunity"

Unlike classical bistatic radars, passive radars make use of illuminators of opportunity to detect targets and to estimate target parameters. One existing radio transmission suitable for passive radar operation is the global system for mobile communication (GSM). For non-cooperative bistatic configurations, one of the major difficulties is the estimation of the reference signal which is required to perform detection. This reference signal, a priori unknown, can be extracted from the signal received at the antenna array provided the direction of arrival of the direct path signal is known. Conventional matched-filter based Doppler filtering offers the possibility of placing the target and interferences in a domain where they can be separated based on Doppler shift. However, slow moving targets residing near mainbeam clutter in the range-Doppler diagram, remain difficult to detect. Internal clutter motion (ICM) exacerbates this issue by spreading the clutter signal power in Doppler frequency. In this paper, we first present a method to estimate autonomously the direction of the illuminating GSM base station from measurements obtained with a two-element antenna array. We passively detect the azimuth of the transmitter without a priori knowledge of the environment. Spatial processing is then employed to attenuate the

direct path signal and mitigate its influence on the target detection process. We then propose two methods able to cope with clutter echoes with non zero-Doppler components. We first propose an extension of a CLEAN-like algorithm. We also propose to extend adaptive matched filters to noise-like signals. The adapted matched filter can be used to suppress strictly static clutter but also clutter affected by ICM. These methods are validated by using actual clutter measurements obtained from a passive radar using a GSM base station as illuminator of opportunity. [C1832]

"A noncoherent approach to radar localization through unknown walls"

A simple and practical noncoherent approach to through-the-wall radar detection and localization in the presence of unknown walls is presented. The technique corrects for the shifts introduced in target location estimates due to ambiguities in the wall thickness and dielectric constant. Data is collected using three independent monostatic single-antenna radar units, employing stepped-frequency signals, at two or more different standoff positions of the radar system from the wall. In post-data acquisition processing, one of the wall parameters assumes a fixed value. Localization is then performed, for different assumed values of the other parameter at different standoff positions, using a trilateration-based technique that incorporates the presence of the wall. Target displacement trajectories, each corresponding to a different standoff position, are then formed and the cross-over point is estimated to be the target location. The results show that the radar system is able to correctly locate targets behind unknown walls. [C1833]

"Space-time transmit signal construction for multi-mode radar"

This paper addresses the problem of constructing, selecting, and/or evaluating non-separable space-time transmit functions for radar transmitters. By expressing a constrained space-time transmit function as a superposition of space-time basis functions, this problem is recast as finding an optimal set of superposition weights, which are collected and expressed as complex transmit vectors. Optimality in this problem is defined as the transmit vector that results in an optimal radar measurement, and thus depends on the radar task, target scenario, and receiver construction. After discussing the properties of the ideal (but unobtainable) radar measurement, an information theoretic criterion is presented as a logical method for selecting optimal transmit vectors. A numeric simulation demonstrates the efficacy of this method. [C1834]

"End-to-end modeling and simulation of GMTI target detection from space"

The design of space based radars for detection of ground moving targets must consider several factors to be operationally effective. The high speed of the satellite coupled with unknown motion patterns of the ground moving vehicles requires efficient detection and geolocation algorithms, as well as dynamic tasking of the satellite. An end-to-end simulation of the process has been constructed and a realistic scenario has been analyzed in terms of the detection statistics and effects of satellite and spacecraft motion and deformation errors. Three analytic META models have been constructed to evaluate antenna and signal processing architectures, while maintaining an effective simulation throughput. The effects of these META models on signal to noise ratio, probability of detection and minimum detectable velocity are examined. Examination of key measures of performance provides insight into sensor design and tasking requirements. [C1835]

"Evaluation of antenna architectures for angle estimation of endo-clutter targets in airborne adaptive radars"

Adaptive beamforming techniques such as space-time adaptive processing (STAP) combine spatial and temporal degrees of freedom to detect slow moving targets in strong clutter backgrounds. Many techniques exist for choosing the spatial and temporal degrees of freedom. In general these techniques are typically evaluated based on their ability to provide good target detection performance using performance metrics such as signal to interference plus noise ratio (SINR). Since adaptive radars must also provide target location information it is important to also consider how the choice of spatial degrees of freedom will impact direction-of-arrival estimation performance. This paper will investigate the DoA estimation performance of various airborne array architectures including elements and fixed beams (beamspace). It will be shown that in some interference scenarios the spatial degrees of freedom required for good detection performance differ from those required for good DoA estimation performance. [C1836]

"Borehole radar performance characteristics and applications for underground change detection"

Low-frequency borehole radars have proven useful in recent years as tools for locating underground features, such as rock fissures and voids. In fact, these radar systems are now commercially available at multiple operating frequencies. Most of the borehole radar applications to date have utilized the systems in a tomographic mode because of its capability to locate a target between two boreholes. In this paper, we focus on

the use of a borehole radar system in a reflective mode because of its capability to detect a target anywhere in the vicinity of the radar. As expected, the detection range of the system is severely limited due to two-way attenuation through the earth. Nonetheless, we show that it is possible to form a roughly focused range-vs.-depth image of the region surrounding the borehole. More importantly, by developing and implementing some straightforward signal processing techniques, we are able to detect the introduction of a target into an adjacent borehole in both the focused and the unfocused imagery. [C1837]

"Performance enhancement of the FRACTA algorithm via dimensionality reduction: results from KASSPER I"

The recently developed FRACTA algorithm is a reiterative censoring and detection algorithm for space-time adaptive processing (STAP) which has been shown to provide excellent detection performance in non-homogeneous interference environments. In this paper, a partially adaptive implementation of the FRACTA algorithm is presented which significantly reduces the high computational complexity and large sample-support requirements of fully adaptive STAP. Prior to application of the FRACTA algorithm, the data is passed through a multi-window post-Doppler dimensionality reduction transformation. Two implementations of the multi-window post-Doppler dimensionality reduction methodology are considered: PRI-staggered and adjacent-bin. A detailed analysis of the application of the partially adaptive FRACTA algorithm to the KASSPER I challenge datacube is presented. The PRI-staggered approach with D=6 filters per Doppler bin is found to provide the best detection performance, outperforming the fully adaptive case while simultaneously reducing the runtime by a factor of ten. Using this implementation, partially adaptive FRACTA detects 197 out of 268 targets with one false alarm (the clairvoyant processor detects 198 targets). In addition, the partially adaptive FRACTA algorithm is shown to be resilient to jamming, and performs well for reduced sample support situations. When compared to partially adaptive STAP using traditional sliding window processing (SWP), the runtime of partially adaptive FRACTA is 14 times faster, and the detection performance is significantly increased (SWP detects 46 out of 268 targets with one false alarm). [C1838]

"SBR sparse array performance with subarray orientation and timing errors"

Coherent multiple aperture radars have been proposed for ground moving target indication to improve tracking accuracy and for along-track interferometry for detecting slow moving objects. An alternate architecture is indicated for detection of very slow moving targets. The approach that promises the most effective detection of slow moving targets is along-track interferometry (ATI). The Air Force Research Laboratory's RLSTAP has been used to synthesize the clutter and target returns for a sparse space based radar array. This paper considers the limitations on along-track interferometry detection of moving targets, due to metrology on array orientation and coherency, and target motion. The effects of orientation between the two subarrays can be accommodated if accurate metrology and compensation are provided. [C1839]

"Multiple sectors, multi function, multi radar dwell time management using particle swarm optimization (M3RTM)"

In this paper a particle swarm optimization algorithm based approach is presented for dwell time management of multiple multi function radars monitoring multiple sectors. Each radar can perform two functions, which are normal surveillance (NS) or search and track targets. Multiple radars are used to perform these functions for multiple sectors. A particle swarm optimization based algorithm evolves the optimal dwell time management. The dwell management affects the probability of detection of targets, as well as the surveillance coverage range. The first objective of the paper is to optimally allocate the dwell time of multiple radars to surveillance and track tasks to achieve the maximum coverage of the sector while achieving the required probability of detection for all the targets. In the second case, beams from multiple radars are used to track targets and improve the probability of detection. The objective is to optimize the coverage of each region as well maximize the probability of detection of different targets. The decisions of using radar resources, which are its dwell time and energy, have to be made in real time and arriving at optimal configuration is non trivial. The particle swarm optimization algorithm covers the targets by varying the range which each of the radar will cover in each sector. Particle swarm optimization is proposed to intelligently search and find the optimal time management. The ability of particle swarm to achieve and quickly converge to an optimal solution, which is a pattern of assigning functions to dwells and simultaneously setting the sector's instrumented range for the multiple radars, is presented. [C1840]

"Cramer-Rao bounds for target Doppler and power in space based radar"

In this paper, the Cramer-Rao bound for target parameters from a space based radar platform is derived. In particular, the bounds for target Doppler and power are derived under a variety of conditions-target in white noise, target in clutter and noise case. In the later case, the performance is analyzed with range foldover and in

the presence/absence of earth's rotation. When both these phenomena are present, the bound is shown to be inferior compared to other situations where only either effect is present. In the general case, methods such as waveform diversity should be considered for superior target detection. [C1841]

"Atomic decomposition for ISAR imaging"

We explore the capabilities of atomic decomposition (AD) for ISAR imaging. On the contrary to our previous work with AD where our research was focused on radar signal detection and maximization of sensitivity, the main concern in ISAR imaging based on AD is to obtain focused images, target feature extraction and low computational burden. [C1842]

"Detecting moving targets in SAR via keystoning and multiple phase center interferometry"

Without motion compensation, synthetic aperture radar (SAR) images of the ground are generally blurred. In 1997, MITRE reported the development technique called the keystone process for removing the range migration caused by the radial velocity component of each pixel's movement within the scene, whether moving or stationary with respect to the ground. When applied to multiple phase center phased array radar data, this first pass process allows for automated detection of moving targets via phase thresholding. Once detected in phase space, the moving targets can be individually and automatically focused using the procedures previously reported. Although we can easily detect and accurately geo-locate bright (large radar cross-sections) moving targets using either phase or amplitude thresholding techniques, we have found that, for smaller targets, the phase differences between the cells containing the moving target are greatly distorted by the presence of strong ground clutter simultaneously present in those cells. Only after the ground clutter is cancelled will the phase difference be sufficiently dominated by the target response to allow correct geo-positioning. Here we report on a technique whereby the clutter may be cancelled by using multiple phase centers. [C1843]

"A New Algorithm for Scattering Calculation of Absorber Coated Objects"

In certain applications, for various reasons, it is necessary to reduce the RCS of targets such as aircrafts, missiles, and satellites. Distributed loading is one of the means of reducing the RCS of targets. In this paper a new algorithm for scattering and RCS computation of distributed loaded objects has been presented. In order to compute scattered field from these objects we have used the parabolic equation method. Solving parabolic equation with the marching method needs limited computer storage even for scattering calculations of large targets. Distributed loaded object's boundary has been modeled by Leontovich boundary conditions. Various types of object's boundaries, for modeling complex objects, have been considered and necessary equations have been derived. In order to show the validity of numerical results, the analytic solution for scattered field and RCS of distributed loaded cylinder has been obtained. Next, numerical results for RCS of cylinder have been compared with analytic solution. Finally scattered field and RCS of a distributed loaded missile are calculated [C1844]

"Monopulse-Doppler Radar Front-End Concept for Automotive Applications Based on RF MEMS Technology"

A concept for a high pulse repetition frequency (HPRF) monopulse-Doppler radar front-end for automotive applications is presented. The design is based on an RF MEMS electronically scanned array (ESA). The front-end detects targets up to 150 m with a range resolution of 1.5 m, unambiguous relative velocity estimation up to 400 km/h with a velocity resolution of 6.25 km/h. The front-end is capable of scanning plusmn;11deg degrees from boresight in azimuth. Amplitude-comparison monopulse tracking allows the radar to track targets with an angular deviation from the scanning angle up to plusmn;2.5deg which is a fraction of the beamwidth. The design is optimized for 38 GHz, but is readily scalable to the 76-77 GHz band and brought into compliance with the ITU-R recommendation M.1452 (05/00). It is fabricated using wafer-scale monolithic tile construction. The laminate consists of a 6 inch fused silica wafer which contains a constrained corporate MEMS true time delay (TTD) feed network, two T/R modules and a planar IF monopulse processor, and a Rogers TMM3 substrate which contains a 16 times 8 microstrip antenna array [C1845]

"Edge Diffraction Computing Based on SCTE"

The RCS calculation for high frequency large dimension complex targets in SCTE is divided into two parts: facet and edge. Reflection at conducting surfaces can be computed by using PO approximation. When it comes to identify the edges and calculate the edge diffraction, we obtain the edge parameters judging all edges of 2-dimension models presented in the screen which have been sheltered. Diffraction at edges is computed by MEC and PTD. The calculating results of typical targets are consistent with related references and experiment results. It indicates that the judgment method of target edges and obtaining method of edge parameters are feasible

[C1846]

"Heterogeneous Fusion of Video, LIDAR and ESP Data for Automotive ACC Vehicle Tracking"

This contribution introduces an approach to cross-calibrate automotive vision and ranging sensors. The resulting sensor alignment allows the incorporation of multiple sensor data into a common detection framework. Exemplarily, we show how a realtime vehicle detection system, intended for emergency breaking or ACC applications, benefits from the low level fusion of multibeam lidar and vision sensor measurements in discrimination performance and computational complexity. The following tracking stage estimates the position and velocities of targets to permit distance control, time to collision measurements and further situation analysis [C1847]

"On Bayesian Tracking of Extended Objects"

In tracking and sensor data fusion targets of interest are usually considered as point source objects; i.e. compared to the sensor resolution their extension is neglected. Due to the increasing resolution capabilities of modern sensors, however, this assumption is often no longer valid: different scattering centers of an object can cause distinct detections. Examples of extended targets are found in short-range applications (littoral surveillance, autonomous weapons, or robotics). As an extended target also a collectively moving, loosely structured group can be considered. This point of view is all the more appropriate, the smaller the mutual distances between the individual targets are. Due to the resulting data association and resolution conflicts any attempt of tracking the individual objects is no longer reasonable. With reference to simulated radar data produced by a partly resolvable aircraft formation a Bayesian solution to the resulting tracking problem is proposed. Ellipsoidal object extensions are modeled by random matrices and treated as additional state variables to be estimated or 'tracked'. We expect that the resulting tracking algorithms are relevant also for tracking large, collectively moving target swarms [C1848]

"A Direct Path Interference Cancellation Approach to Passive Radar Based on FM Radio transmitter"

Target detection by non-cooperative illuminator is a research hotspot in electronic warfare field, with four countering' potential advantages. One of the major problems in bistatic radars with continuous waves is the direct path interference (DPI). The conventional solution to this problem is to use an adaptive antenna by steering null towards the interference. Unfortunately the null depth obtained by this technology is not enough for surveillance radar. First of all DPI based on FM broadcast transmitter in passive radar is analyzed in this paper. Secondly, a DPI cancellation approach based on adaptive fractional delay estimation (AFDE) is in detail introduced how to deal with this problem. Finally, a passive radar experimental system based on FM broadcast transmitter is discussed. Simulation results by applying real collected data show the provided method is effective [C1849]

"Target Detection and Characterization using H/alpha Decomposition and Polarimetric Signatures"

Recently, the characterization and classification of terrain-cover using polarimetric SAR data has been extensively investigated and reported on (J.S.Lee, 1994). In this paper we re-examine the entropy-alpha approach (J.S.Lee, 1999) to radar polarimetry and show how the basic method may be augmented by the addition of the polarimetric signature parameters (F.T. Ulaby and C. Elachi, 1990), the propagation and helicity phase angles and the backscattering cross section. The method has been tested using the full polarimetric airborne data sets acquired with DLR's experiment SAR (E-SAR). The test region is the area of Oberpfaffenhofen, Germany acquired in the P-band. The results agree with the accepted understanding of radar backscatter and show that the use of the polarimetric signatures deliver complementary information to the entropy/alpha decomposition [C1850]

"Radar Cross-Section of Targets using Beam wave incidence for Horizontal Polarization"

The behavior of RCS of partially convex targets taking large sizes up to five wavelengths in free space was evaluated. The scattering problems of plane and beam wave incidences were considered. In this study, the effects of the target configuration together with beam width on the laser RCS (LRCS) compared to the case with plane wave incidence were clarified. When the target size becomes larger enough than the beam width, it was found that target curvature has a slight effect on the LRCS behavior. On the other hand of the later case, the LRCS was proved to differ obviously from RCS for plane wave incidence and that difference increases with target size. At certain limit, LRCS diminishes with large enough target and the beam wave incidence becomes incapable of target detection. For larger beam width, LRCS becomes closer to RCS for plane wave incidence,

however, it changes obviously with target curvature [C1851]

"Analysis of an X-Band Retrodirective Noise Correlating Radar for Large-Caliber Bullet and Projectile Detection"

This paper focuses on the performance of a retrodirective noise correlating radar using a novel analytic tool-the retrodirective matrix (RM). The RM couples the transmit array to the receive array through free space, and when combined with band-limited electronic feedback becomes part of a loop analysis that is useful in analyzing the transformation from random noise to quasi-coherence, and in predicting the radar detection time and range as a function of array size and electronic gain [C1852]

"UWB Radar Calibration Using Wiener Filters for Spike Reduction"

Ultra wide band (UWB) radar systems are used to get information from a detected target. This can be done by studying the shapes of incident and reflected pulses. To evaluate the target transfer function, a calibration is necessary to eliminate the influences of the system and the environment. The calibration includes deconvolution operations producing spike artifacts. In this paper a calibration approach for spike suppression by using Wiener filters in the deconvolution process is introduced [C1853]

"Soil Moisture and Surface Roughness Effects in Ground Penetrating Radar Detection of Land Mines"

Nonmetallic mine detection with GPR is challenging because of poor target/soil contrast and clutter from the random rough ground surface. Greater soil moisture implies higher dielectric constant, which in turn increases contrast and scattering of radar waves, but also increases the contrast between the air and the soil, increasing clutter. The finite difference time domain method for modeling impulse radar is use to quantify the effects of clutter on the target signal for both ideal smooth ground surfaces and rough surfaces for uniformly dry, wet, and a profiled moisture distribution characteristic of short-time watering. Results indicate that each uniform moisture case offers detection features that allow for the distinct temporal and spatial separation of target and clutter signals, but that non-uniform soil moisture makes nonmetallic mine detection problematic [C1854]

"Data Fusion for Ground Moving Target Tracking"

The aim of ground surveillance is the large scale, continuous and near real time determination of a dynamical ground picture. This task comprises detection and tracking of moving single targets and convoys, mobile weapon systems, and military equipment. The sensors of choice are airborne GMTI-radar (GMTI: ground moving target indicator) and SAR (synthetic aperture radar). As ground target tracking often suffers from dense target situations, high clutter, and low visibility, the integration and fusion of external background information is essential for providing precise and continuous tracks. We present multi hypotheses techniques for tracking several targets in complex ground situations with clutter. Methods to incorporate topographic information, in particular digital road maps, are described and demonstrated [C1855]

"Short range detector of static or mobile targets in the ISM band 2.45 GHz"

This paper presents a RF design for a short range (10-50 cm) detector of static or mobile targets and a simple new method of signal processing. A brief study of classical detection systems is firstly presented. Then the new radar architecture and the principle of detection are experimentally validated in the ISM band 2.4-2.48 GHz [C1856]

"Stealth Consideration for Passive Millimetre-wave Detection and Guidance"

Under actual threat of passive millimetre-wave (MMW) detection and guidance, to enhance survivability of ground target in future battlefield, MMW passive stealth technology research is conducted. Its necessity is analyzed and certified, and MMW passive detection distance is analyzed on the base of target radiation characteristic testing principle. The main direction for MMW passive stealth, the shape and the materials behavior control, are pointed out and the actual control methods are analyzed [C1857]

"Range Finding by Using NRD Guide Pulse Radar Front-End at 60 GHz"

An NRD guide pulse radar front-end was fabricated for level sensor applications at 60 GHz. Main emphases were placed on circuit configuration and digital signal processing of multi-reflection for short range detection. Typically, an oscillation power is divided by a junction circuit and is introduced into two parts. One is for transmitter, and the other is for LO wave to construct hetero-dyne detection in receiver and the frequency of the

former is up-converted so as to be different from the frequency of the LO wave, and thus, an amplifier is installed in the transmitting side due to low power of the up-converted millimeter-wave. In this paper, we proposed a new circuit configuration, which consists of a Gunn oscillator with two output ports to eliminate a junction circuit, a direct pulse-modulator to obtain a high level transmitting power without an expensive millimeter-wave amplifier, and a filter-based down-converter with an up-converter as a local oscillator. Multi-reflection between the radar front-end and target was removed by introducing an FPGA-based digital signal processing including high-speed counting, memorizing, and averaging. Good range finding was performed because the error was less than 1 % for the distance from 2 m to 40 m [C1858]

"A Multipath Viterbi Data Association Algorithm with uncertain ionospheric state"

The tracking system of over-the-horizon-radars (OTHR) inevitably output multiple tracks for one target in radar coordinate because of serious multiple propagation modes. At the same time, great error is usually introduced for the uncertain of the ionospheric state. In this paper, a multipath Viterbi data association (MVUI) algorithm with uncertain ionospheric state is proposed, through modeling target movement in ground coordinate and implementing data association in radar coordinate so that Viterbi data association (VDA) is extended from association between measurement and track to association among measurement, propagation mode and track. The simulation results show that MVUI improves the tracking performance at low probabilities of detection [C1859]

"Radar as a Tool for Antiterrorism"

Recognizing of peoples and group of peoples on the native environment with different conditions is an important task for antiterrorism activity in many different regions (Chechnya, Afghanistan, Iraq, etc.). Report describes the possibilities of radar technologies for solution of this task for different conditions. The base of new methods and equipments is a polarization optimization for selection of radar target. Main parameters for polarization optimization are: different kinds of native environment (woods, rocks, beaches, etc.), weather (snow, rain, wind, etc.), temperature, pressure, etc [C1860]

"Distributed Pre-Processed CA-CFAR Detection Structure For Non Gaussian Clutter Reduction"

This paper deals the cell averaging constant false alarm rate (CA-CFAR) distributed RADAR detection of targets embedded in a non Gaussian clutter. We develop a novel pre-processing algorithm to reduce spiky clutter effects, notably a non linear compression procedure. This technique is similar to that used in non uniform quantization where a different law is used. Two approaches to combine data from the pre-processed CA-CFAR detectors are proposed The performance characteristics of the proposed CA-CFAR distributed systems are presented for different values of the compression parameter. We demonstrate, via simulation results, that the pre-processed procedure combined with distributed systems when the clutter is modeled as alpha-stable distribution, are computationally efficient and can significantly enhance detection performance [C1861]

"The Intelligent Identification of Air and Sea Targets in Coastal Radars"

Target identification is important in coastal radars to separate air and sea targets. In this paper a novel algorithm for identification of air and sea targets in coastal radars is presented. For this purpose, a multiple PRF technique along with a maximum likelihood frequency estimation method has been used. Then an intelligent algorithm, based on artificial neural networks, or a simple and efficient algorithm are utilized for resolving the Doppler frequency ambiguity and the classification of sea and air targets. Our simulation and practical results have shown that this method has an excellent performance to identify air and sea targets in coastal radars, even in low SNRs [C1862]

"Characterisation of a Multistatic Radar System"

In this paper we report on the initial characterisation and calibration of a multistatic radar system, which has been designed using 'commercial off the shelf components'. This initial test strategy will provide a useful gauge of how effectively the system can detect certain simple targets and thus pave the way for further work looking at developing multistatic radar systems [C1863]

"Fast and Accurate Method for PCL Radar Detection in Noisy Environment"

A new fast and very accurate method for target detection in PCL radars is presented. This algorithm in noisy environment with SNR up to -60 dB could provide the perfect and accurate detection. Presented initiative algorithm apply a special filter bank to the target signal and clean the additive noise of the environment from it and detect the multiple targets with different RCSs [C1864]

"2-Dimensional Measuring Method Using a Wide-area Surveillance Sensor with Leaky Coaxial Cables"

We have developed a wide-area surveillance sensor with a pair of leaky coaxial cables (LCX). It detects targets in the surveillance area by scattering signals generated by targets whose positions are measured using propagation delay time. Such a sensor has been studied previously; however, several problems remain. The primary issue is two-dimensional sensing which in practice is desired to improve the accuracy of the boundary line of the surveillance area. In this paper, we present a fundamental beam-forming technique for LCXs and a method for measuring 2-dimensional target position using a multi-frequency measurement technique [C1865]

"Monostatic Radar Signatures of Significant Classes of Ground Targets, in the Time and Frequency-Domain"

The problem of characterizing the radar returns from complex man-made localized targets using airborne radar platforms has been and currently is a topic of tremendous interest. This paper presents results of modeling four generic types of ground targets, and analyzes the monostatic radar cross section (RCS) both in the frequency and the time domain. The recorded results reinforce the conclusion that in realistic situations return signals are complex enough to include higher order terms, other than the shifted in time and frequency replica of the transmitted signal. A mechanism is shown on how to estimate these higher order terms. The existence of these terms allows one to see how signals are structured in the time domain. This in turn may successfully lead in the development of suitable matched filters for the class of targets studied in this paper [C1866]

"Detection of Small Changes in a Hip Prosthesis using the E-Pulse Technique"

A subsurface target identification scheme based on the E-pulse technique is proposed and investigated. The target inside a homogenous medium is approximated using Baum's transform. An E-pulse is constructed with the transformed complex natural resonances (CNRs) and convolved with the target returns from subsurface targets. Numerical examples of a hip prosthesis implanted within a homogenous half space shows that the proposed technique is capable of differentiating small physical changes between two hip prosthesis models at least under a homogeneous half-space condition. The proposed method can also be applied to other subsurface target detection problems such as UXO recognition, and for a dielectric target, the problem of recognition of malignant lumps within human breast tissue [C1867]

"Evaluation and Tuning of a SAR Detector using Sparse-Array Spotlight Mode Simulations"

We describe a method of tuning a simple detection process of stationary targets in SAR images. The tuning metric accounts for the squared-error performance of prescient estimators of target location and reflectivity. The efficiencies of these prescient estimators are compared to their Cramer Rao bounds (CRBs). The off-line tuning is performed by collecting statistics of scatterer estimation in SAR images created using sparse-array spotlight mode simulations [C1868]

"Barankin Bounds for Target Localization by MIMO Radars"

Multiple-input multiple-output (MIMO) radar/sonar systems transmit signals coded in time and space domains and have several advantages upon conventional systems. In this paper, the Barankin bound on target localization errors is used for analysis of the threshold signal-to-noise ratio (SNR) of MIMO radar/sonar systems. It is shown that the threshold SNR of MIMO systems with spatially orthogonal transmit signals, is significantly lower than with coherent transmit signals. Orthogonal signal transmission results in lower threshold SNR, because of the lower sidelobes in the likelihood function. The lower sidelobes are achieved, since MIMO configuration allows to process the signal in both transmit and receive modes. Simulation results show that the threshold SNR obtained by orthogonal signal transmission is lower by more than 10 dB compared to coherent signal transmission [C1869]

"A New Radar Detector in Unknown Signal and Clutter Environment"

In this paper, we introduce a new detector in the absence of any statistical knowledge of the fluctuating signal; perhaps a weak signal, and clutter. We use a few sampled fractional moments (FM) to construct the maximum entropy (MAXENT) probability density function (PDF) estimation. These moments; i.e., their fractional orders, are obtained from the observed sample variates. Using the fractional moments instead of the integer moments the estimated PDF is quite close to the true PDF. The test statistics is a fractional polynomial of very low order of the received samples. We consider the following target fluctuating models, swerling, lognormal, and Rician. We also consider the clutter to follow low and heavy tail models; i.e. Rayleigh, and lognormal [C1870]

"Moving Target Localization for Indoor Imaging using Dual Frequency CW Radars"

In this paper, we propose a simple method, to determine the unambiguous range of a moving target, using dual frequency continuous wave (CW) radars. The carrier frequencies, and hence the wavelength, determine the maximum unambiguous range of the target. The technique is capable of determining range for an indoor moving target. It uses phase comparison of the Doppler signals to estimate the range, where as the target velocity is directly obtained from the Doppler shift. Simulation results are presented in the presence of noise to validate the technique. Experimental results are also provided showing the effectiveness of the proposed method for indoor range estimation. Specifically, we have performed two experiments, the first experiment is in an indoor laboratory setting with absorbers to mitigate multipath. In the second experiment, the target was behind a one foot thick concrete wall, in an indoor setting without absorbers. For both experiments, we were able to successfully detect the target and estimate its range [C1871]

"Analyses of Autofocusing Schemes for Indoor Imaging with Unknown Walls"

The quality and reliability of through-the-wall radar imagery is governed, among other things, by the knowledge of the wall characteristics. Ambiguity in wall characteristics has a two-fold effect. It smears and blurs the image, and also shifts the imaged target positions. In this paper, we consider the smearing effect and present an autofocusing technique, based on higher order statistics, which corrects for errors under unknown walls. This is achieved by tuning the wall variables until the sharpest image is obtained. Simulation results show that the proposed technique provides high-quality focused images with target locations in close proximity to the true target positions [C1872]

"A waveform strategy for detection of targets in multiplicative clutter"

Conventional radar signal processing techniques approximate multipath as a linear process. Unfortunately, such an approach results in poor detection performance and because the model for the interference does not accurately represent the physical scattering process. We instead propose a method that uses the flexibility of waveform design for a given aperture to linearize the physical scattering phenomenon. This allows us to successfully detect targets using a Wiener matched filter approach in high multipath conditions. [C1873]

"Programmable Processor Design for Givens Rotations based Applications"

A wide range of applications involve matrix decompositions which can be computed using givens rotations. A programmable processor for givens rotations offers more flexibility than highly tailored systolic array hardware implementations. The programmable processor design presented in this paper employs an approximate rotations method to compute givens rotations. Instantiations of this programmable processor can then be arranged/configured (i.e. in arrays of varying size and dimension) according to the requirements of the target application. Another advantage of this approach is that the processor can be programmed to compute different algorithms (e.g. QR decomposition, singular-value decomposition or a combination of both) [C1874]

"Single-Snapshot Beamformer Performance using Large Arrays with Faulty Sensors"

Large sensor arrays are prone to element failures which can seriously degrade their performance. In the event of sensor failures, conventional non-adaptive re-design of array weights for the resulting non-uniform or even sparse array often leads to undesirable mainlobe-versus-sidelobe level trade-offs. Alternatively, adaptive array processing techniques can be employed but for large arrays it can be compromised by lack of snapshot support in dynamic environments. Recently, an approach called beamspace adaptive channel compensation (BACC) was introduced based on the idea of reconstructing the filled array data from the receive beams in which the sidelobe leakage of strong interferers from adjacent beams is minimized. In this paper, BACC and various alternatives are evaluated using actual radar data with both injected and real scatterers. Results of four methods, BACC, MV adaptive beamforming using an augmented Toeplitz covariance matrix (Toeplitz-MV), principal solution beamforming, and conventional beamforming in the presence of faulty sensors are compared in terms of ROC performance, probability of detection versus SINR, and the unmasking of targets in estimated range-Doppler spectra [C1875]

"Optimal Adaptive Array and Angle Tracking for Multiple Targets-A Re-examination of Optimal Array Processing"

The optimal array for detecting the signal from a desired direction but contaminated by receiver noise and strong interference from different sources with unknown arriving-angles is re-examined. The well-known optimal array is obtained by inverting the covariance matrix of interference and noise to maximize the signal to interference and

noise ratio (SINR). In practice, the covariance matrix is unknown and has to be estimated by a sample covariance matrix. The optimal array is thus estimated by inverting the sample covariance matrix. This procedure has been employed in optimal array research without challenge. However, it is shown in this paper that the estimated optimal array fails to yield the highest SINR in the case of unknown arriving-angles. Instead the highest SINR can be achieved by optimally estimating the arriving-angles of interference followed by a constrained matched filter, which maximizes the signal to noise ratio subject to canceling the interference from the estimated arriving-angles. In order to reduce the computational burden, an angle-tracking system for multiple targets is adopted to achieve the optimal estimation of arriving-angles. The resulting system of angle-tracking adaptive array offers the highest SINR at a computational burden only on 2 the order of N middot M2 multiplications within a radar range-cellDeltatau, rather than N3multiplications in the well-known but questionable estimated optimal array. Here N is the number of sensors in the array and M the number of interference sources. Typically, N = 1,000 in a planar radar array, M = 2-10 and Deltatau = 1 mus. Numerical simulations confirm the theoretical results [C1876]

"Doppler-compensated adaptive pulse compression"

Within the minimum mean-square error (MMSE) context the adaptive pulse compression (APC) algorithm has been shown to effectively suppress the range sidelobes resulting from large targets to the level of the noise thereby unmasking nearby small targets and yielding substantial sensitivity improvement over deterministic matched/mismatched filtering techniques. However, this sensitivity improvement is limited by filter mismatch whenever the radar returns from large target(s) undergo a substantial Doppler phase shift caused by significant radial motion relative to the radar platform. To correct for the Doppler-induced filter mismatch, the Doppler compensated APC (DC-APC) algorithm is presented whereby the respective Doppler shifts for large target returns are jointly estimated along with the illuminated range profile and subsequently incorporated into the APC adaptive receive filter formulation thus suppressing the Doppler-mismatch-induced range sidelobes and regaining a significant portion of the sensitivity improvement of APC. [C1877]

"Radar Waveform Design using Minimum Mean-Square Error and Mutual Information"

This paper addresses the problem of radar waveform design for target identification and classification. Both the ordinary radar with a single transmitter and receiver and the recently proposed multiple-input multiple-output (MIMO) radar are considered. A random target impulse response is used to model the scattering characteristics of the extended (nonpoint) target, and two radar waveform design problems with constraints on waveform power have been investigated. The first one is to design waveforms that maximize the conditional mutual information (MI) between the random target impulse response and the reflected waveforms given the knowledge of transmitted waveforms. The second one is to find transmitted waveforms that minimize the mean-square error (MSE) in estimating the target impulse response. Our analysis indicates that under the same total power constraint, these two criteria lead to the same solution for a matrix which specifies the essential part of the optimum waveform design. The solution employs water-filling to allocate the limited power appropriately. We also present an asymptotic formulation which requires less knowledge of the statistical model of the target [C1878]

"Signal Waveform's Optimal Under Restriction Design for Active Sensing"

We consider signal waveform's optimal under restriction design (SWORD) for active sensing. In the presence of colored interference and noise with known statistical properties, waveform optimization for active sensors such as radar can significantly increase the signal-to-interference-plus-noise ratio needed for much improved target detection. However, the so-obtained optimal waveforms can result in significant modulus variation, poor range resolution, and/or high peak sidelobe levels. To mitigate these problems, we can constrain the waveform optimization problem by restricting the sought-after waveform to be similar to a desired waveform, which is known to have, for example, constant modulus as well as reasonable range resolution and peak sidelobe level. One example of the desired waveform is the widely used linear frequency modulated waveform or chirp. We will provide a detailed solution to the constrained optimization problem and explain how it is related with the existing waveform optimization methods [C1879]

"Experimental results on single antenna target detection using time-reversal techniques"

In this paper, we describe a single antenna time-reversal based detection scheme that can be used to enhance the performance of a radar system in a multipath rich scattering environment. Using time-reversal, the response from a cluttered medium is first nulled. When the target enters into the medium, the electromagnetic energy focuses around the target so that a stronger echo is obtained. The experimental results show that depending on the amount of clutter in the medium, the performance of a radar detection scheme can be improved up to 4.8 dB using time-reversal methods with a single antenna [C1880]

"Vehicle identification and GPS error detection from a LIDAR equipped probe vehicle"

When detecting and tracking vehicles in LIDAR data it is important to differentiate between the measurements from vehicles and the measurements from fixed objects such as road boundaries. In this paper we present our approach to classify the LIDAR targets as vehicles and non-vehicle objects, and detect GPS positioning errors from a probe vehicle equipped with LIDAR and DGPS. The classification approach is developed based on a world space density image generated by averaging over historical LIDAR measurements. A correlation approach is used to detect GPS positioning errors and prevent incorrect classifications of the targets caused by erroneous projections between the vehicle coordinate system and the world coordinate system. The classification approach is then modified accordingly and becomes robust to these GPS errors [C1881]

"Resonance behavior of a dielectric target in a half-space using the CNR (complex natural resonance) method"

The primary objective of this research work is to detect and identify a dielectric target buried below a homogeneous half-space from the backscattered time domain signature. It is well known that the transient scattering of electromagnetic waves from a conducting or dielectric target contains information about the resonance behavior of the target itself as quantified by the complex poles or complex natural resonances (CNR) of the target. This paper describes an approach to model the impulse response of a dielectric target in a half-space using a time domain deconvolution technique. A finite difference time domain code is used to calculate the time domain responses. A singular value decomposition algorithm is used to estimate the impulse response of target and a robust algorithm such as matrix pencil of functions (MPOF) algorithm is used to calculate the CNR's of the scatterer. The extracted poles are compared with the poles scattered by the target in free space [C1882]

"Improved Target Detection and Tracking in Littoral Environments Using a Self-organising Spatio temporal CFAR"

This paper describes a self organising spatio-temporal radar CFAR system that uses multiple intelligent software agents to detect and adapt the processing to features in the environment. By combining both temporal and spatial data gathering sufficient samples can be collected to allow both the first and second order moments of the clutter distribution to be approximated for each cell. By gathering higher order statistics to a useful accuracy, more stable thresholds may be produced. [C1883]

"Exploiting multipath propagation for GMTI in urban environments"

This paper evaluates the potential for exploiting multipath propagation for improved radar detection of moving ground targets in dense urban environments. In particular, the radar coverage offered by exploiting non-line-of-sight (NLOS) propagation from an airborne radar platform is considered. A quasi-analytical model for NLOS propagation assuming multiple specular reflections off buildings is derived to evaluate radar coverage as a function of target range, aircraft altitude, building height and separation, and relative target position on a street. A statistical characterization of the urban environment is used to compute probabilities of line-of-sight versus non-line-of-sight propagation and surveillance sweep width. Comparison of sweep width for LOS versus at least one NLOS path indicates that NLOS could offer a significant improvement in coverage rate. In essence, NLOS propagation permits radar surveillance at longer ranges with lower altitude radar platforms. In addition to radar coverage, the Cramer-Rao lower bound (CRLB) for estimation of target position in a specular multipath environment is derived. The CRLB indicates that, in theory, range accuracy improves with multiple paths and that only three paths are required to jointly estimate target range, position within the street, and street width. [C1884]

"An association algorithm for tracking multiple moving objects"

In the field of intelligent vehicle and in order to raise the road safety, an improvement of the driver's assistance, more particularly obstacles detection systems, is presented. Objects are detected with sensors laid out on a car, and are then tracked thanks to an association algorithm. Rombaut (1998) association algorithm has been modified in order to have a better decision when data reliability decreases or if one sensor fails. This paper presents Rombaut (1998) association algorithm and the modification made on it. Then, a comparison between the two association algorithms for a decreasing data reliability is made using simulated data. Finally the robustness of the two algorithms was tested with data coming from a CCD camera [C1885]

"Range-dependence Issues in Multistatic STAP-based Radar"

Multisatic radar systems offer the potential to overcome some of the limitations of the monostatic or bistatic systems. In particular, the ability to build larger apertures allows to increase spatial accuracy. Space-time adaptive processing (STAP) is a method of choice in the context of slow-moving target detection. However, the statistics of signals from multistatic radars are typically range-dependent. This range-dependence leads to major difficulties in estimating the interference plus noise covariance matrix required to perform STAP In this paper, we present a method able to compensate for the range-dependence of the signal statistics and we show that this method achieves near-optimal performance [C1886]

"Concurrent Detection and Tracking using Multiple, Flying, Sensors"

We develop a probabilistic technique for performing multiple target detection and tracking based on data from multiple, flying, sensors. Multiple sensors can facilitate detecting and discriminating low signal-to-clutter targets by allowing correlation between different sensor types and/or different aspect angles. However, the data association problem can cause the computational complexity of standard trackers to become prohibitively high when combining too much data-a problem which will be exacerbated when including data from multiple sensors. Dynamic logic (DL) is a probabilistic technique for performing data association, based upon maximum likelihood parameter estimation of mixture models, which does not suffer from a computational explosion with increasing amounts of data. Previously, a DL-based tracker was developed for the relatively simple case incorporating data from a stationary sensor platform. In this paper we expand the framework to incorporate multiple, moving, sensor platforms, which requires a revision in the parameter estimation equations. The framework is general enough to be valid for different sensor types, for example radar or electro-optical. Sample results from synthetic data are presented [C1887]

"Cognitive Radar Networks"

This paper describes the use of cognitive radar networks for the reliable surveillance of an environment where the likelihood of the presence of uncooperative targets is high. Despite the limited effectiveness of amplitude as a radar discriminant, through the clever use of detection through tracking, the detection performance of the noncoherent radar is enhanced. Further improvement in overall performance can be attained through the adaptive illumination of the environment, made possible by linking the receiver to the transmitter via a feedback channel, which, in turn, makes the tracking adaptive, and sensor fusion performed in the central base station [C1888]

"Lane Change Maneuver Detection from Probe Vehicle DGPS Data"

The impact of lane change maneuvers is fundamental to microscopic traffic flow theory. Due to the difficulty of tracking many vehicles over time and space, most of the published research in this area seek to find lane change maneuvers visually from wayside cameras. This paper presents a different approach, finding the lane change maneuvers of a probe vehicle itself using differential Global Positioning System (DGPS) data. We first use multiple probe vehicle trajectories through a study corridor to establish a reference trajectory from the median of all trajectories and this reference trajectory is used to define the position of the current lane. This approach eliminates the need for high-resolution maps accurate enough to capture the exact position of the individual lanes. Our lane change maneuver detection is then divided into two parts, controlling for the impacts of mandatory lane change maneuvers (MLC) and then for discretionary lane change maneuvers (DLC). MLC are detected by comparing the difference between the mean and median of lateral distance of all trajectories relative to a reference trajectory. After distinguishing all the MLCs, the DLC are found by setting lateral thresholds around the reference trajectory, i.e., when a given trajectory leaves this virtual lane. In the process we control for the impacts of GPS errors, such as multipath, arising from obstructions. DLC are then found by comparing the out-of-threshold-line time and length to a threshold acquired empirically from data [C1889]

"Learning Algorithm for Real-Time Vehicle Tracking"

This article presents a learning algorithm for real-time object tracking in video sequences which uses an improvement of a feature selection method known from object detection. But in contrast to trackers based on object detection methods, our approach explicitly selects the features which are best suited to track an object, which are different from the best features for object detection. The used features are constructed from pairs of image patches and related to Haar features. Besides the automatic selection of features according to their discriminative (tracking) power, the advantage of this approach is that the resulting tracker is very fast, allowing it to run in addition to a detector to robustify the object position estimation and to compensate for dropouts of the detector. A comparison of the proposed tracking algorithm with other tracking methods is presented which shows the accuracy of the proposed algorithm [C1890]

"A Distributed Detection Scheme for Multiple Monostatic Radars"

The body of distributed detection theory is based on the common assumption that all sensors test the same resolution cell at the same time. However, for multiple monostatic radars that are far from one another, it is unreasonable to assume they have common resolution cell grid. Meanwhile, it is economically appealing to use existing radars to fulfil the distributed detection. Thus, we proposed a simple data association method to map local resolution cell grids to the global cell grid of the fusion center. Considering the time of different radar sweeping a given volume may be different and the interesting target may be moving, we present a mixed summation fusion rule to overcome the harmful effect of cell grid overlap and time-asynchronization. Results show that our method far outperforms the single radar's detection performance and can improve the position estimate of target Therefore, it is feasible [C1891]

"Digital signal processing of multi-reflection for short range detection using NRD guide pulse radar front- end at 60 GHz"

A pulse radar front-end using an NRD-guide technology was fabricated for a millimeter wave level sensor, and then range finding was performed by using it. Multi-reflection however occurred between a target and a planar antenna due to a pencil beam radiation of our developing planar antenna, so that a precise distance could not be calculated for short range detection. In this paper, an FPGA-based signal processor was devised in order to eliminate such multi-reflection. Continuous sampling method was employed to reduce experimental errors, which were investigated from the viewpoint of difference of a period between a modulated pulse train and a continuous sampling clock. The error of range finding was successfully measured to be less than 12 cm for the distance range from 2 m to 20 m under the multi-reflection environment. It was improved compared with that of a signal processor without the continuous sampling method. [C1892]

"An experimental GSM based passive radar"

This paper presents a low-cost experimental GSM based passive radar and testing of ground vehicle detection. It describes the system design, signal processing, and field measurement for detecting various ground vehicles. Using this novel passive radar, numerous field experiments for various ground moving targets are extensively explored. Interesting field experiment results were presented to demonstrate the GSM based passive radar ability to detect and track the Doppler frequency of different types of ground moving targets. [C1893]

"Subsurface Investigations by MARSIS in Mars Express Mission"

The analysis of the surface return echoes in the subsurface data extraction in North Mars Polar region has shown the possibility to utilize simplified surface models, at least, for the purpose of the evaluation of the penetration depth capability. The surface simulation, obtained starting from MOLA data, has been utilized during the planning activity in order to select the MARSIS operative sequence in order to optimize the amount of scientific data taking into account the data rate available and the scientific target to be investigated during the next part of the mission. Moreover a simulator, still in progress, utilizing the surface characteristics will perform the analysis of the real data in order to make available the required information expected, by the mission, in terms of detection and identification of dielectric constant on the surface and subsurface. [C1894]

"The Joint Radar Targets Detecting and Communication System"

The combined radar system architecture for joint radar target detection and communication is considered. In this system we use complex quasi-continuous waveform of the big time-bandwidth product and duration with the combined modulation. This waveform is used in interrupted continuous wave radar technique. With reference to mariner radar [1] for a radar-location and communication it is offered complex coherent radar waveform with phase and linear frequency modulation. Problems of waveform synthesis, performance characteristic of the combined system are discussed. [C1895]

"Adaptive Target Detection in Clutter Using MIMO Radar"

In this paper the problem of target detection using coherent pulse terrain was considered for MIMO radars. We have formulated this problem as a hypothesis test. Using the generalized likelihood ratio test (GLRT) two adaptive decision schemes have been developed for clutter with unknown statistics. The performance of the proposed detectors have been evaluated using Monte-Carlo simulations. The results show the superiority of the MIMO radaars with temporal coherent processing over the conventional phased arrays. [C1896]

"A Subspace-Based Approach to Sea Clutter Suppression for Improved Target Detection"

A key issue in detection of small targets on the ocean surface using active radar is low signal-to-clutter ratio (SCR), particularly in situations involving low grazing angle and high sea state. When sufficiently high pulse repetition rates are available, it is possible to obtain several samples of the clutter in a time interval short enough that key contributors to the clutter remain approximately stationary. This paper develops an approach to estimate the clutter subspace in such scenarios and exploit this estimate for clutter suppression and improved detection performance. [C1897]

"Sequential Detection for a Target in Compound-Gaussian Clutter"

Sequential detection allows the analysis of an incoming data flow and the detection of changes in the distribution of these measurements. In this paper, we develop the sequential detection algorithm for a target under compound-Gaussian clutter. Both the target and clutter parameters are assumed unknown. We first derive estimates for these parameters, then discuss the sequential detection algorithm for two cases: target parameter is known and unknown. We consider detections for both the target appearance and disappearance. We examine the relationship between several performance measurements for the sequential detector, including the false-alarm rate and the average detection delay. In the numerical example part, we first illustrate the performance of our algorithms. Then we present an example of the optimal polarimetry design in the sequential detection. [C1898]

"Tracking Separating Targets with Possibly Merged Measurements Using Generalized Janossy Measure Concept"

This paper is concerned with tracking a group of separating targets, using possibly merged measurements from active or passive RF or IR/EO sensors. Assuming that each sensor subsystem performs single-scan-based signal processing to generate, as a recently-developed or soon-to-be-developed capability, a probabilistic assessment of the number of targets from which a single detection originates, a new kind of tracking approach based on the generalized Janossy measure concept is proposed. [C1899]

"An Efficient Implementation of the Nearest Neighbor Based Visual Objects Tracking"

An independent visual objects tracking is less reliable than the data association of visual objects tracking. This paper describes a tracking method based on the nearest neighbor (NN) data association, which serves lower computational than do the multiple hypothesis tracking (MHT) or the joint probabilistic data association filter (JPDAF) but gives low reliability, if the number of targets is increased. This reliability can be increased by selecting appropriate visual object model. To obtain low computation while capable of handling non-rigid object, we propose an object model which combines the threshold of accumulated object region and the object bounding box. The elements of the association matrix are the distance function that is proposed as a mixture of object models of distance function. The combinations of object models of distance function are important mechanism for determining appropriate state of object correspondence which can be divided into six groups: updated track, missing track, newly track, grouped track, merged track and complex track. The missing track is solved by the track life time criterion while the grouping, the merged and the complex track are resolved by using the proposed NN algorithm again. The experimental results are correctly shown on various situations of correspondence problem from surveillance image sequences [C1900]

"Bio-Medical Sensing using Ultra Wideband Communications and Radar Technology: A Feasibility Study"

The aim of this work is to study the application of ultra wideband (UWB) technology to perform biomedical sensing and vital signs monitoring in humans. Among the numerous signals that can be measured, the heart rate (HR) is chosen as the first objective due to its importance. The research is pointed towards the development of a technique that can allow both, radar sensing and communications using the same UWB transceiver. Such a sensor, could use UWB radar principles to measure the heart beat rate and UWB communication standards to transmit these measurements. Readily available commercial transceivers with minor adaptations will be considered as possible to solve for the physical layer. Signal processing for target detection will be done at higher levels. Having sensors with such "duo" properties can make them ideal nodes for wearable computing, as well as sensor and body area networks [C1901]

"Application of STAP For Detection of Target In The Presence of Ground Clutter"

For Airborne radars it is necessary to suppress the levels of the interferers well below the weak desired signal. The problem is complicated due to the motion of the radar platform as the ground clutter received by airbornne radar is spread out in range, angle and over Doppler. Space-Time adaptive processing (STAP) is a technique,

which helps to detect small signal of interest in such a noisy environment. This paper considers a generic clutter model. The simulations clearly bring out the 2-D nature of ground clutter and give an insight into the noisy environment in which the target is detected. [C1902]

"Detection of Targets in Sea Clutter Using Adaptively Truncated Interleaved Spectral-Temporal Interferometry"

A new method is introduced to detect targets in the presence of sea clutter. Most previous analysis methods have worked almost exclusively in the spectral domain, but the new method uses a combination of band-pass spectral filtering, autocorrelative algorithms and time-series analysis for target detection. The procedure is well adapted to deal with scenarios involving accelerating targets and de-accelerating targets, and outperforms traditional methods in this area. impulsive RF noise can also be effectively ignored. The method is at least the equal of traditional methods for uniformly moving craft. The method also has some advantages in detection of slowly moving targets in the presence of low frequency sea-clutter. The procedure is called Adaptively Truncated Interleaved Spectral-Temporal Interferometry (ATISTI). [C1903]

"3D motion model and detection method for ISAR imaging"

This paper develops an algorithm to detect the presence of 3-dimensional target motion from ISAR data. With the detection algorithm, we have the ability to distinguish the time intervals when the target undergoes smooth 2-dimensional motion from those containing more chaotic 3-dimensional motion. As a result, we can reliably detect those time intervals where 2-dimensional target motions are predominant and can use the existing 2-dimensional motion compensation algorithms such as the adaptive joint time-frequency to form well-focused inverse synthetic aperture radar images. [C1904]

"Radar Detection of Small Sailing Yachts"

Paper describes measurements in the real sea conditions of the maximum radar detection and tracking distances of small sailing yachts without radar reflectors and equipped with different types of radar corners by contemporaneous ship and shore based radar equipment. Researches were conducted on order of the Maritime Office in Gdynia. [C1905]

"Performance Analysis of a Novel Adaptive SLB/CFAR System"

In many radar applications, strong signals may enter through the antenna sidelobes and be interpreted as main beam signal. This results in false detection and angle errors [1]. A new adaptive sidelobe blanking (SLB) combined with a constant false alarm rate processor (CFAR) is proposed to prevent acquisition of strong target in the antenna sidelobes and also to reject pulsed interference originating in the sidelobes with maintaining constant the false alarm rate. We assume that the target is a Swerling I target fluctuation model. Closed form of probabilities of detection, false alarm, blanking and false blanking are determined and the performance of the system SLB/CFAR is analysed. [C1906]

"Performance Analysis of Permutation and Rank Tests under K-Distributed Clutter in Radar Detection"

In this paper, we analyze the performance of some nonparametric detectors (permutation and rank tests) against the parametric ones. The detector performance analysis was realized by Monte-Carlo simulations, having considered the ideal case of independent and identically distributed (IID) samples of K-distributed clutter, and nonfluctuating and Swerling II target models. The results are shown in curves of detection probability (Pj) versus signal-to-clutter ratio (SCR). Also, we have to point out that both permutation and rank detectors are constant false-alarm rate (CFAR) detectors under IID clutter samples. [C1907]

"Resource Management of a Multifunction Array Radar"

In this paper we propose resource management and simulation of the multifunction array radar (MFAR). This air defence radar can cope with two kinds of targets: aircrafts and missiles. We choose optimum search coverage and so decrease time of one scan notably. This radar can track up to 100 targets simultaneously. For estimation and prediction of the target state we use interacting multiple model (IMM) algorithm and compare the performance of this algorithm with second order Kalman filter for several trajectories. [C1908]

"Estimation Of Target Movement Parameters In Synthetic Aperture Radar"

The publication presents a technique of detecting moving objects observed by a Synthetic Aperture Radar.

Movement of the target introduces certain changes to the echo structure in SAR system. Those changes decrease SAR performance and in order to detect moving target correctly a two-dimensional Doppler filter should be applied. 2D Doppler techniques usually have high computational costs, which connected with large amount of data processed by SAR makes them difficult to implement it real-time systems. The authors propose to apply a simple 2D Doppler filter as a pre-processor and a source of an a priori information for further MTI processing. The technique of determining target's movement parameters based on a phenomenon of Range Migration is also presented. The authors show, that movement of the target changes the range migration curves and the shape of the curve can be used to estimate the target velocity. The estimates can be used to match SAR processing to a target echo. [C1909]

"Sensitivity Analysis of Configuration in Bistatic Radars"

There are inherent errors in target location and velocity measurement caused by bistatic geometry in addition to the errors that are caused in monostatic radars. In this paper, the accuracy of measurement with respect to some parameters like baseline variance and DOA estimation is considered and bistatic parameters sensitivity with respect together is formulated. [C1910]

"Multi-target Detection in FMCW Radar based on Six-Port Technology"

The traditional FMCW radar has its own limitation in multi-target detection. Six-port radar is proposed as a new way to solve this problem because of the phase measurement capability. The method of using six-port radar to suppress false alarm is discussed and computer simulations prove that the method is valid and practical. [C1911]

"Subtle Detection of Target Profiles Using Submillimeter Waves"

Continuously increasing interests and attentions for different applications in sub-MMW band (1000 to 100 mum) have been received in recent years. Many unique applications of this electromagnetic spectrum have been demonstrated by pioneer researchers, such as in astronomical molecules detection and high resolution imaging. In this paper, we investigate the sub-MMW scattering properties of perfectly conducting objects. Based on the numerical study of radar cross sections for different targets with subtle features, we show that sub-MMW has the ability to capture the subtle target profiles. [C1912]

"Adaptive Waveform Design for a Multi-Antenna Radar System"

We consider a radar system which uses an array of antennas, and is capable of adjusting the waveform transmitted through these antennas based on target and clutter statistics, on a pulse by pulse basis. A model for the radar returns which incorporates the transmit waveforms is developed. The target detection problem is formulated for that model. An algorithm is derived for designing the transmit waveform so as to optimize detection performance. [C1913]

"Stretch Processing for Long Integration Time Passive Covert Radar"

The paper presents a study of possibility of increasing the passive covert radar sensitivity by extending the coherent integration time. The long integration time induces the target range migration of moving targets. To overcome this problem, the usage of stretch processing is investigated. The paper shows, that even a simplified algorithm applying stretch processing concept, can significantly improve the radar sensitivity [C1914]

"Study on HPRF Pulsed Doppler Stepped Frequency Radar System"

Stepped-frequency radar has the ability of high range resolution. It normally adopts frequency time transformation (IDFT) processing to get the range profile of targets. Alternatively stepped frequency radar can also use time-frequency transformation (DFT) processing, with which it is regarded as a kind of Doppler (PD) radars. Through parametric design and signal processing methods, DFT method can achieve both unambiguous velocity and high resolution ranging in a single dwell under HPRF mode. This paper gives parameter design principle for HPRF PD stepped-frequency radar system, and its system implementation methods. Both theoretical analysis and simulation result prove that this radar scheme can simultaneously achieve unambiguous velocity and high resolution ranging [C1915]

"Adaptive monopluse with STAP"

Monopulse is a well known technique for high accuracy estimation of target parameters such as azimuth and elevation as well as the radial velocity. In conjunction with an adaptive processor for cancellation of interference

one obtains so called adaptive monopulse. Interference may be either jamming or clutter or both. In this contribution some properties of adaptive monopulse applied in a clutter environment is discussed. We focus on an airborne radar scenario so that the adaptive monopulse includes a space-time adaptive processor (STAP). Several different STAP architectures are compared with respect to their aptitude for target parameter estimation [C1916]

"Evidential versus Bayesian Estimation for Radar Map Building"

This paper discusses the role played by signal detection algorithms in the mobile robot map building problem. Typical mapping techniques make the assumption that the internal signal detection, which is required to produce an (r, rho) point estimate, is ideal. That is, the probability of detecting the signal is unity, and the probabilities of a false alarm or missed detection are zero. In the case of grid mapping, this allows for the occupancy probability to be distributed under the constraint of a unity summation amongst affected cells. In the case of SLAM, this allows for a feature's (x,y) coordinates to be modeled with (Gaussian) probability density functions. This paper shows that typical signal detection algorithms contain all the necessary measurement models to exactly calculate the map occupancy estimates. Furthermore, once restrictive signal assumptions are relaxed, its shown that evidence theory and not Bayesian theory should be used in the combination and updating of the map estimates. The ideas presented in this paper are demonstrated in the field robotics domain using a millimeter wave radar sensor. Target presence and absence beliefs are derived directly from signal likelihood ratios as opposed to a priori assigned constants as is typical for mapping algorithms. Results obtained from outdoor sensing experiments, show the improvement of this new model, given targets of fluctuating radar cross section (RCS) [C1917]

"Target Detection Based on The Artificial Neural Network Technology"

As it is difficult to detect small ship targets from complex background in an IR image because of the impact of kinds of noises, complex background and the smallness of the target, this paper puts forward a method of background prediction utilizing the neural network. The method estimates the background of the input image nonlinearly, gains the residual error image, and detects the target. By comparison, NARX whose hidden layer transfer function utilizing L-M algorithm can achieve more excellent target detection than other neural networks like BP in training speed and stability, thus it is research valuable in the field of small target detection in complex background [C1918]

"Novel Filter Design for detecting weak targets of slow speed out of multi-mode clutters"

The paper presents a novel stagger MTI filter design algorithm, which can detect weak targets of slow speed out of multi-mode clutters. The method is carried out by slipping pulses, and the best pulse repetitive frequencies selected by gradient-GA make the first notches of the filter banks as shallow as possible, so the weak targets in the first notch can be detected. Multi-model clutters can be suppressed by MTI filter, and blind-velocity can be appeared out of three times velocity of sound. Combined GA's the capability of the whole searching and not limited by selection of initial parameter with the gradient algorithm's advantage of fast searching, it can offer fewer initial population and low computation complexity. The simulation and performance analysis demonstrate the feasibility and validity of the algorithm [C1919]

"Analysis of STAP on MDV for Spaceborne SAR-GMTI Applications"

Space-time adaptive processing (STAP) holds tremendous potential for the new generation spaceborne radar to get good performance of ground/sea moving target indicator (GMTI). A system scheme based on the fully adaptive space-time processing of spaceborne SAR-GMTI mode of operation is presented in this paper and the minimum detectable velocity (MDV) of target in GMTI mode is analyzed. Theoretical analysis and simulations demonstrate the effectiveness of the system scheme [C1920]

"Research on Target Auto-tracking Initiation Based on Plot Fusion Processing of Multi-radar"

According to principle of target auto-tracking initiation, the track automatic initiation speed algorithm of multi-radar plot fusion system is compared with that of single radar plot system, and an algorithm for improving the track initiation speed of the system is presented by means of averaging data updated time. To meet the need of real application, the track initiation averaging time is also quantitatively analyzed for multi-radar plot fusion system [C1921]

"UWB signature analysis for detection of body-worn weapons"

Presented work is dedicated to the study of innovative principles, which can be used for the remote detection of

concealed, body-worn weapons & explosives (CW&E). The approach is based on the analysis of the late time response (LTR) of the human body illuminated by a UWB signal: if CW&E are attached to the body it will essentially influence the LTR characteristics. A set of LTR parameters represents the unique signature of target. Our aim here is to demonstrate the ability of the developed approach to extract and to interpret the signature. In order to validate a feasibility of the approach analytical consideration, full-wave modeling and initial experiment have been implemented and results have been compared [C1922]

"Application of Adaptive Stochastic Resonance in Noise Restrain"

The phenomenon of stochastic resonance (SR) in symmetric bistable nonlinear system is analyzed. The conditions which make the system to resonance are given and validated. In order to resolve the problem of improving the SNR while using airborne early warning (AEW) radar to detect slow speed target on the ground, an improved adaptive stochastic resonance system is proposed. The validity and feasibility of the system is proved by simulation experience [C1923]

"2B-5 Ultrasound Imaging with Beamforming Adapted to Target"

For over fifty years adaptive beamforming (ABF) algorithms have been applied in RADAR and SONAR signal processing. These algorithms reduce the contribution of undesired off-axis signals while maintaining a desired response along a specific look direction. Typically, ABF achieves higher resolution and contrast than conventional beamforming (CBF), at the price of an increased computational load. In this paper we develop a novel ABF that can be applied to medical ultrasound, named the Time-domain optimized near-field estimator, or TONE. We performed a series of simulations using ultrasound data to test the performance of this algorithm and compare it to conventional, data independent, delay and sum beamforming. We also performed experiments using a Philips SONOS 5500. CBF was applied using the default parameters of the Philips scanner, whereas TONE was applied on single-channel, unfocused data with plane wave transmit. TONE images were reconstructed at a sampling of 67mum laterally and 19mum axially. The results obtained for a series of 5 20mum wires in a water tank show a significant improvement in spatial resolution when compared to CBF. We also analyzed the performance of TONE as a function of speed of sound errors and array sparsity, finding TONE robust to both [C1924]

"SAR Imaging Simulation for Subsurface Target Detection"

In surface mapping synthetic aperture radar (SAR), homogeneous media is usually assumed, through which transmitted and reflected signals propagate. In ground penetrating SAR (GPEN SAR) system designed for detecting buried targets, we must take account of multiple media condition. It brings several factors which affect the quality of SAR image, such as refraction on air-soil interface and wave attenuation in the soil. These effects will be quantitatively analyzed in this paper. Also some simulation results show the comparison between surface target image and buried target image. [C1925]

"A Processing Detection Project Research of Weak Targets in the Complex Ground Clutter"

The paper present a project of improving the weak targets detection capability in the complex ground clutter at the same time maintaining the hardware's simplicity for the air-ground millimeter-wave terminal guidance radar. The project use the wide band chirp-subpulse stepped-frequency signal to detect targets, and get the target region's quasi two dimension image by processing the echo signal both in the time and frequency domain, thereby improving the weak target detection capability and providing the real guidance information. The theoretical analysis and computer simulation result proved the project's validity. [C1926]

"High Resolution Capabilities of MIMO Radar"

Multiple-input multiple-output (MIMO) radar is a multistatic architecture composed of multiple transmitters and receivers, which seeks to exploit the spatial diversity of radar backscatter. In conjunction with centralized processing, MIMO radar has the potential to significantly improve radar functions such as detection and parameter estimation. MIMO radar is distinct from other types of array radars such as phased array or STAP, which process the signals of closely spaced elements and, hence, cannot capitalize on the spatial characteristics of targets. In this work, we explore the ability of MIMO radar and coherent processing to locate a target with high resolution and to resolve targets located in the same range cell. A distributed target model is developed. It is demonstrated that MIMO radar with centralized coherent processing is able to resolve scatterers with a range resolution well beyond that supported by the signal bandwidth. The location estimation capabilities are further illustrated by introducing a new two-dimensional ambiguity function. The analysis is discussed in the context of established results for randomly thinned arrays. The investigation of high resolution MIMO radar also includes comparison with the performance of non-coherent MIMO radar and the effect on performance of the number of

sensors and their locations. [C1927]

"New Non-Stationary Target Feature Detection Techniques"

In a seminal paper, two algorithmic versions of the multichannel parametric adaptive matched filter (PAMF) applied to space-time adaptive processing (STAP) in an airborne radar application were shown to achieve superior test detection statistics over the conventional adaptive matched filter (AMF), which uses a non-parametric approach to estimate the detection weight vector. In fact, the performance of the PAMF approach is very close to the ideal matched filter (MF) detection statistics under exactly known covariance (the clairvoyant case). Improved versions of the two original multichannel PAMF algorithms, one new multi-channel PAMF algorithm, and a new two-dimensional PAMF algorithm (all four with fast computational implementations) have been summarized in recent papers. In this paper, we provide the detection performance of the four improved/new PAMF algorithms with simulated radar data. In all cases, the performance is at least comparable to, and in some cases superior to, the original multi-channel PAMF algorithms presented by M. Rangaswany et al (2000), while achieving computational savings over the originals. [C1928]

"Chirplet Transform Signal Decomposition for Echo Detection and Estimation"

Decomposition and analysis of nonstationary signals is a challenging problem common to radar, sonar, EEG, speech processing, and ultrasound. The chirplet transform signal decomposition (CTSD) algorithm described in this work presents a computationally efficient method for separating overlapping echoes through successive detection. Performance of this algorithm is evaluated for different signals typical in ultrasound and target detection and ranging. As part of algorithm characterization, a system on a chip (SoC) hardware implementation has been developed. [C1929]

"An Imaging Simulation Method of SAR for Three-dimensional Targets"

The imaging simulation of SAR (synthetic aperture radar) is very useful for designing and understanding SAR systems. In this paper, a fast image simulating algorithm of SAR for complex three-dimensional ground object targets is presented. The simulation parameters and echo signal expression of SAR system are presented. In the simulation testing, the imaging of a complex three-dimensional ground object target is realized. [C1930]

"Combined Membership Functions in Fuzzy Signal Detection"

In this paper, we propose a model for a constant false alarm detection (CFAR) that uses fuzzy logic to describe the uncertainty on the decision about the presence or the absence of a target. The received signal is processed and the membership function to three regions, namely; "signal present", "signal absent" and "uncertainty" is evaluated. The membership functions from different observations are combined according to some fuzzy fusion rules to obtain the global decision. The results obtained showed that the fusion rule defined by min(x+y, 1) gives better performance detection than the other rules [C1931]

"Laser Radar Cross-Section of Conducting Targets Using Horizontal Polarization"

This work presents a study to handle the behavior of radar cross section (RCS) of partially convex targets of large sizes up to five wavelengths in free space. The nature of incident wave is an important factor in the remote sensing and radar detection applications. To investigate the effects of incident wave nature on the RCS, scattering problems of plane and beam wave incidences are considered. Targets are taking large sizes to be bigger enough than the beam width with putting into consideration a horizontal incident wave polarization (E-wave incidence). The effects of the target configuration together with the beam width on the laser RCS compared to the case with the plane wave incidence are numerically analyzed. Therefore, we will be able to have some sort of control on radar detection using beam wave incidence. . [C1932]

"A Study Of Air Target Detection Base On Signal Disturbance"

This paper introduces an allocation method for air target detection based on DBS TV satellite signal non-cooperation space-ground bistatic (multi) radar and analyses its fundamental principle. Upon the plenitude study of the characteristic of target information acquisition and information processing of bistatic radar, this paper puts forward a kind of target information acquisition technique that is different from the typical bistatic radar system. Basic principle for target detection and target information acquisition is analyzed. [C1933]

"Target Detection with Non-Cooperative Illuminators"

The main features of target detection based on non-cooperative illuminators is introduced in this paper, develop

status quo of passive radar and basic structure of the system presented, and the key techniques which are required for implementing the system and their current development described. [C1934]

"Analysis and Real Time Implementation of a Clutter Map CFAR Detector with Noncoherent Integration"

In this paper, we analysis a CMAP-CFAR (Clutter Map Constant False Alarm Rate) detector with noncoherent integration. The predetector statistics of the complex envelope are assumed Gaussian. A Swerling II target fluctuation model is considered and the incoming pulses are assumed independent. Closed form expressions of the probability of detection and the probability of false alarm are determined. On another hand, we propose a real time implementation of CMAP-CFAR detector with post integration using Texas Instrument DSP TMS320C4x. [C1935]

"Estimation of Efficiency of Modified Method of Detecting and Recognizing Shallowly Buried Objects"

A modified digital spectral analysis method of detection and discrimination of shallowly buried targets is presented The technique includes three steps. calibration of radar-subtraction of the ground surface return-modified range profiling and had been tested for different antennas system and objects. The method accounts for the antenna dispersion in the case of not too wide radiation pattern and considerably improves situation with unwanted multiply reflections between antennas and ground surface. It has been found that from the properties of peaks in the radar range profile (amplitude, the form of change from a minimum to a maximum) one can estimate the difference in contrast of the buried object and surrounding medium. It allows evaluating properties of the object approximately if the permittivity of the ground is known. [C1936]

"Radar Detection and Track Determination with a Transform Analogous to the Hough Transform"

We propose in this paper the standard Hough transform to be changed with analogous polar Hough transform (PHT). The obtained polar Hough detection algorithm is very comfortable for track and target detection because the input parameters of this transform are the output parameters of the search radar. Another important advantage is the transform stability when the target changes its speed and flies at different azimuths. [C1937]

"Spatial-Temporal Differential Analysis for GMTD with Airborne Radars, Part 2: First Experimental Results"

We consider an application of the spatial-temporal differential analysis (STDA) technique to the ground-moving target detection (GMTD) using airborne radars with multiple receive channels. STDA is a new approach, suitable to processing multiple radar signals which utilizes spatial and temporal scintillations in the instantaneous signal power. To test the practical potential of STDA, we used multi-channel airborne radar measurements (MCARM) database, which was developed to test and improve space-time adaptive processing (STAP). In particular, we processed the MCARM file rd050575, obtained from flight 5, cycle d, and acquisition 575. The goal was to detect the Sabreliner airplane flying towards the radar-carrying airplane BAC 1-11 in the presence of urban, land, and sea clutter. Second-order structure functions for multiple radar signals were used for the processing. This simplified STDA technique applied in the time domain only provides a good performance by detecting the Sabreliner with a false alarm rate below 10' in the same range bin where it was previously detected using several STAP variants. [C1938]

"Knowledge-aided Heterogeneity-compensation Algorithm for STAP Applicable to Bistatic Configurations and Conformal Antenna Arrays"

Space-time adaptive processing (STAP) is a well-suited technique to detect slow-moving targets in the presence of a strong interference background. We consider the application of STAP in a bistatic radar configuration when the radar returns are recorded by a conformal antenna array (CAA). The secondary data snapshots used to estimate the optimum weight vector are typically heterogeneous, i.e., not identically distributed with respect to range, thus preventing the STAP processor from achieving its optimum performance. We present a novel knowledge- aided (KA), registration-based pre-processor that mitigates the heterogeneity of the secondary data. When applied to simulated data for a bowl-shaped antenna, this pre-processor is shown to provide enhanced performance when used in conjunction either with the standard sample matrix inversion (SMI) algorithm or with the more computationally- and data-efficient joint domain localized (JDL) algorithm. [C1939]

"Spatial-Temporal Differential Analysis for GMTD with Airborne Radars, Part 1: Theoretical Background"

We introduce a conceptually new approach to processing multiple synchronized radar signals. The method is referred to as the spatial-temporal differential analysis (STDA). STDA operates with spatial and temporal increments of the instantaneous signal power received from multiple channels. To improve the radar detection and tracking capabilities, STDA takes advantage of the signal scintillations, which are regarded as a harmful phenomenon by conventional signal analysis techniques. We present and discuss a simplified technique for ground-moving target detection (GMTD) using airborne radars with multiple receive channels. The technique is based on structure functions in a time domain, which are statistical moments of the increments. We demonstrate that STDA in the time domain "senses " different characteristics of the scatterers than conventional spectra-based techniques do. This new concept enables detection of weak moving targets in heavily cluttered environment. [C1940]

"Homomorphic Inverse-FEXP filtering for target detection in sea SAR images"

Generalized linear filtering techniques allow signals that have been nonadditively combined to be separated, and the analytical convenience of the principle of superposition for linear systems to be preserved. In this paper we employ Fractionally Exponential spectral models (FEXP) to adaptively modify homomorphic filtering of sea Synthetic Aperture Radar (SAR) images, thereby improving target detection in sea SAR imagery. The presented method demonstrated reliable results when applied to ERS1 and ERS2 SAR PRI of the Mediterranean Sea and North Sea. [C1941]

"The GPOF-based Ground Return Deembedding in Stepped Frequency Ground Penetrating Radar"

The work is devoted to a problem of detecting shallow underground objects like anti-personnel mines using ultra-wideband ground penetrating radar (GPR). In case of step-frequency radar, an inverse discrete Fourier transform (IDFT) is a standard data processing technique to convert the raw radar data into the range profile. The latter can be used for detecting buried targets and estimating their depth. Here, an advanced data processing algorithm based on a general-pencil-of-functions (GPOF) method is proposed to improve the radar performance. [C1942]

"Permutation Detectors under Nonhomogeneous K-Distributed Clutter in Radar Applications"

In this paper, we analyze the performance of some permutation tests (PTs) under a nonhomogeneous K-distributed clutter model, and nonfluctuating and Swerling II target models. Also, we compare the PTs results against their parametric counterparts under the same conditions. We shall analyze the detector performances in terms of detection probability versus signal-to-clutter ratio for different parameter values: the number of integrated pulses, the clutter reference samples, the false alarm probability, the shape parameter of the K-distributed clutter and the power deviation of the clutter. [C1943]

"Nonparametric Algorithm for Radar Detection of Moving Target"

New nonparametric algorithm of radar signal disorder detection has been considered. The algorithm is based on spectral estimation of a few signal samples of some close windows and nonparametric rank test application to compare them. The algorithm can be used for radar signal detection specifically in the tasks of turbulence detection in clouds and precipitation as well as for moving target detection. The efficiency of new algorithm is analyzed. [C1944]

"A Case Study on the design of a cluttermap based plot classification mechanism"

Many fielded state-of-the-art radars suffer occasionally from excessive false alarm rates. Various mechanisms have been devised in order to improve the signal-to-clutter ratio in general, but control of false alarms remains to be an issue of concern for the designers. This paper discusses a post-detection mechanism that splits the total offer of plots into four classes, such that each of these classes may be utilized by the tracking algorithm in order to have control over the false track rate. The mechanism has been developed for maritime sea-surveillance radar having a logarithmic receiver and a sliding window video extractor. It is basically a plot map performing a two-dimensional feature based classification. The features exploited are the signal-to-noise ratio and the target extent. The parameters in the algorithm are tuned based on a learning set from the radar operating in real life and tested using the same parameter values on a test set, also recorded during real life operation. The results suggest that a mechanism like proposed can be effective in controlling the false alarm rate', however sometimes at the expense of loosing some detections of real targets. [C1945]

"CFAR Target Detection Based on Gumbel Distribution for HF Radar"

High frequency (HF) radars are capable to detect and track targets at extremely long ranges. But the signal environment that includes external noise, different kinds of clutter and interference will significantly limit the detection and system capability. This paper considers a new approach to solve the target detection problem in a complex HF radar signal environment. It uses conventional constant false-alarm-rate (CFAR) detection procedure but based in this case on an untypical assumption of Gumbel distributed power spectrum values along range cells for thresholding. The CFAR detection test rule was combined with a local peak determination procedure. The proposed detection scheme was tested using real HF radar data and gave very promising results. [C1946]

"Optimal Equalizers and Targets for Detection in ISI Channels"

In this paper we consider the alternate approach of designing the equalizer and target jointly so that they minimize the overall bit-error rate in the system. Our main result is theoretical analysis that shows that the MMSE equalizer and the monic GPR target do indeed perform the best (compared to other designs) for uncoded inputs. However, for spectrally shaped coded inputs, the proposed design produces filters that are different from those GPR design. Thus, we predict a gain with the new design over the monic GPR design for coded signals. [C1947]

"A study on application of partial response maximum likelihood channel to magnetic recording system using patterned media"

The approach to find a suitable partial response maximum likelihood (PRML) channels for the R/W channels using patterned media is studied. The results show that the R/W channel using the double layered media shows the good performance, and the FR channel is suitable for the first target for GPR channel in the region of higher bit error rate (bER) than 10-5. [C1948]

"Utilization of chirp-z transform to improve the performance of target number detection of low resolution radar"

Although it is difficult to resolve formation flight targets for low resolution radar, several signal processing methods are proposed to solve the problem. All these methods need to first obtain the I/Q data of the range gate containing the formation targets. In this paper, chirp-z transform (CZT) is proposed to be used in obtaining peak I/Q data of range gate, which can reduce the amplitude and phase errors and assure the effectiveness of further signal processing. Simulation results show that by applying CZT to obtain target echo data and then perform Doppler analysis or one-dimensional (1D) cross-range imaging, the target number can be effectively determined [C1949]

"Basic Study of Navigator's Recognition of Radar Target Direction"

The radio detection and ranging (radar) is one useful instrument which a navigator uses to attempt safe navigation in poor visibility and night navigation. In the case of poor visibility and/or many similar targets in a close area, navigators sometimes make an error in recognizing the direction when they find the target in the landscape from radar information-target direction, distance, echo size, echo shape, sweep and relationship among targets' echoes. Also, they can make errors when finding the radar target's echo from the target information in the landscape. We have to prevent the errors to ensure safe navigation. The purpose of this paper is to find characteristics of target recognition using simulated marine radar in two steps: 1) to propose a model for radar target recognition; 2) to evaluate the errors of target recognition on the radar monitor by using two basic experiments. [C1950]

"Microstrip Antenna For Detecting Buried Land Mines"

Two patch array antennas have been proposed for detection of buried land mines using the mutual coupling effect. Mutual coupling among the edges of a patch or among the edges or nearby patches can influence the performance of microstrip antennas and arrays. The finite-difference time-domain method (FDTD) is used. The patch array antennas (sensor) have been simulated to detect various types of targets (nylon plate, stycast plate, and metal plate targets) in different types of soil properties [C1951]

"Resonances of complex shape scattering objects: Modelling by resonant circuits"

In resonance domain, the radar scattering response of any object can be modelled by natural poles of resonance with the formalism of the Singularity Expansion Method (SEM). The mapping of poles gives useful information for the discrimination of radar targets. In this paper, we propose to use resonant circuits modelling to characterize the resonance behavior of complex shape targets from the quality factor Q and the natural pulsation of

resonance Г‚Вї0. For perfectly conducting (PC) canonical and complex shape targets, we present results exhibiting advantages of these two parameters {Г‚Вї0 ; Q}. [C1952]

"Study of System Design Parameters for Space-Based Traffic Monitoring"

This paper addresses the ground moving target indication (GMTI) performance and the impact of system design parameters on space-based multi-channel synthetic aperture radar (MSAR) systems as they suffer from the high speed of the radar platform leading to a wide spread clutter spectrum. Opposite to classical GMTI systems near future space-based SAR systems offer only few simultaneous channels and relatively low pulse repetition frequency (PRF). The impact of PRF, antenna size, antenna separations and number of channels on detection performance is studied. The analysis is based on a post-Doppler approach of the optimal processor. [C1953]

"An effective orbit estimation algorithm for a space debris radar using the quasi-periodicity of the evaluation function"

Orbit estimation of space debris, which is unnecessary objects orbiting around the earth, is an important task in avoiding the collision with spacecrafts. Kamisaibara Space Guard Center radar system was built in 2004 as the first radar facility devoted to the observation of space debris in Japan. In order to detect smaller debris, it is effective to improve SNR (Signal-to-Noise Ratio) using coherent integration. However it is difficult to apply the coherent integration to the real data because the motion of the target is unknown at the first step. We propose fast algorithms for signal detection and orbit estimation for faint radar echoes from space debris by utilizing the characteristic of the evaluation function. The proposed algorithms improve SNR by 10.62 dB. The error of the range and the Doppler velocity with expected one are 89 m and 21 m/s, respectively. [C1954]

"A Simplified Equation for Estimation of Detection Characteristics of Radar Wits Selector of Moving Targets in Case of High Correlation of Fluctuation of Speed Wind Vector"

First Page of the Article [C1955]

"Fresnel reflector antennas for mm-Wave helicopter obstacle detection radar"

Rescue helicopters have to be versatile under any weather condition. By flying at low altitude they are facing targets, such as power lines, that may not be detected in the visual flight rules. In order to overcome this problem, a global system achieving an image fusion between a CCD, an infrared camera and a mm-Wave FMCW radar was developed. [C1956]

"Observation of lateral moving traffic with an automotive radar"

Radar sensors for automotive applications are used to measure the target distance and azimuth angle as well as the radial component of the target's velocity. To overcome the limitation of pure radial velocity measurements, this paper presents a technique how to estimate the lateral (cross-range) velocity component of extended targets by a single radar observation. [C1957]

"Detection and Recognition of Target Signals in Radar Clutter via Adaptive CFAR Tests"

In this paper, adaptive CFAR tests are described which allow one to classify radar clutter into one of several major categories, including bird, weather, and target classes. These tests do not require the arbitrary selection of priors as in the Bayesian classifier. The decision rule of the recognition techniques is in the form of associating the p-dimensional vector of observations on the object with one of the m specific classes. When there is the possibility that the object does not belong to any of the m classes, then this object is to be classified as belonging to one of the m classes or to class m+1 whose distribution is unspecified. The tests are invariant to intensity changes in the clutter background and achieve a fixed probability of a false alarm. The results obtained in this paper agree with the simulation results, which confirm the validity of the theoretical predictions of performance of the suggested adaptive CFAR tests. [C1958]

"LPI Radar Systems with Spatial Feedback"

The radar system with spatial feedback is considered. In this system there are self-oscillations, if the system is closed through a space of the signal radio-path and the target. When the target is absent (system is not closed), transmitter output power of the noise signal is insignificant, and that complicates detection of the radar radiation. In the report principles of such system functioning and results of tests on the real targets are stated. [C1959]

"Evaluation of eCognition for Assisted Target Detection and Recognition in SAR Imagery"

Defence R&D Canada-Ottawa (DRDC Ottawa) has been assessing custom off-the-shelf (COTS) software products and developing custom tools that can assist image analysts (IAs) to complete their tasks more quickly and efficiently. In some cases, IAs are tasked with detecting targets of interest within large-area surveillance operations, and these detection tasks may be repeated with a regular flow of incoming imagery. SAR imagery is a data source of choice for large-scale detection operations due to its ability to image in all weather conditions without external illumination sources. An activity was undertaken to evaluate ecognition (a COTS product) for target detection in SAR imagery and as a means of facilitating workflow improvements in the course of target detection and surveillance activities. eCognition is segmentation-based classifier that uses fuzzy reasoning techniques, enabling users to represent fuzzy rules in a human reasoning-like form. It offers the promise of being a usable tool that fulfills the objective of providing improvements over the traditional practice of manual inspection for target detection and surveillance. This paper reports on the evaluation process and findings when using ecognition for ship detection and land vehicle detection in SAR imagery. [C1960]

"A Complex of Multi-Frequency at 3GHz, 5.6GHz, 20GHz and 37GHz, Polarimetric, Combined, Short Pulse, Short Range Action Radar- Radiometers for Soil and Snow Remote Sensing and Surveillance"

A complex of polarimetric (dual polarization), spatio- temporally combined active-passive devices of S (~3GHz), C (~5.6GHz), Ku (~0GHz), and Ka (~37GHz) band of frequencies is represented, for bare and vegetated soils, waved water surface and land snow cover microwave reflective and emissive characteristics multi-frequency, polarimetric, simultaneous and spatially coincident measurements. The complex is dedicated to solve problems applied to soil (bear and vegetated) and snow moistures retrieval, to near water surface wind and wave field parameters retrieval, by synergetic application of various kind microwave means of remote sensing, as well as applied to surface and sub-surface targets detection and identification tasks solution. The complex is set in ECOSERV Remote Observation Centre's control-test experimental site, in Armenia, which is equipped by facilities for microwave devices absolute calibration, by spatially distributed stations for in-situ measurements of soil and moistures and temperatures, and has a local meaning small weather station. This paper has an aim to attract attention of researchers who are interested in such kind measurements and to invite them to perform their own or joint measurements using available facilities. [C1961]

"Man Made Target Detection in a Forest with a Subspace Detector SAR Processor"

This paper deals with the capability of a SAR processor based on a subspace detector to get better performance than a classical SAR processor for Man Made Target (MMT) detection in a forest. The new algorithm aims at using new models, different from the isotropic point one commonly used in SAR processors. The implementation of the Subspace Detector SAR (SDSAR) algorithm is described and detection performances between a classical SAR (CSAR) algorithm and the SDSAR one are compared when detecting a MMT in white Gaussian noise and in a simulated forest. [C1962]

"Target Feature Extraction in Fully Polarimetric High Range Resolution Radar"

In this paper, the authors propose a technique for polarimetric feature extraction from radar range profiles. The technique, which is based on super-resolution algorithms, proves effective when applied to simulated data via an E.M. simulator, namely the EMvironment. [C1963]

"Optimized FM PCL Radar Waveform"

To make a balance between time of detection and resolution of detection in radar, it must select an optimized time interval for integrations and signal bandwidth. In this paper, a new algorithm for finding best width of window and bandwidth of the FM signals for FM PCL radar is designed. [C1964]

"Pre-Crash Application for Multiple Target Situations"

In this paper a system model for an extended crash area is developed, which takes the maximum possible maneuvers and a reaction time of the driver into account simultaneously. The driver reaction time includes the current state of the steering wheel and the time needed to change from the throttle to the braking pedal. Advanced detection of crashes gives the opportunity to improve safety and to reduce serious consequences of the passengers. With decreasing driver reaction time the safety gain based on actuators can be improved. This concept finally offers a crash detection with an extended reaction time for the actuator. [C1965]

"Joint Adaptive Detection-Estimation Algorithm for Maneuvering Target Tracking"

An adaptive maneuvering target tracking algorithm based on dynamic system model which incorporates both random and deterministic character of maneuver is presented. Such a model enables to work out relatively simple recursive adaptive input estimation (IE) algorithm with analytic threshold level calculation. The simulation results of the algorithm implementation are presented. The comparative analysis has revealed better performance characteristics of the proposed algorithm in comparison with the interactive multiple model (IMM) approach. [C1966]

"A modified M/N logic for track initiation of low observable targets using amplitude information"

This paper deals with the optimization of the track initiation procedure for fast moving low observable targets. The standard approach consisting in applying a first detection threshold to each scan followed by an M/N logic, requires very low threshold values to guarantee an acceptable detection probability, which results in turn in a high probability to initiate false tracks. We derive a new technique to initiate tracks of low observable targets by exploiting the full amplitude information as well as the monopulse ratio information and evaluate its performance. The new technique outperforms the M/N decision logic, while keeping comparable a simplicity and low computational cost. [C1967]

"S-Band, Polarimetric, Combined, Short Range Action Scatterometer-Radiometer for Platform and Vessel Application"

In this paper S-band (~3 GHz), polarimetric, combined, short pulse scatterometer-radiometer is described, for simultaneous and spatially coincident measurements of sea surface, snow, bear and vegetated soil microwave reflective, and emissive characteristics, and for backscattered radar signal frequency distribution statistical parameters estimation. The system may be successfully used for near sea surface wind and sea surface wave fields' parameters precise and unambiguous retrieval, as well as for land and sea surface signatures and targets detection and identification their origin. [C1968]

"Multiband Radar Modelling"

In this paper, the methodology of modelling the multiband radar based on radar equations for search and cued search radar is presented. This methodology was work out under assumption that the processing in each band is independent. Based on this methodology and real data of S/N from trials there were done appropriate calculations to have the parameters of the model of dual band radar (VHF, C band) in which each of band have the same range of detection of the same target with equal probability of detection. [C1969]

"Acoustic Random Noise Radar Using Ultra Wide Band Waveforms"

Ultra wideband noise radar gives high range resolution and the range ambiguity is suppressed as a result of the non-periodic waveform. Random noise waveforms could also be applied in acoustic radar (Sodar/Sonar). Both wave generation and signal processing can then be performed on a PC. As a result, some signal processing algorithms used in random noise radar/sodar can be tested simpler using sound waves. This paper presents basic relationships and algorithms for signal processing in random noise radar/sodar, and the noise floor generated by the randomness of the transmitted signal is defined. A PC-controlled acoustic radar with ultra wide band random noise waveform (1-8 kHz) was implemented to test some of the algorithms described Measurements were carried out on both moving objects and stationary scenes. Moving target indication using stretched time processing (Doppler) and change detection algorithms were tested as well. Recording from a bridge shows the potential use of the technique for water level indication as an example. [C1970]

"Informative characters in spectral-polarization images of backscattering from surface objects"

The frequency, spectral and polarization features of the signals scattered by transportation (wheeled, caterpillar) and biological objects (person, animals, birds) are studied with coherent radar in pulse and CW modes in wave bands 10 cm, 3cm, 8 mm, 4mm and 2mm. It's showed that Doppler spectrum of signals scattered by person contains dominant line which corresponds to velocity of target and pedestal (below the line at -10Г· -15 db) caused by secondary phase modulation due to fine structure of target movement. In the case of transportation the pedestal is of ruled structure due to vibrations of the target. The characteristics of signals scattered that presented in the paper are of interest for target detection and recognition [C1971]

"PCL-Signal-Processing for Sidelobe Reduction in Case of Periodical Illuminator Signals"

Passive coherent location (PCL-) systems deal with illuminators of opportunity, whose signals are usually not adapted to radar applications. Especially in the case of signal inherent periodicities the target echoes are often

covered by sidelobes of clutter. In order to reduce high correlation sidelobes and enable highly accurate range measurements, a signal adaptive filter processing is introduced. Its mathematical description explains that aiming at low sidelobes and highly accurate range estimation for arbitrary signals results in a filter method providing a phase correlation. The SNR obtained by this filter method turns out to be dependent on the amplitude variation of the signal frequency spectrum. The effectiveness of the side lobe reduction is demonstrated on experimental data of analogue TV-signals to verify that accurate unambiguous range estimation is possible, even for strongly periodical signals. [C1972]

"Fast and High-Resolution PCL Radar Detection in Noisy Environment"

Multiple target detection in conventional PCL (Passive Coherent Location) radar systems by means of Ambiguity Function Processing and without any powerful algorithm is impossible. Presented Gradual Clean Algorithm (GCA) is a new and simple method, which could provide the perfect detection in noisy environment and heavy clutter condition up to SNR=-15 dB and SCR=-100 dB (clutter is assumed as a distributed target with large RCS). Determining the number of real targets and keeping the false alarm probability approximately constant are the presented algorithm capabilities. [C1973]

"TerraSAR-X Products and Product Performance Update"

TerraSAR-X is a German satellite to be launched towards end of the year 2006. The SAR instrument built by EADS/Astrium has a multipolarized active phased array antenna and is programmable in wide ranges. This allows to operate imaging modes such as e.g. stripmap, spotlight, ScanSAR and dual-polarization modes. By further dividing the antenna in halves with different position or different polarization, experimental modes for ground moving target detection (GMT) or Quad-Polarization are possible. As a consequence of the various sensor capabilities the tree of SAR products offered by the DLR Ground Segment contains many different variants of polarization, resolution and scene size. Even more product variants are caused by different processing parameters selectable by the user. Some product performance parameters, such as the radiometric accuracy as a function of geometric resolution or the image resolution as a function of incidence angle depend on both, sensor settings (PRF, pulse duration) and on processing parameters (bandwidth, weighting, multi-looking). The processing parameters for the products have been designed by DLR in a way so that valuable products with maximum information content are offered to the user. In order to generate the specified products, the TerraSAR Multi Mode SAR Processor TMSP has been designed by DLR. This processor will be operated at the DLR payload ground segment in Neustrelitz for commercial and scientific customers. The processor will also be operated at additional direct access partner stations of Infoterra GmbH, who will serve private and public customers. [C1974]

"Data Fusion: Cumulative Effects of Discrete Fusion on Target Detection Probability"

This paper describes the culmination of a four-year research, application, and development program towards finding and quantifying a methodology for sensor and data fusion of remotely sensed targets. It builds on previous research reported in IGARSS'02 [1] and IGARSS'04 [2]. Here, we examine the effectiveness of the data fusion methodology, specifically, the impact of iterative data collection on the effective probability of detection of targets. Through statistical (Bayesian) combination of sensor iterations, low confidence sensors (those with moderate probability of detection and moderately low probability of false alarms) can provide high detection performance. This can be extended to multiple data source types. The goal is to make use of higher coverage data products which have only moderate detection performance in the detection and tracking of targets. This is made possible through a combination of discrete target data, along with the analysis of parameters from the respective remote sensing technologies. This process requires the existence of a reasonable maneuvering model or sufficient processing resources. [C1975]

"Detection, Location and Imaging of Fast Moving Targets Using Non-uniform Linear Antenna Array SAR"

First Page of the Article [C1976]

"Change Detection using Multi-PASS and Multi- DATE Data at P and L bands"

First Page of the Article [C1977]

"Moving Target Detection based on Sub-aperture Image"

First Page of the Article [C1978]

"A method for automatic spotting using water column"

This paper addresses the method for automatic measurement of projectile target deviation using water columns cause by underwater explosion. The detection and tracking of water column is operated according to the transformation of RCS of a water column. A model of water columns is described here, and a bi-parameter sea-clutter map was used as detection background in order to distinguish water columns from sea-spikes and low-velocity targets. Finally, the paper gives the actual experimental result that proves the correctness of the method [C1979]

"Networks of Maritime Radar Systems: Sensor Selection Algorithm for PD 1 Based on the Modified Riccati Equation"

This paper presents a novel sensor selection algorithm for target tracking, based on the Modified Riccati Equation (MRE). The MRE provides an upper bound of the CramГґB©r-Rao lower bound (CRLB) and is easily calculated. Using the MRE, it is possible to include sensors with a probability of detection Pd 1. State estimation is done with a modified Particle Filter (PF), taking into account missed detections. The performance of the MRE sensor selection scheme is studied for single and multiple steps ahead, and, for the case of Pd = 1, compared with other methods. [C1980]

"Lidar signal denoising based on wavelet domain spatial filtering"

Lidar is an effective tool for remotely monitoring target or objects, but the lidar signal is often affected by various noises or interferences. Therefore, detecting the weak signals buried in noises is a fundamental and important problem in the lidar systems. In this paper, an effective noise reduction method based on the wavelet domain spatial filtration is presented to denoise lidar signal. This method can effectively detect the edge of lidar signal and reduce noise. The performance of our method is investigated by detecting the simulating lidar signals in noise. The simulation results show that our approach performs well in identifying the edge of signal and detecting weak lidar signal buried in noises [C1981]

"Study on Reducing False Targets for Anti-collision Radar in Intelligence Transportation System"

A novel waveform named double-slope symmetrical saw-tooth wave is presented and its corresponding algorithm is also introduced to resolve the problem of multiple targets detection for automotive anti-collision radar. The method by using the proposed waveform and algorithm improves the response characteristic of radar system and reduces false targets in detection process. Computer simulation results and theoretical analysis prove that the method is effective and practical for multiple targets detection in intelligence transportation system [C1982]

"RCS Aspects of Multi-Band Radar Systems Composed of "VHF," L" and "X" Band Radars"

An essential characteristic of any radar target is the measure of its ability to reflect energy to the receiving antenna. The parameter used to describe this ability is the radar cross section (RCS) of the target. Stealth techniques and technologies, which affect the efficiency of early warning radar systems currently in operation, are described in ref [1]. The problem is to find countermeasures that fully integrate new requirement capabilities into the current long-range radar net and infrastructure, keeping research & development, and maintenance costs, low. The netcentric approach recently proposed in ref [2] using VHF-based multi-band radar systems is a new concept for Recognized Air Picture production based on long-range radars, which offers a powerful solution for the surveillance of large areas at a reasonable cost. Target RCS behaviour, fluctuations due to aspect angle and frequency are of particular interest in these systems, because the antenna beam positioning of the "VHF", "L" (or "S") and "X" band radars should be synchronised in azimuth and elevation. Targets could change orientation, course and kinematical characteristics during the time required for beam positioning. Advance knowledge and accurate prediction of target RCS is therefore desirable in order to design and develop efficient (robust) discrimination algorithms for the optimisation of target detection, tracking and non-cooperative target recognition. This paper reviews the target RCS aspects in current radar systems of interest, and examines RCS behaviour for use in future multi-band radar system applications. [C1983]

"FMCW Radar Transmitter Based on DDS Synthesis"

This paper presents some design problems and aspects of building FMCW radar transmitter based on DDS. Significant parameters of this radar are small targets detection possibility, small resolution cell and high range resolution. It requires resolving a problem of generation microwave signals with excellent linear frequency modulation and very good phase noise performance. One of possible solution is DDS (direct digital synthesis) technology, which is rapidly advancing. [C1984]

"High Accurate Multiple Target Detection in PCL Radar Systems"

A new approach in multiple target detection in PCL (passive coherent location) radars based on TV and radio ambiguity function processing is presented. Fast computation and high accuracy are the presented algorithm capabilities. Presented algorithm is a new and simple method which could provide perfect detection in noisy environment up to SNR=-30 dB [C1985]

"A method of hybrid ATI and DPCA technique to detect moving target"

The technique of moving target detection is more important in surveillance and detection. Both the along-track interferometry (ATI) and displaced phase center antenna (DPCA) techniques can estimate the position and radial velocity of moving target; however they are used in different circumstance. In the paper we compare the detection performance of slow ground moving target using ATI and DPCA technique for the new model of distributed space-borne SAR in detail. And provide a method of hybrid ATI and DPCA technique to detect moving target. Some typical computer simulation results are presented which illustrate the problem convincingly [C1986]

"Adaptive Radar Clutter Suppression Based on Real Data"

Adaptive radar clutter suppression algorithm and realization are important things in radar signal processing system. The paper firstly discusses a method based on the maximum average improvement factor to compute the weight vector of adaptive clutter filter in theory, and then describes a simple, low-cost adaptive MTI system for bimodal clutter suppression, which uses precomputed filter coefficients stored in the weight coefficients library. Results of applying this adaptive MTI filter on real radar data demonstrate that the filter gives an extensive reduction of clutter in the radar image [C1987]

"Frequency diversity to low-angle detecting using a highly deterministic multipath signal model"

In this paper, based on a highly deterministic multipath signal model, we derives 4-rays echo signal formula in multipath. Use MTD to detect the low-angle moving target, but its performance is limited by the multipath propagation factor. Frequency diversity method can resist the multipath fading. Simultaneous detecting in multiple diversity channels can improve the low-angle detecting performance. And this paper puts forward multiple diversity channel accumulation algorithm to advance the detecting performance to a higher position. Simulation shown this technique is effective [C1988]

"A New Radar Emitter Recognition Method Based on Variable Precision Rough Set Model"

Radar emitter information detected by multisensor system takes on uncertainty, illegibility and contradiction. In real reconnaissance environment, the patterns of radar classes often overlap, the accurate classification of the Pawlak rough set model restricts its application in the real world. In order to solve emitter recognition problem, a new method of finding decision rules is presented to classify radar emitter from the new point of view of variable precision rough set. This method is according to dependent degree of decision attributes on condition attributes. The decision rules proposed are more straightforward. At last, example of recognizing the radar emitter purposes is selected. During the experiment, discretization is conducted on extracted index data of radar emitter and metrical radar characteristic parameter firstly. Then, positive region of each condition attribute are calculated under the given error parameter, which is the basis of decision rules. Experimental results demonstrate this new radar emitter recognition method by finding decision rules based on variable precision rough set model is effective and feasibility [C1989]

"FDTD Study of an UWB Radar Technique for Breast Tumor Detection"

A finite difference time domain (FDTD) method is applied to investigate capabilities of an ultra-wide band (UWB) radar system to detect a breast tumor. The first part of the investigations concerns FDTD simulations of a phantom formed by a plastic container with liquid and a small reflecting target. The second part focuses on a three-dimensional numerical breast model with a small tumor. FDTD simulations are carried out assuming a planar incident wave. Various time snap shots of the electromagnetic field are recorded to learn about the physical phenomenon of reflection and scattering in different layers of the phantom. [C1990]

"Null Function as a Fast and Accurate Algorithm for Noisy Environment Target Detection in PCL Radars"

A new fast and very accurate algorithm for target detection in PCL (passive coherent location) radars is

presented. This algorithm in noisy environment that SNR is low as -45 dB operates, with an error less than 20 percent. Presented algorithm is capable for target detection by few samples of signals and obtains real-time processing in passive radars [C1991]

"Novel Long-Term Coherent Integration Method For Moving-Target-Detection"

In radar signal processing, clutter suppressing and moving targets detection are basic problems. In order to detect the weak targets effectively, a novel method of long-term coherent integrated moving-target-detection based on the fractional Fourier transform is proposed in this paper. This method can compensate the Doppler migration and suppress the clutter effectively by using the discrete FRFT as the swept-frequency filter bank. The simulation results show that it has better performance of weak targets detection than the classical MTD and its computation burden is acceptable, which prove the validity of this method [C1992]

"A Monopulse Based Correlation Technique for De-Garble Processing of SSR Replies"

Secondary surveillance radar (SSR) aids in the identification of aircrafts and often works in conjunction with the primary radar for better target awareness. An important module of the SSR system is the reply signal processor unit. One of the major issues in reply processing is the occurrence of garbled replies, which occurs due to the overlapping of replies. Overlapping occurs when range difference between the two targets is less than de-garble resolution (3045 m). In practical scenarios SSR replies are often garbled (e.g.: formation flights). So efficient de-garbling algorithms are required for providing the target identification. In this paper a new algorithm towards de-garbling of SSR replies is discussed. The information derived from the delta to sigma ratio channel (Delta/Sigma) and the Sigma (sum) channel of the monopulse receiver are effectively combined for separating the garbled replies [C1993]

"Averaging of Sorted Bigenvalues for STAP"

Optimum STAP requires knowledge of the true interference covariance matrix. In practice, this matrix is not known and must be estimated from training data, which must be target-free and statistically homogeneous with respect to the range gate under test. These conditions are often not satisfied, which degrades the detection performance. Particularly, for ground moving target indication radar, the clutter Doppler frequency depends on range for all array geometries, except linear side-looking. This range dependency leads to problems in clutter suppression through STAP techniques. In this paper, we study issues associated with a novel technique, which works on the eigenanalysis of homogeneous clutter, to address this clutter range dependency problem. Simulation results show a significant improvement in processor performance as compared to conventional STAP techniques [C1994]

"A CFAR Based on Statistics of Cell Under Test"

Aiming at solving the problem of detection performance degradation of CA-CFAR and OS-CFAR in the circumstance of multi-targets and strong interference, a CFAR whose selection of reference samples is based on statistics of the CUT (cell-under-test) is presented. Simulation shows that this CFAR suffers a small CFAR loss compared to CA-CFAR in homogeneous environment, and performs robustly against interferers in a non-homogeneous environment [C1995]

"On the Ambiguity Function for Accelerating Target in FMCW Radar"

In the paper we are concerned with the FMCW radar detection of an accelerating target, echo of which is buried in an additive white Gaussian noise. For this problem, we derive and analyze three-dimensional generalized ambiguity function for target range, velocity and acceleration. We interpret known properties of this function and obtain new ones. This allows us, for example, to specify resolution and regions of unambiguous velocity and acceleration. [C1996]

"Socot Project (scatterometry for integrated circuits defectoscopy)"

SOCOT is a Specific Targeted Research Project. Its full title reads: scatterometry overlay control technology in the integrated circuit industry for the 32 nm technology node and beyond. The project concerns definition and validation of an optimal methodology that will allow overlay control in semiconductor industry. The imaging technology currently used for that purpose may not be sufficiently accurate for the 32 nm technology node. The transition to the 32 nm technology is therefore at risk along with the profitability of the semiconductor industry. [C1997]

"Space-Time Adaptive Processing analysis for the moving target on the sea surface indication purpose"

Space-time adaptive processing (STAP) can improve target detectability in a presence of a ground clutter for airborne radar. Ground clutter echo has a wide spectrum as a result of the radar platform (airplane or satellite) motion. To reject clutter echo and preserve target echo, STAP employs antenna array. Simultaneous filtering in both spatial (angle) and frequency domain can improve performance. In this paper we propose a new application of STAP. Assuming an antenna array standing on a sea shore, the objective is to detect targets on the sea surface. Unfortunately sea clutter has different statistical properties compared to airborne clutter. As a consequence, basic STAP algorithm is not optimal in any sense. Future research will face the problem of evaluating performance of STAP applied to sea clutter. We hope to develop a new algorithm that can perform better in the presence of sea clutter. [C1998]

"Radar Range Modelling in Noise Jamming Conditions"

The paper deals with the influence of noise jamming on the surveillance radar range. There are indices presented here according to which the resistance of a radar is evaluated against the interference. There are the terms for the calculation of the radar range in various configurations of the target and jammer derived. [C1999]

"Comparison of several algorithms for suppression of foliage clutter"

Detection and recognition of targets, obscured by foliage clutter is an active research area. We address here the important question of foliage clutter modeling. The observed clutter is an highly impulsive random process and can be modeled more accurately with symmetric alpha stable (SalphaS) random process. In fact this is the first objective of this paper. The second one is the comparison of several wavelet (wavelet-like) algorithms for foliage clutter suppression. These algorithms are evaluated through artificial doppler signal corrupted by artificial clutter, following SalphaS distribution and real radar clutter using X-band portable continuous wave radar. [C2000]

"Precession Period Extraction of Ballistic Missile Based on Radar Measurement"

A method of extracting the precession period of ballistic missiles (BM) in the midcourse phase of their ballistic trajectories with radar cross section (RCS) sequence was presented. The motion of ballistic missiles in the midcourse phase was analyzed and modeled. Then the relationship between the precession period of missile warhead and its RCS sequence was discussed. Based on the variation characteristics flying in the RCS sequence, a method of extracting the precession period was proposed. Simulation results demonstrated the efficiency of the method [C2001]

"Radar Track-Before-Detect Algorithm of Multitarget Based on the Dynamic Programming"

For detecting and tracking multitarget under the background of low SCR, a radar track-before-detect algorithm of multitarget based on the dynamic programming is presented. This algorithm can exactly estimate the number of targets in the observed region, and optimally separate the tracks of these targets. Therefore it can solve the problems of missed alarms and false alarms, which usually arise, when the pervious track-before-detect algorithm are used to detect multitarget with unknown number of targets [C2002]

"Effects of geometry on clutter characteristics of hybrid bistatic space based radar"

For hybrid bistatic space based radar (HB-SBR) which is composed of a transmitter on a satellite and a receiver on an airplane, clutter is a serious problem for detecting slow moving target. The authors discuss the effects of geometry on clutter characteristics, such as Doppler-angle traces, isorange and isodoppler contours, Doppler ambiguities and so on, of HB-SBR which applies space-time adaptive processing (STAP) in this paper. It is shown that some unique clutter properties appear due to the great differences of platform speeds and heights between the transmitter and receiver in the hybrid mode. Some suggestions about bistatic geometry design are also made to improve he performance of moving target indication (MTI) [C2003]

"Outline Structural Representation for Radar Target Classification Based on Non-Radar Templates"

Automatic target recognition (ATR) is often based on statistical methodologies rather than using symbolic information relationships and properties. In this paper, a possible approach for the syntactic outline representation for radar target classification based on non-radar templates is presented, describing the outline extraction and tine detection algorithms to define a code-book of structures representing the target radar shape. The outline target recognition is attempted from a multi-perspective point of view: only the illuminated side of the target is preserved and then combined with other partial shapes collected from different nodes of a hypothetical

radar network [C2004]

"Multi-cycle Integration of Weak Target Signals in LFMCW Radar"

This paper presents a new way for integration and detection of weak signals with large Doppler frequency in linear frequency-modulated continuous wave (LFMCW) radar systems. With secondary mixing of up-sweep beat signal and down-sweep beat signal, the range-Doppler coupling can be resolved effectively, and a new signal with only Doppler frequency information is brought out. By two-dimensional FFT (fast Fourier transform), multi-cycle weak signals can be integrated to get high signal-to-noise ratio (SNR) for target detection and parameters estimation. Using peak detection, target velocity is estimated first. Motion compensation then follows according to the velocity estimated, and target range can be found out also through two-dimensional FFT. And performance analysis is carried out finally. The efficiency of the method is proved by the simulation results [C2005]

"Radar Targets Detection in Formation Based on Time-Varying AR Model"

A novel method for radar targets detection in formation is proposed based on the instantaneous frequency (IF) estimation of radar echoes. The time-varying autoregressive (TVAR) model is selected to model the signal and the IF is estimated using the phase of model polars. With the polars selection process and the fusion of the echoes' time-varying frequency estimation at different range cells, the algorithm is enhanced in robustness [C2006]

"Detection and Imaging of Aerial Moving Targets Based on Spaceborne SAR"

According to the characteristic that the bandwidth of spaceborne SAR is generally quite wide, a new method called "sub-band double carrier frequency conjugated processing" is presented in this paper. The approach can decrease the equivalent central frequency of the synthetic signal and remove the Doppler ambiguity. Consequently, Keystone transform can be used to correct the linear range migration of the fast moving targets with low input SNR. After the target range curvature is corrected, time-frequency analysis can be used to implement low resolution imaging and targets detecting. The radial velocities of the targets can be obtained from targets detection, and high resolution imaging process can be completed to each moving target. The simulation results show the effectiveness of the new method [C2007]

"Importance sampling for NMF class of STAP detectors"

Importance sampling (IS) techniques are applied to space-time adaptive processing (STAP) radar detection algorithms for performance characterization via fast estimation of false alarm probabilities (FAP's). The work here builds on and extends the initial thrust in this area provided in a recent paper. The theory of the normalized matched filter (NMF) and normalized adaptive MF (NAMF) detectors is briefly discussed and a new variant, the envelope-law NAMF detector, is presented. New IS biasing techniques, using rotation of data vectors and 2-dimensional biasing, are proposed and used for fast simulation. The envelope (or E-NAMF) detector is also analyzed and its detection probability is compared with that of the NAMF detector for fluctuating and non-fluctuating targets in homogeneous and nonhomogeneous backgrounds [C2008]

"Frame-overlapped Zoom-FFT Optimization in PD Radar Application"

This paper addresses a frame-overlapped zoom-FFT method applied to pulse Doppler (PD) radar echo spectrum analysis. The method can achieve high resolution of local spectrum, and improve the gain of coherent integration, so it can enhance the detection probability and the precision of parameter estimation for poor echo signal. Firstly this paper introduces the principal of frame-overlapped zoom-FFT. Then it addresses the parameter design criterions in high pulse repeat frequency (HPRF) PD radar application. Furthermore based on analyzing the effects on incoherent integration and target detection due to frame overlap, it illustrates the parameter design process by an example of PD radar spectrum analysis application and gives the comparison of overlap processing and no-overlap processing. Finally, a real-time spectrum analysis system implementation adopting the frame-overlapped zoom-FFT method is proposed [C2009]

"Detection, Velocity Estimation and Imaging of Fast Moving Targets Using Single Antenna SAR"

In conventional methods of velocity estimation of moving targets using single antenna SAR, if the Doppler-shift exceeds PRF/2, in other words, if the radial velocity of a fast moving target exceeds the "blind velocity", the radial velocity estimation ambiguity will occur. In this paper, a novel method is proposed to detect and image fast moving targets. Specially, this method can accurately estimate the velocities of fast moving targets beyond the "blind velocity" limit. Numerical simulation and real data are provided to validate the method [C2010]

"A synthetical pose estimation of SAR imagery using Hough transform and 2-D continuous wavelet transform"

SAR target recognition close relates to target pose. When the pose of target is confirmed, the computational complexity can be deduced, which can increase the recognition probability greatly. Hough transform is an efficient approach to recognize the target pose. But, in general, Hough transform can obtain many poses for a single SAR target. The right pose can't be obtained only using Hough transform. In order to resolve this problem, in this paper, the angular energy density of 2-D continuous wavelet transform combined with Hough Transform is proposed. Many experimental results of MSTAR public target database show that this method is feasible and it can obtain the pose correctly [C2011]

"Relative Speed Step Size in SAR processing for Moving Target Detection"

Ground moving target indication (GMTI) using synthetic aperture radar (SAR) is studied in this paper. For systems using long integration time relative speed between the target and the SAR platform has to be included in the detection algorithm. A separation between the true relative speed and the relative speed used in the SAR process will cause unfocused targets. Unfocused targets decrease the detectability. In the detection phase of SAR moving targets blind hypothesis on relative are used. The step size between the hypotheses or the quantization step in relative speed is a trade off between the number of hypotheses to test and detectability. A large number of tests will increase detectability but will also increase computation load and vice versa. The importance of relative speed increases as the azimuth integration time gets larger. Long integration time is associated with low signature moving targets detection in strong clutter environment and especially for SAR GMTI at low frequencies. In this paper we determine the optimum quantization of relative speed for moving target detection. The optimum quantization is derived from the moving target impulse response. By using the optimum quantization the computation burden in SAR GMTI is reduced and the detectability secured [C2012]

"Performance Analysis of A Long-Term Integration Algorithm for Space-borne Radar Based on Segment Processing"

Long-distance detection and tracking of weak targets in outer space is one of the key problems for the space-borne radar. Long-term Doppler integration technique is commonly used to improve detection range while the transmitter power is fixed. However, the real-time processing ability and memory volume limitation of DSP chips usable in outer space make it hard to implement long time Doppler coherent integration. Therefore, a long-term integration processing algorithm is proposed, combined intra-segment FFT processing and inter-segments DFT processing in the integration period to achieve long-term coherence ability. More emphasis is put on the performance analysis of the proposed algorithm. It proved the algorithm is quite fit for the real-time processing and greatly reduces the memory demand. Compared with the ideal theoretic coherent integration gains, SNR losses of the segment processing are only 2.4 dB. Finally, the computer simulations demonstrate the validity of theoretical analysis results [C2013]

"Fractal Features and Detection of Meteor Interference in OTHR"

Backscatter signal from OTHR receiver may contain strong noise and interference background, among which the meteor echo is a typical and strong Impulsive interference. This meteor echo may inject transient but great power into the receiver, arise the noise floor in the range-Doppler map and decrease SNR. So it must be suppressed before target tracking. Many solutions are presented for meteor echo excisions, among which the meteor position must be estimated firstly. Usually the ocean clutter is so strong that it may cover other signals such as target and meteor, so it must be suppressed before position estimation. Different from these approaches, this paper proposes a novel algorithm of meteor position estimation without depressing clutter. The main idea is focused on the different fractal dimension corresponding to the ocean clutter and the meteor echo. Accounting for the real-time processing requirements, an effective of directional fractal dimension based on the fractional Brownian motion model is also proposed. Experiments prove that it is an effective method [C2014]

"Analysis of Doppler Features of Spiral Maneuver of Reentry Missile with Time-Frequency Transform"

To have excellent penetration capability, the tactical ballistic missile (TBM) maneuvers during the process of reentry, which makes the realization of interception somewhat difficult. In this paper a kind of trajectory maneuver-spiral maneuver is researched. At first, the mathematical model of spiral maneuver is developed. Then based on a hit-to-kill missile, the simulation results verify the accuracy of the mathematical model. With the moving window Fourier transform, analysis of the time-varying Doppler signature in the joint time-frequency domain can provide useful information for target detection, recognition, tracking and interception [C2015]

"Order Statistic and Algebraic Product CFAR Detector for Weibull Clutter"

A new radar constant false alarm rate (CFAR) detection algorithm operating in Weibull clutter is developed. In the proposed CFAR detector, that called order statistic and algebraic product (OSAP) CFAR detector, the output of OS processors on the both lagging and leading windows around the test cell are weighted by fuzzy weighting function (membership function) and are combined by algebraic product (AP) rule to get a better detection performance. The weighing function of this detector is obtained and the performance of the OSAP detector is evaluated and compared with the OSGO and OSSO-CFAR detectors. The results represent that the detection performance of OSAP-CFAR detector is superior to than of OSGO and OSSO CFAR detectors in the homogenous background and in multiple interfering targets situations [C2016]

"Two-Hierarchical Hough Transform for Sky-wave Over-the-Horizon Radar Track Initiation"

In this paper, a data preprocessing method for sky-wave over-the-horizon radar (OTHR) track initiation using two-hierarchical 2D Hough transform is proposed. We firstly use range-time data space to hierarchical I Hough transform and obtain rough candidate measurement sequences, where Doppler is used as an accumulation constraint; then we use the corresponding azimuth and time measurements to hierarchical II Hough transform to refine above sequences for track initiation. Simulation results show that the proposed method can eliminate clutters efficiently and make significant improvement in reducing false tracks [C2017]

"Multiresolutional Maneuvering Target Tracking with Average Interpolation and Parallel Implementation"

The difficulty for tracking maneuver target is to decide whether a maneuver occurs and when the target begins to maneuver. Since target tracking is a real time problem, the crucial factor is to detect the target maneuver as accurately and quickly as possible. A new approach for the maneuvering target tracking is presented, especially for the target maneuver detection in heavy noise. The algorithm is based on the criterion where the maneuver detection delay is made minimum, which replaces the original measurements by those of the average interpolation to reduce the delay to avoid tracker divergence, and uses wavelet transforms to increase the probability of detection. However, it requires much more computation time, which may be critical in a real-time application. With parallel processing techniques, a parallel implementation of the algorithm is also proposed by multibus computer system with three CPUs. Simulation results show that our scheme has the superior performance than conventional algorithms especially for tracking maneuvering targets in heavy noise, while approaching the same computation time as those. The algorithm has great potential for real-time applications [C2018]

"Comparison and Simulation of Linear/LOG CFAR Algorithms"

An intelligent CFAR (constant false alarm rate) circuit can effectively combine the advantages of linear and LOG CFAR circuits by switching from linear to LOG or vice-versa and also deciding the algorithm that suits a particular environment best based on various parameters such as clutter, distance, optimum number of range cells etc automatically. This paper presents a comprehensive tabulation of results which can be used to implement the intelligent CFAR circuit The MATLAB simulations were performed for seven algorithms both LOG and linear for all possible environments (homogeneous/non-homogeneous). They were done for various sizes of range cells (16, 32 and 64). They were also simulated for different clutter environments such as Rayleigh, Weibull and log-normal. The results including the number of targets, no of false alarms, no of missed targets along with the multiplication factors were tabulated for 1000 iterations [C2019]

"Prediction of Sea Clutter Based on Chaos Theory with RBF and K-mean Clustering"

Artificial neural network (ANN) has been widely applied in time series analysis, typically, it can give an effective method to solve complicated problems which are too complex to understand in physic and statistic method, or observation data varied statistically and the data generated in nonlinear mechanism. Based on the underlying dynamic mechanism of the sea clutter, to reconstruct the nonlinear model of dynamical phase space, correlation integral (also called C-C method) and Cao method are used to get time delay tau and embedding dimension min this paper. Furthermore, an algorithm of radial basis function (RBF) with k-mean clustering to adjust and modify the networks is also presented to predict the nonlinear characteristic sea clutter for the goal of detecting the weak target signals beneath the sea clutter. With the new algorithms, computation complexity can be deduced while its reliability can be greatly improved. It also can satisfy the real-time requirement in real application. More detailed calculates and test results are presented [C2020]

"Geometric Analysis on Moving Targets and First-order Sea Clutters in Bistatic Shipborne SWR"

The geometric relationship between a bistatic radar and targets is highly complicated when they are moving with different velocities and headings. Target motion equations, which are used to describe the complex dynamic system's characteristics, is derived based upon the Cartesian coordinate systems established both on the transmitter (CCST) platform and on the receiver (CCSR) platform of the bistatic radar system. The results show that the instantaneous ranges between a target and the transmitter platform (TP) and the receiver platform (RP) contain a time-variable tangential component and a time-variable radial component. The Doppler-broadening mechanism of first-order sea clutters in bistatic shipborne surface wave radar (SWR) is analyzed based on the results derived above, and the conclusion shows that there exists dynamic broadened component in the broadened Doppler spectrum resulted from the difference of the motion between TP and RP [C2021]

"Receiving Signal Processing of Wideband MIMO Radar Based On Transmitting Diversity"

Multiple input multiple output (MIMO) radar is a new radar technique developed recently. This paper described the principle of wideband MIMO radar based on transmitting diversity and presented it's receive signal processing method, Simulation results show that the proposed wideband receive signal processing method can effectively accomplish matched filter and simultaneously form multiple receive beams and surveillance multiple targets [C2022]

"An Adaptive Compensation of Moving Clutter Doppler Shift for Helicopter MTD Radar"

The accurate estimation and compensation of the moving clutter Doppler shift are essentials for the moving target detection of the airborne radar system. In this paper, a technique for the real-time estimation and compensation of the moving clutter Doppler shift due to the moving radar platform is presented for the airborne pulsed Doppler radar system. A new algorithm employs the dwell-time based clutter-lock MTD method in order to estimate and compensate the mean Doppler shift within antenna beam dwell time by using high speed DSP based Doppler FFT processing. Through the helicopter-borne radar flight test using real-time radar data acquisition system, the moving clutter Doppler spectrum is measured and analyzed in terms of various operational parameters [C2023]

"Detection and Recognition of High-speed Anti-Radiation Missiles with Simple Multi-antenna VHF Radar"

A new warning radar for detection and recognition of high-speed anti-radiation missiles (ARM) is presented. The radar adopts a special antenna construct and is developed on the basis of the resonant effect of VHF bands, which makes RCS increase remarkably. Practical detecting method is analyzed according to the features of high-speed ARM. The system boasts the merits of simplicity, low cost and small size, etc. Experiment results are given to show the validity of the method [C2024]

"A Novel Fusion and Target Detection Method of Airborne SAR Images and Optical Images"

In this paper, the main problems of fusion techniques of airborne SAR and optical images are discussed. First, the regions of interest for target candidates in each mono-source data are independently segmented, and then the fusion is processed during the decision stage. A novel detection method of fusion images of targets which is based on "3S" technology is proposed. The experimental results demonstrate the advantage of this method [C2025]

"A Pre-Doppler Approach for Reduced Loss Bistatic STAP"

In this paper we investigate the effects of bistatic clutter spectral dispersion on STAP techniques. The use of reduced d.o.f. algorithms is considered since they enable localized training in the range dimension and thus limited effects of clutter non-stationarity. To this aim, the selection of appropriate adaptive degrees of freedom is demonstrated to be a crucial issue. Due to their intrinsic capability to yield reduced adaptivity loss and to their limited computational load, Pre-Doppler STAP techniques are shown to be a very appealing solution for clutter cancellation and slowly moving target detection in bistatic radar systems [C2026]

"A New Method of Resolving Velocity Ambiguities in Multi-Channel Interferometric SAR/GMTI"

Along-track interferometry is an effective technique of the land clutter suppression for ground moving target indication (GMTI). Based on the principle of clutter cancellation in dual channels along-track interferometric synthetic aperture radar (SAR), the performance of relocation and radial velocity estimation in the three channels SAR/GMTI is analyzed, and a set of analytical formulas is derived. To solve velocity ambiguities resulted from interferometeric phase, unequal separation four channels along-track interferometric SAR/GMTI scheme is

proposed, and the method of resolving velocity ambiguities is presented in detail. In addition, irregular spacing of sub-aperture help to exclude blind velocities and improve detection probability. Theoretical analysis and simulation results show the validity of this scheme [C2027]

"A Study on the Technologies of Ultrahigh-speed Data Acquisition and Signal Processing of Ultrawide-band Radar"

Ultrawide-band radars (UWBR) are of very high resolution and have become a new tool of detecting targets. The technologies of high-speed data acquisition and processing of ultrawide-band signals are the key technologies for ultrawide-band radars. A project of ultrahigh-speed, real-time, and direct RF acquisition is put forward in this paper. Pulse compression as a way of processing of ultrawide-band signals is studied. Experiments show that the high-speed data acquisition system may implement the high speed, high accuracy and real-time stable sampling of the ultrawide-band radar signals, and that the algorithm of pulse compression is actually feasible [C2028]

"Model-based Adaptive Target Detection in Clutter Using MIMO Radar"

In this paper the problem of target detection using coherent pulse terrain in auto regressive (AR) clutter has been considered for MIMO radars. We have formulated this problem as a hypothesis test. Using the generalized likelihood ratio test (GLRT) an adaptive decision scheme has been developed for clutter with known order but unknown parameters. The performance of the proposed detectors have been evaluated using Monte-Carlo simulations. The results show the superiority of the MIMO radars with temporal coherent processing over the conventional phased arrays due to both angular spread and a newly presented phenomenon which is called Doppler spread in this paper [C2029]

"A method for MTD detectability improvement using FFT/WFFT-DWT"

When the Doppler frequency of target mismatches the fast Fourier transform (FFT) bin frequencies, the high side lobe appears. Discrete wavelet transform (DWT) has been applied to output of weighed FFT (WFFT) to suppress side lobe. And then FFT/WFFT-DWT is proposed to improve processing gain (PG) further. PG formulae for both WFFT and WFFT-DWT are given. Experimental results demonstrate that FFT/WFFT-DWT can attain much higher detectability than FFT/FFT-DWT as well as FFT in unmatched state [C2030]

"Novel Ground Bounce Removal Algorithms Based on Non-homogeneous Detector"

In this paper, a non-homogeneous detector (NHD) is developed for ground penetrating radar (GPR) for the first time. The homogeneousness of ground bounce (GB) and the number and position of buried targets (or target-like objects) can be determined by the general likelihood based NHD. Combined with NHD, principal components analysis (PCA) based and blind source extraction (BSE) based methods are also presented for GB removal, which are referred to as NHD-PCA and NHD-BSE algorithm, respectively. For NHD-PCA algorithm, PCA is only taken on target areas to avoid leakage of target signals energy and descend of signal noise ratio (SNR) in target areas. For NHD- BSE algorithm, since the number of targets can be priorly determined by NHD, it has much less number of components to be extracted than that needed by independent component analysis (ICA), therefore less computational load is required. Meanwhile, all sources selection strategies needed by ICA are unnecessary for NHD-BSE because of the known number of extracted sources. The experimental results show the good performance of proposed methods [C2031]

"A Practical Method Against Passive Centroid Jamming in Monopulse Radar"

Passive centroid jamming is an effective method against conventional monopulse radar. When spatially dispersed decoy is used, the radar antenna will tend to point at the centroid between target and decoy. This paper analyzes the effect of centroid jamming on angle estimation in monopulse radar, and provides for a practical method against this jamming based on multiple targets detection algorithm and a priori knowledge of DOA of the target. Simulation results validate the effectiveness of this method [C2032]

"On Scheduling the Dwells of a Multifunction Radar"

Among several other tasks, the radar of a fighter has to search, track and identify potential targets. The waveforms used by the radar for each of these tasks are most often incompatible and hence, cannot be processed simultaneously. Moreover, these tasks are repeated several times in a cyclic fashion. Altogether, this defines a complex scheduling problem that impacts a lot on the quality of the radar's output In this paper, we define a formal framework for this real time scheduling problem and we introduce a local search method to compute efficient schedules for the radar. We also describe a set of lower bounds for the scheduling problem.

Simulated results are provided [C2033]

"Analysis and Simulation of Air Traffic Control Conflict"

With the development of civil aviation, air traffic flow and flight conflicts have increased greatly, and it is more and more difficult to control air traffic. In this paper, a flight conflicts analysis and simulation system is introduced to resolve the analysis, evaluation and training problems efficiently and accurately. Design and implementation of the system are discussed including data acquisition subsystem and conflict analysis subsystem. This paper mainly introduced radar data acquisition and processing, analysis and simulation of conflict cases. The results have high reality and accuracy, can help to summarize experience and develop the business level of air traffic controllers [C2034]

"Analogue TV Signal-Based Passive Radar onboard Single Air-Platform"

An analogue TV signal-based passive radar onboard single air-platform can be considered as a bistatic CW radar. This implementation suffers, however, considerable range ambiguities due to the time-varying form of analogue TV video signal, when it detects and tracks the target by exploiting the AOA and TDOA information in echoes of targets from transmitter of opportunity. In this paper we describe the implementation of passive radar onboard single air-platform that measures the AOA information in the echoes of target using air-borne orthogonal interferometry array and obtains un-ambiguous TDOA information by exploiting both analogue TV video and audio signals [C2035]

"A Robust CFAR Detector Based on Ordered Statistic"

An improved version of VI-CFAR called OSVI-CFAR is presented. It is a combination of the ordered statistics (OS) CFAR, the smallest-of OS (SOOS) CFAR and the greatest-of OS (GOOS) CFAR. In homogeneous and clutter edge environments, the detection performance and false-alarm regulation properties for the OSVI-CFAR detector are almost consistent with the VI-CFAR based on mean level (called ML VI-CFAR). But in multiple target situations which the interfering targets are present in both the halves of the reference window, the detection performance for the OSVI-CFAR detector is improved greatly, so it is more robust than the MLVI-CFAR in practice. Finally, some important properties of the OSVI-CFAR detector are analyzed and discussed [C2036]

"Detection Performance Analysis of Distributed OSCA CFAR with Nonconherent Integration"

A novel distributed detector, called order statistic cell-averaging (OSCA) detector, are proposed in the case of noncoherent integration, In this detector, each sensor transmits its test cell sample and a designated order statistic (OS) of its reference observations surrounding test cell to the fusion center. At the fusion center, the global noise power level is obtained with cell-averaging (CA) processing. Under the assumption of chi-square family target model and exponential clutter for independent square-law detector, the exact formulas of probability of false alarm (Pfa) and probability of detection (Pd), are derived. Finally, the corresponding detection performance is calculated with numerical analysis [C2037]

"Wideband Phased Subarray Jammer Nulling Technique"

High-resolution radar imaging systems are vulnerable to external interferences. When jammer power is large, it has a great impact on detectability and identifiability of the target. A jammer nulling method is presented after stretch processing and narrowband filtering which uses LMF signal in this paper. Moreover, The algorithm is simple in computation and easy in practical engineering. At last the computer simulation demonstrates the effectiveness of the method [C2038]

"Side-Lobe Blanking In Doppler-Domain For An Airborne Side-Looking Phased Array PD Radar"

For airborne PD radar, some strong side-lobe clutter would be detected as targets, because the Doppler shift of the side-lobe clutter is different from the Doppler shift of main-beam clutter when the angle between the side-lobe clutter scatter and the main-beam direction is over some value. However, when we filter the main-beam clutter with Doppler filter, the side-lobe clutter would be remained and then be detected as targets. These side-lobe false alarms shows an equal-range ring on radar display. This paper discusses a side-lobe blanking (SLB) method in Doppler-domain, which compares the Doppler filter output amplitude of Sigma channel with that of auxiliary channel, if Sigma channel is smaller, it's a side-lobe false alarm, blank it. Practical results shows effectiveness [C2039]

"Target Detection in Long Duration Energy Integration by Time-Frequency Distribution and Morphological Filtering"

A new energy integration detection scheme is proposed to detect a nonlinear frequency modulate (FIM) embedded in strong complex additive white Gaussian noise (CAWGN). In this scheme, the optimal kernel of Cohen's time-frequency distribution (TFD) is designed to realize local coherent integration of a signal. Thresholding and morphological filtering are used to extract the time-frequency (TF) support region of the signal from the TFD of an observation. Simulated results show that in the strong noise background with low ratios of signal to noise (SNR) the proposed method is effective [C2040]

"Lateral velocity estimation based on automotive radar sensors"

Automotive radar sensors are applied to measure the target range, azimuth angle and radial velocity simultaneously even in multiple target situations. The single target measured data are necessary for target tracking in advanced driver assistance systems (ADAS) e.g. in highway scenarios. In typical city traffic situations the radar measurement is also important but additionally even the lateral velocity component of each detected target such as a vehicle is of large interest in this case. It is shown in this paper that the lateral velocity of an extended target can be measured even in a mono observation situation. For an automotive radar sensor a high spectral resolution is required in this case which means the time on target should be sufficiently large [C2041]

"Target Detection with Adaptive Power Regression Thresholding for HF Radar"

High frequency (HF) radars are capable to detect and track targets at extremely long ranges. But the signal environment that includes external noise, different kinds of clutter and interference will significantly limit the detection performance and system capability. This paper considers a new approach to solve the target detection problem in a complex HF radar signal environment. It uses a conventional constant false-alarm-rate (CFAR) detection procedure but the thresholding scheme is based on regression analysis of power spectrum values along range and Doppler cells. The CFAR detection test rule was combined with a local peak determination procedure. The proposed detection scheme has been tested using real HF radar data and gave very promising results [C2042]

"A Kind of Dual-Channel GMTI Real-Time Processing Method Based on Frequency DPCA"

In this paper, current situation of GMTI technology would be discussed firstly. After that, a kind of dual-channel GMTI real-time processing method based on frequency DPCA would be presented. After analyzed the principle of clutter-suppression and the diagram of the algorithm, the processing result to both simulation data and real echo data from X-band dual-channel SAR system by the algorithm would be presented. The results proved this method is reasonable and reliable [C2043]

"A Wavelet-Based Algorithm to Compensate Fast-Moving One-Dimension Target's Range Profile"

The fast-moving target can cause one-dimension range profile aberration, evidence impacts on movement compensation and the performance of imaging algorithm, so in this paper, by analysis of the wideband echo signal model of fast-moving target, then wavelets transform method which can with well capability on low SNR compared with appeared algorithm is proposed to compensate the influence of high speed moving. Computer simulation shows the proposed method can compensate the range profile aberration of fast-moving target effectively [C2044]

"Adaptive Beamforming Passive Radar Based on FM Radio Transmitter"

Target detection by non-cooperative illuminator is a study hotspot in electronic warfare field, with 'four countering' potential advantages for passive radar. First of all, direct path interference (DPI) suppression which is the technique bottleneck of moving target detection by non-cooperative FM radio transmitter is analyzed in this paper. Secondly, a space-time-frequency domain synthetic solution to this problem is introduced: adaptive nulling array processing is employed in space domain; DPI cancellation based on adaptive fractional delay interpolation (AFDI) technique is used in time domain; additionally, coherent integration is utilized. Finally, an experimental system is schemed by regarding FM radio transmitter as non-cooperative illuminator, simulation results by real collected data show applying this method is effective in moving target detection [C2045]

"AR Model-based Rapid Detection of SAR Phase History Data with Wald Tests"

In this paper, we report a novel algorithm of automatic target detection applied directly to the SAR phase history data in a state of non-imaging. The proposed algorithm is based on a sequential Wald test. The inherently time-

sequential behavior of the SAR phase history is modeled as a stationary 2D autoregressive (AR) stochastic process. The sequential Wald test is employed to dynamically ascertain the presence or absence of a target while the SAR phase history data is being collected during SAR platform flying along its trajectory. Compared with conventional image-based detection methods, both simulation and experimental results show that significant savings in collection aperture can be obtained using the proposed algorithm which dynamically control the SAR resource allocation (azimuth aperture dwell time) to increase system search rate capabilities [C2046]

"A new method of improving the weak target detection performance based on the MIMO radar"

Based on the spatial diversity of the multiple input multiple output (MIMO) radar, a new method is presented to improve the detection performance of weak targets in clutter in this paper. First, the general spatial diversity condition is deduced. Accordingly, by selecting suitable MIMO radar spatial configuration, the target and clutter in a detection unit may be regarded as the non-fluctuating and the fluctuating components, respectively. Therefore, an effective method to exploit the spatial diversity to increase the signal-to-clutter-plus-noise ratio of the receiver is proposed. Compared to the conventional radar, it is shown that superior detection performance may be obtained with the proposed method, especially for the weak target in clutter. Finally, detailed numerical experiments are also provided to demonstrate the effectiveness of the proposed method [C2047]

"A Novel KICA Method for Ground Bounce Removal with GPR"

Nowadays ultra wideband ground penetrating radar (GPR) is widely used in landmine detection. For shallowly buried plastic landmines, the ground bounce is usually much stronger than the weak return from landmines and their arrival time is very close with each other, so ground bounce removal is very important for the following detection, imaging and target recognition. In this paper, kernel independent component analysis (KICA) is first introduced to ground bounce removal with GPR. A novel scheme is proposed for the automatic independent component (IC) selection, which is vital for any ICA based ground bounce removal algorithms. Experimental results based on field-test data show that the proposed method has good performance [C2048]

"Ultra-wideband Radar Signals Generated with Two-channel"

Synthesis of ultra-wideband (UWB) linear frequency modulated radar signals is a very important technology for microwave imaging, target identification and detection of low radar-cross-section (RCS) targets. In this paper a new method of UWB radar signals generated with two-channel is presented. The realization structure is given, and the principle of signal synthesis is analyzed. At the same time, an automatic adjustment measure of signal phase is proposed because of discontinuity of signal phase in this method. The simulation and experiment results show that radar signals with large instantaneous bandwidth can be generated by means of this method on the condition that the high-speed digital devices are limited [C2049]

"The Detection of Deception Jamming against SAR Based on Dual-Aperture Antenna Cross-Track Interferometry"

This paper is concerned with the detection of deception jamming by using the cross-track interferometry. A new scheme of deception jamming detection is investigated on the basis of dual-aperture antenna cross-track interferometric cancellation. First, the deception jamming is introduced with its mode and the jamming signal characters. Second, this scheme is discussed on its spatial cancellation algorithm and applicability in detail. Finally, its validity is demonstrated effectively with point target simulation in detecting deception jamming [C2050]

"Coherent Integration Detection Algorithm Research of Space Debris"

In this paper, the problem of coherent integrative detection of high velocity moving target-space debris by a space-based chirp radar is investigated. It is pointed out that during coherent integrative detection the space debris target returns may migrate in radar resolution cells. A fast velocity-dependent motion compensation method is proposed to resolve this problem. Simulation results show that the good performance of coherent integrative detection of space debris can be achieved [C2051]

"Detection and Parameter Estimiation of LPI Signals in Passive Radar"

It is desired for multi-static passive radar to intercept target radar signals simultaneously during the process of location which utilize the difference time of arrival (DTOA). However, many LPI techniques are adopted by airborne radar in practice such as low side lobe method and narrow beam technique. As a result, receivers will not locate in the coverage of major lobe simultaneously. One is covered by the main beam while others located in the side lobe of the antenna. Therefore the difference of signals' strength between these receivers will be more than 20 dB. The strong signal intercepted by the receiver in the main beam is analyzed by auto-correlation

theory, and signal's periodicity is estimated. Then we take it as replica of the side lobe signal to define the model of mixing product. Furthermore, mixing product signal which has no relations to do with the modulation of signal is deduced. Finally, an example of real data process which validated its effectiveness in application is given [C2052]

"An IMF-product detector for the UWB radar signal"

We develop an intrinsic mode functions (IMF) product detector for UWB radar. The UWB noisy data are decomposed into finite number of intrinsic mode functions (IMFs) by empirical mode decomposition (EMD) method. The detection method is based on the IMF point-wise product detection. The proposed method was tested in the case of low signal-to-noise ratio (SNR), the large similarity between target signal and background noise, and absence knowledge of noise's probability density function (PDF). The test data comes from the UWB radar experimental system. We compared the performance of the proposed detector with that of Teager energy operator (TEO), and showed the superiority of the proposed detector over TEO [C2053]

"Approximate Invariance of the Inverse of the Covariance Matrix and Its Applications"

Space-time adaptive processing (STAP) normally requires knowledge of the inverse of the covariance matrix (ICM) of undesired signals for detecting desired target signals. The computation of the real-time ICM is impractical at current computer speeds. Presenting two theorems, this paper shows that the ICM is approximately invariant to clutter changes if radar and platform parameters remain unchanged. Potential applications of this approximate invariance are manifold. One of applications we suggest in the paper is a pre-built space-time non-adaptive processor (PSTAP). Both simulated data generated by the high fidelity simulation software, RLSTAP, and real data collected by the multi-channel airborne radar measurements (MCARM) system are tested. The results indicate that PSTAP performs virtually the same as STAP. A moving target has been detected from the MCARM data [C2054]

"Rank CFAR Detector in Presence of Randomly Arriving Impulse Interference"

We have researched the rank detector in presence of clatter and randomly arriving impulse interference with Poison and binomial distributed flow with arbitrary average repetition frequency and magnitude, Raleigh amplitude distribution, and Swerling II target model. Our purpose is to obtain the limits when this detector is nonparametric and to compare it with post-detection integration (PI), binary integration (BI), excision (EXC) BI, and robust adaptive censoring post-detection integration (RACPI) CFAR processors. The results are obtained by Monte Carlo simulations and can be used in both, radar and communication receivers [C2055]

"Effects of Multiple Targets on the Mean Level STAP Detector"

Robustness of the constant false alarm rate (CFAR) mean level adaptive detector for phased array radar equipped with a space-time adaptive processing (STAP) algorithm is analysed when the secondary data is contaminated by multiple interfering targets at different ranges. Closed-form analysis is first given based on the assumption of Gaussian interference and Swerling I target models. The deleterious effect on target detection is then experimentally examined using the multi channel airborne radar measurements (MCARM) database. It is found that both the probability of detection and the false alarm rate decrease in accordance with the sum of the signal power of the interfering targets. In addition, the false alarm rate is very sensitive to the presence of interfering targets, in the sense that a small sum (below the noise floor) of their signal power can lower the false alarm rate [C2056]

"Small Target Detection in Sea Clutter Based on Doppler Spectrum Features"

Small target detection in sea clutter is a challenge problem in radar signal processing community. Based on the analysis of sea clutter Doppler spectrum characteristics, two target detection algorithms are proposed, namely, a Bayesian detection algorithm based on joint Rayleigh distribution model and a feature detection algorithm based on the entropy feature extracted from signal's Doppler spectrum. The detection performances of the proposed algorithms are evaluated based on the data collected by the McMaster IPIX radar at the east coast of Canada [C2057]

"An Improved DPT-based Estimator and its Application to Maneuvering Air Target Detection for 0TH Radar"

In this paper, we propose an improved DPT-based estimator, and give its application to maneuvering air target detection in over-the-horizon radar (OTHR). The discrete polynomial-phase transform (DPT) is an efficient analysis tool for the polynomial-phase signal (PPS), and it provides accurate estimation on the parameters of the

PPS. However, the DPT-based estimator requires a sufficiently high input signal-to-noise ratio (SNR). To overcome this limitation and extend the scope of its application, a pre-processing method, including frequency-band compressing and time-frequency filtering, is added before the nonlinear operator involved in the original algorithm. The resulting algorithm is proved to have a rather good performance in low SNR cases, and can be applied to enhance the detection performance of the maneuvering air target in OTHR. The simulation results are given to demonstrate the validity of the proposed algorithm [C2058]

"GLRT Detection for Range and Doppler Distributed Targets in non-Gaussian Clutter"

A generalized likelihood ratio test (GLRT) is derived for adaptive detection of range and Doppler distributed targets. The clutter is modelled as a spherically invariant random process (SIRP) and its texture component is range dependent (heterogeneous clutter). We suppose here that the speckle component covariance matrix is known or estimated thanks to a secondary data set. Thus, unknown parameters to be estimated are local texture values, the complex amplitudes and frequencies of all scattering centers. The proposed detector assumes a priori knowledge on the spatial distribution of the target and has the precious property of constant false alarm rate (CFAR) with the assumption of a known speckle covariance matrix or by the use of frequency agility [C2059]

"Study of location based on T-R and T/R-R mode in Bistatic Radar"

In this paper we analyze some methods for the location in bistatic radar and present two novel methods for location in the shipborne passive synthetic impulse and aperture radar (SIAR) that is a ground-wave over-the-horizontal-radar (GW-OTHR). The novel methods are based on the analysis of overwhelming error we encountered in practice. Since the accuracy of location in bistatic radar is sensitive to the position of target, we explore redundant information to interpolate higher accuracy position information when radar works in T/R-R mode. The approaches ameliorate the performance of detection when limited information about target can be acquired. Moreover, analysis and simulation results which show the efficiencies of the two new approaches are presented [C2060]

"Radar Micro-motion Target Resolution"

Micro-motion such vibration and rotation induces unique phase modulation or Doppler modulation and offers a new way of characterizing objects. When multiple vibration/rotation targets detection and identification are considered, the echo signal is multi-component sinusoidal modulation signal. So far multi-target resolution is still a major challenge facing radar signal processing community. In this paper, A new conception, multi-target micro-Doppler is introduced, and then B-distribution (BD) is applied to implement micro-motion target resolution (MMTR). Based on multi-target micro-Doppler, a complete scheme is presented for micro-motion target resolution. BD for resolving multiple vibration/rotation targets is demonstrated with synthetic data, and simulation results confirm our expectations [C2061]

"Integrated Antenna Architecture for High Frequency Multifunction Naval Systems"

We present an integrated topside approach to the design of a multifunction naval high frequency (HF) system. Following this approach two high-level designs for systems capable of simultaneously providing radar, communications, and electronic support measures are generated. The solutions employ a system of shared antennas to offer enhanced capabilities such as over-the-horizon detection while minimizing the radar cross section (RCS) of the ship. The performances of the proposed systems are assessed using a suite of software simulations and found to be feasible. Detection of low-level air targets is expected at 4-5 times the conventional microwave radar horizon. Reliable communication performance, well within current modem capabilities, is predicted for three geographical locations. Meteorological monitoring could take place at ranges up to about 350 km. Phased array operation of the shared antennas provides a high level of directivity that is expected to make the system highly effective at direction finding compared to conventional ESM systems and also provide high jamming performance [C2062]

"Adaptive Filtering in Polarization Domain with the Criterion of LCMV"

The radar targets can be detected by polarization information when they are difficult to be distinguished from clutter or interference environment by information derived from time and frequency and spatial domains. The traditional methods of polarization filtering are not suitable for the detection of targets in an environment containing strong jams because the signal to interference ratio (SIR) is usually every small and the polarization state of the jam is unknown or distributed continuously. This paper proposes a novel algorithm of adaptive polarization filtering based on the principle of linear constraint minimum variance (LCMV), which achieves the optimal receive of signal by adopting the variable polarization of antenna. For the realization of algorithm and the

adaptive fast varying interference, a recursion polarization filtering algorithm is given which can adapt the polarization states of the jam at sampling speed. Simulations are shown and results are in good agreement with theoretical analysis [C2063]

"A method or radar targets position acquisition based on Possibilistic C_means algorithm"

Targets position acquisition is a key technique in radar data processing system. The existence of sea clutter result in the coupling of targets in radar video which lead to the distortion of targets position acquisition. A method for radar targets position acquisition based on possibilistic C_means algorithm is used to solve the problem. During marking different targets by the connectivity and combination algorithm, a method based on possibilistic C_means algorithm is presented to segment coupled targets. The result of the experiment showed that this method can use azimuth and range of radar video simultaneously to realize target position acquisition which can overcome the targets splitting caused by conventional method based on one-dimensional acquisition and can segment coupled targets caused by several factors effectively, thus improving the accuracy of targets position acquisition [C2064]

"Detection and Location of Fast Moving Targets Using Minimum Redundancy Linear Array SAR"

In this paper, a new system called minimum redundancy linear array SAR (MRLA-SAR) is proposed. Using multiple complex images formed by multiple antennas with a special configuration, MRLA-SAR can not only suppress the stationary clutter, but also locate and image both slowly and fast moving targets accurately. Numerical experiments are also presented to demonstrate the effectiveness of MRLA-SAR [C2065]

"An Effective Approach to Ground Moving Target Imaging for Single Channel SAR System"

Based on the envelopes and the characteristics of Doppler spectrum of returns in single channel synthetic aperture radar (SAR) systems a method is proposed, which adopts two order Keystone transform to adjust the range curvature of echo data, then range walk rates of echoes' envelopes are estimated to make some adjustments of walk and the Doppler parameters of moving targets are obtained through analyzing the Doppler spectrum of the moving targets. At last the images and positions of ground moving targets are gained, which make it possible that the moving targets can be indicated in right locations in SAR image. In addition the key motion parameters of moving targets can be estimated by the relationship between the Doppler parameters and motion parameters of ground moving targets. The results of the measured data show that this method can image ground moving targets and estimate motion parameters effectively [C2066]

СПИСОК ЛИТЕРАТУРЫ

C906. Di Lallo A. Adaptive spatial processing applied to a prototype passive covert radar: Test with real data. / Di Lallo A., Fulcoli R., Timmoneri L. // 2008 International Conference on Radar. - Adelaide, SA, 2-5 Sept. 2008. - P. 139-143.

C907. Hai Deng. Ground moving target detection using bistatic image feature-based space-time processing (BIFSTP) for airborne bistatic radars. / Hai Deng, Himed B. // 2008 International Conference on Radar. - Adelaide, SA, 2-5 Sept. 2008. - P. 144-147.

C908. Marple S.L. Performance tradeoffs for multi-channel parametric adaptive radar algorithms. / Marple S.L., Corbell P.M., Rangaswamy M. // 2008 International Conference on Radar. - Adelaide, SA, 2-5 Sept. 2008. - P. 154-159.

C909. Antoniou M. The concept of a forward scattering micro-sensors radar network for situational awareness. / Antoniou M., Sizov V., Cheng Hu, Jancovic P., Abdullah R., Rashid N.E.A., Cherniakov M. // 2008 International Conference on Radar. - Adelaide, SA, 2-5 Sept. 2008. - P. 171-176.

C910. Gorski T. Effect of integration time on detection performance of MTI and STAP algorithms in HF radar. / Gorski T., Fabrizio G., Le Caillec J.-M., Kawalec A., Thomas N. // 2008 International Conference on Radar. - Adelaide, SA, 2-5 Sept. 2008. - P. 160-164.

C911. Ageev I.M. Mathematical and numerical modeling of moving inhomogeneous weakly ionized gas-plasma

flows for determination of target scattered fields. / Ageev I.M., Shishkin A.G., Shishkin G.G., Merdanov K.M., Skvortsov V.S. // 2008 International Conference on Radar. - Adelaide, SA, 2-5 Sept. 2008. - P. 446-449.

C912. Chen Mingyan. Study on simulation of signal processing system of space surveillance radar. / Chen Mingyan, Xie Jianmin, Zhang Wei, Wang Xuegang. // 2008 International Conference on Radar. - Adelaide, SA, 2-5 Sept. 2008. - P. 474-477.

C913. Chun-hong Zhang. Signal-to-noise ratio analysis in satellite-airship bistatic space based radar. / Chun-hong Zhang, Hai-bo Liu, Teng Long. // 2008 International Conference on Radar. - Adelaide, SA, 2-5 Sept. 2008. - P. 434-439.

C914. Kennedy H.L. Controlling track coalescence with scaled Joint Probabilistic Data Association. 2008 International Conference on Radar. - Adelaide, SA, 2-5 Sept. 2008. - P. 440-445.

C915. Douvenot R. Inverse methods for Refractivity From Clutter. / Douvenot R., Fabbro V., Bourlier C., Saillard J. // 2008 International Conference on Radar. - Adelaide, SA, 2-5 Sept. 2008. - P. 488-491.

C916. Battistelli G. Multiscan association as a single-commodity flow optimization problem. / Battistelli G., Chisci L., Papi F., Benavoli A., Farina A. // 2008 International Conference on Radar. - Adelaide, SA, 2-5 Sept. 2008. - P. 519-524.

C917. Nielsen P. Integrated detection and tracking via closed-loop radar with spatial-domain matched illumination. / Nielsen P., Goodman N.A. // 2008 International Conference on Radar. - Adelaide, SA, 2-5 Sept. 2008. - P. 546-551.

C918. Haitao Jia. Research of radar automatic target recognition in practical high resolution range profile. / Haitao Jia, Wei Zhang, Ke Zhang, Chi Zhang, Chuanyang Dai. // 2008 International Conference on Radar. - Adelaide, SA, 2-5 Sept. 2008. - P. 492-497.

C919. Kennedy H.L. Comparison of MHT and PDA track initiation performance. 2008 International Conference on Radar. - Adelaide, SA, 2-5 Sept. 2008. - P. 508-512.

C920. Turley M.D.E. Signal processing techniques for maritime surveillance with skywave radar. 2008 International Conference on Radar. - Adelaide, SA, 2-5 Sept. 2008. - P. 241-246.

C921. Mata-Moya D. Robust detectors for targets of unknown correlation in clutter. / Mata-Moya D., Jarabo-Amores P., Nieto-Borge J.C., Lopez-Ferreras F. // 2008 International Conference on Radar. - Adelaide, SA, 2-5 Sept. 2008. - P. 247-252.

C922. Menelle M. Full digital High Frequency Surface Wave Radar: French trials in the biscay bay. / Menelle M., Auffray G., Jangal F. // 2008 International Conference on Radar. - Adelaide, SA, 2-5 Sept. 2008. - P. 224-229.

C923. Fabrizio G.A. adaptive mitigation of spread clutter in high frequency surface-wave Radar. / Fabrizio G.A., Holdsworth D.A. // 2008 International Conference on Radar. - Adelaide, SA, 2-5 Sept. 2008. - P. 235-240.

C924. Kristoffersen S. Denial jamming technique development against pulse-doppler radars using genetic algorithms. / Kristoffersen S., Moen H. // 2008 International Conference on Radar. - Adelaide, SA, 2-5 Sept. 2008. - P. 253-258.

C925. Piotrowski A. In band interference to radar for swerling targets. 2008 International Conference on Radar. - Adelaide, SA, 2-5 Sept. 2008. - P. 379-385.

C926. Bayat S. Target detection by passive coherent FM based bistatic radar. / Bayat S., Nayebi M.M., Norouzi Y. // 2008 International Conference on Radar. - Adelaide, SA, 2-5 Sept. 2008. - P. 412-415.

C927. Yunhan Dong. A new adaptive displaced phase centre antenna processor. 2008 International Conference on Radar. - Adelaide, SA, 2-5 Sept. 2008. - P. 343-348.

C928. Ghahramani M. Optimum two-pulse UWB detector for different target fluctuation models. / Ghahramani M., Mohseni R., Sheikhi A., Saeimanesh F. // 2008 International Conference on Radar. - Adelaide, SA, 2-5 Sept. 2008. - P. 355-359.

C929. Hanselmann T. Sensor scheduling for multiple target tracking and detection using passive measurements. / Hanselmann T., Morelande M., Moran B., Sarunic P. // 2008 11th International Conference on Information Fusion. - Cologne, June 30 2008-July 3 2008. - P. 1-8.

C930. Musicki D. Multi scan target tracking with finite resolution sensors. / Musicki D., Koch W. // 2008 11th International Conference on Information Fusion. - Cologne, June 30 2008-July 3 2008. - P. 1-8.

C931. Guerriero M. Radar/AIS data fusion and SAR tasking for Maritime Surveillance. / Guerriero M., Willett P., Coraluppi S., Carthel C. // 2008 11th International Conference on Information Fusion. - Cologne, June 30 2008-July 3 2008. - P. 1-5.

C932. Fayad F. Object-level fusion and confidence management in a multi-sensor pedestrian tracking system. / Fayad F., Cherfaoui V. // 2008. MFI 2008. IEEE International Conference on Multisensor Fusion and Integration for Intelligent Systems. - Seoul, 20-22 Aug. 2008. - P. 58-63.

C933. Melezhik P.N. Coherent Ka-band radar with a semiconductor transmitter for airport surface movement monitoring. / Melezhik P.N., Andrenko S.D., Sidorenko Y.B., Provalov S.A., Razskazovskiy V.B., Reznichenko N.G., Zuikov V.A., Balan M.G., Varavin A.V., Usov L.S., Kolisnichenko M.V., Muskin Y.N. // 2008. TIWDC/ESAV 2008. Tyrrhenian International Workshop on Digital Communications-Enhanced Surveillance of Aircraft and Vehicles. - Capri, 3-5 Sept. 2008. - P. 1-5.

C934. van Genderen P. Evaluation of some features for extended target extraction in polarimetric radar. / van Genderen P., Kovalenko V. // 2008. TIWDC/ESAV 2008. Tyrrhenian International Workshop on Digital Communications-Enhanced Surveillance of Aircraft and Vehicles. - Capri, 3-5 Sept. 2008. - P. 1-6.

C935. Galati G. 1090 MHz channel capacity improvement in the Air traffic control context. / Galati G., Piracci E.G., Petrochilos N., Fiori F. // 2008. TIWDC/ESAV 2008. Tyrrhenian International Workshop on Digital Communications-Enhanced Surveillance of Aircraft and Vehicles. - Capri, 3-5 Sept. 2008. - P. 1-5.

C936. Xiaoxiang Liu. An intelligent through-the-wall recognition system for homeland security. / Xiaoxiang Liu, Leung H., Lampropoulous G.A. // 2008. IJCNN 2008. (IEEE World Congress on Computational Intelligence). IEEE International Joint Conference on Neural Networks. - Hong Kong, 1-8 June 2008. - P. 2084-2090.

C937. Rodriguez F S.A. Extrinsic calibration between a multi-layer lidar and a camera. / Rodriguez F S.A., Fremont V., Bonnifait P. // 2008. MFI 2008. IEEE International Conference on Multisensor Fusion and Integration for Intelligent Systems. - Seoul, 20-22 Aug. 2008. - P. 214-219.

C938. Musicki D. State dependent detection and object tracking. / Musicki D., Hanselmann T. // 2008. MFI 2008. IEEE International Conference on Multisensor Fusion and Integration for Intelligent Systems. - Seoul, 20-22 Aug. 2008. - P. 372-377.

C939. Hirose A. An adaptive ground penetrating radar imaging system based on complex-valued self-organizing map-recent progress and experiments in Cambodia -. 2008. IJCNN 2008. (IEEE World Congress on Computational Intelligence). IEEE International Joint Conference on Neural Networks. - Hong Kong, 1-8 June 2008. - P. 1609-1614.

C940. Grimmett D. Multistatic target tracking using specular cue initiation and directed data retrieval. 2008 11th International Conference on Information Fusion. - Cologne, June 30 2008-July 3 2008. - P. 1-8.

C941. Oztan B.B. Estimation of the parameters of complex exponentials under radar land clutter and single snapshot observation using Modified Forward Backward Linear Prediction. / Oztan B.B., Tanik Y. // 2008. SIU 2008. IEEE 16th Signal Processing, Communication and Applications Conference. - Aydin, 20-22 April 2008. - P. 1-4.

C942. Suen J.Y. A W-band quasi-optical homodyne Doppler radar for detection of very slow-moving targets. / Suen J.Y., Singh R.S., Taylor Z.D., Brown E.R. // 2008 IEEE MTT-S International Microwave Symposium Digest. - Atlanta, GA, 15-20 June 2008. - P. 1553-1556.

C943. Mertens M. Ground Moving Target Tracking with context information and a refined sensor model. / Mertens M., Ulmke M. // 2008 11th International Conference on Information Fusion. - Cologne, June 30 2008-July 3 2008. - P. 1-8.

C944. Garcia-Fernandez A.F. Analysis of ISAR images of a helicopter by a facet model. / Garcia-Fernandez A.F., Grajal J., Yeste-Ojeda O.A. // 2008 International Conference on Radar. - Adelaide, SA, 2-5 Sept. 2008. - P. 32-37.

C945. Fasoula A. 2D spatial model matching using HRR multi-radar data. / Fasoula A., Driessen H., van Genderen P. // 2008 11th International Conference on Information Fusion. - Cologne, June 30 2008-July 3 2008. - P. 1-8.

C946. Zhuge X. UWB array-based radar imaging using modified Kirchhoff migration. / Zhuge X., Savelyev T.G., Yarovoy A.G., Ligthart L.P. // 2008. ICUWB 2008. IEEE International Conference on Ultra-Wideband. - Hannover, 10-12 Sept. 2008. - Vol. 3. - P. 175-178.

C947. Wee Peng Ang. Sharpening of shadow edges in ultra high resolution SAR images. / Wee Peng Ang, Huixian Chen. // 2008 International Conference on Radar. - Adelaide, SA, 2-5 Sept. 2008. - P. 65-69.

C948. Rosenberg L. Characterisation of low-PRF X-band sea-clutter doppler spectra. / Rosenberg L., Crisp D., Stacy N. // 2008 International Conference on Radar. - Adelaide, SA, 2-5 Sept. 2008. - P. 100-105.

C949. Zhe Wendy Wang. Partial differential equation-based GPR signature discrimination for automatic detection of bridge deck delamination. / Zhe Wendy Wang, Slabaugh G., Tong Fang. // 2008. CASE 2008. IEEE International Conference on Automation Science and Engineering. - Arlington, VA, 23-26 Aug. 2008. - P. 431-435.

C950. Nebus F. Automated detection of moving person from small pulse battlefield radar. / Nebus F., Kurty J. // 2008. MIKON 2008. 17th International Conference on Microwaves, Radar and Wireless Communications. - Wroclaw, 19-21 May 2008. - P. 1-4.

C951. Yuan Zhou. Multi-target UWB passive ranging with local template uncertainty. / Yuan Zhou, Law C.L., Yong Liang Guan, Chin F. // 2008. ICUWB 2008. IEEE International Conference on Ultra-Wideband. - Hannover, 10-12 Sept. 2008. - Vol. 1. - P. 233-236.

C952. Ghobadzadeh A. GLR approach for MIMO radar signal sampling in unknown clutter parameter. / Ghobadzadeh A., Tadaion A.A., Taban M.R. // 2008. IST 2008. International Symposium on Telecommunications. - Tehran, 27-28 Aug. 2008. - P. 624-628.

C953. Mathias A. Insideness and collision detection algorithms. / Mathias A., Kanther U., Heidger R. // 2008. TIWDC/ESAV 2008. Tyrrhenian International Workshop on Digital Communications-Enhanced Surveillance of Aircraft and Vehicles. - Capri, 3-5 Sept. 2008. - P. 1-7.

C954. Ghahramani M. Modification of IPCP for different target fluctuation models in UWB radars. / Ghahramani M., Sheikhi A., Saeimanesh F. // 2008. ICUWB 2008. IEEE International Conference on Ultra-Wideband. - Hannover, 10-12 Sept. 2008. - Vol. 2. - P. 85-88.

C955. Hayashi N. A fundamental study of bistatic UWB radar for detection of buried objects. / Hayashi N., Sato M. // 2008. ICUWB 2008. IEEE International Conference on Ultra-Wideband. - Hannover, 10-12 Sept. 2008. - Vol. 2. - P. 125-128.

C956. White K. Radar sensor management for detection and tracking. / White K., Williams J., Hoffensetz P. // 2008 11th International Conference on Information Fusion. - Cologne, June 30 2008-July 3 2008. - P. 1-8.

C957. Hussain M.G.M. Delay-doppler ambiguity function of ultrawideband-throb signals. 2008. ICUWB 2008. IEEE International Conference on Ultra-Wideband. - Hannover, 10-12 Sept. 2008. - Vol. 2. - P. 97-100.

C958. Jingyao Liu. Radar sea clutter suppression and target detection with α-β-γ filter. / Jingyao Liu, Huadong Meng, Xiqin Wang. // 2008. ICSP 2008. 9th International Conference on Signal Processing. - Beijing, 26-29 Oct. 2008. - P. 2376-2379.

C959. Zhigang Su. RCB-based imaging method for 3-D target via curvilinear SAR. / Zhigang Su, Guiying Liu, Yingning Peng, Renbiao Wu, Ruihua Liu. // 2008. ICSP 2008. 9th International Conference on Signal Processing. - Beijing, 26-29 Oct. 2008. - P. 2368-2371.

C960. Jiang Wei. Coherent detection and ambiguity resolution for Frequency Diversity Separated Subarray

Radar. / Jiang Wei, Wang Ju, Wu Siliang, Wang Dajun. // 2008. ICSP 2008. 9th International Conference on Signal Processing. - Beijing, 26-29 Oct. 2008. - P. 2364-2367.

C961. Sijie Yuan. Application research of keystone transform in weak high-speed target detection in low-PRF narrowband Chirp radar. / Sijie Yuan, Tao Wu, Mao Mao, Gaojie Mei, Xin Wei. // 2008. ICSP 2008. 9th International Conference on Signal Processing. - Beijing, 26-29 Oct. 2008. - P. 2452-2456.

C962. Changyong Jiang. A new method for anti-noise FM interference. / Changyong Jiang, Meiguo Gao, Yiwei Shi, Xiongjun Fu. // 2008. ICSP 2008. 9th International Conference on Signal Processing. - Beijing, 26-29 Oct. 2008. - P. 2396-2399.

C963. Yunxia Bao. A novel approach for clutter cancellation in HPRF stepped-frequency radar. / Yunxia Bao, Lixiang Ren, Peikun He, Erke Mao. // 2008. ICSP 2008. 9th International Conference on Signal Processing. - Beijing, 26-29 Oct. 2008. - P. 2384-2387.

C964. Yang Li. A long-term coherent integration method of phase-coded pulse train. / Yang Li, Teng Long. // 2008. ICSP 2008. 9th International Conference on Signal Processing. - Beijing, 26-29 Oct. 2008. - P. 2334-2337.

C965. Wen-guang Wang. Discrimination method to track before detect based on Dynamic Programming. / Wen-guang Wang, Jin-ping Sun, Yu-jie Li, Xiao-yang Su, Zhao-yang Qiu. // 2008. ICSP 2008. 9th International Conference on Signal Processing. - Beijing, 26-29 Oct. 2008. - P. 2306-2309.

C966. You He. A detector based on fractal for range extended targets. / You He, Xin-feng Gu, Tao Jian, Rong-jian Qiu. // 2008. ICSP 2008. 9th International Conference on Signal Processing. - Beijing, 26-29 Oct. 2008. - P. 2294-2297.

C967. Zun-hua Guo. Automatic target recognition of aircrafts using translation invariant features and neural networks. / Zun-hua Guo, Shao-hong Li, Wei-xin Xie. // 2008. ICSP 2008. 9th International Conference on Signal Processing. - Beijing, 26-29 Oct. 2008. - P. 2271-2274.

C968. Tao Jian. Performance characterization of two adaptive range-spread target detectors for unwanted signal. / Tao Jian, You He, Feng Su, Chang-wen Qu, Xin-feng Gu. // 2008. ICSP 2008. 9th International Conference on Signal Processing. - Beijing, 26-29 Oct. 2008. - P. 2326-2329.

C969. Xianglin Wang. An effective BSE-ST method for radar target detection in inhomogeneous clutter/interference environments. / Xianglin Wang, Rao N., Yufeng Cheng, Gang Wang, Minghu Liu. // 2008. ICSP 2008. 9th International Conference on Signal Processing. - Beijing, 26-29 Oct. 2008. - P. 2322-2325.

C970. Yuan Haojuan. Long-Term integration algorithm using the HPRF stepped frequency waveform. / Yuan Haojuan, Gao Meiguo, Wang Sen. // 2008. ICSP 2008. 9th International Conference on Signal Processing. - Beijing, 26-29 Oct. 2008. - P. 2310-2313.

C971. Song Jie. New fast methods for moving target detection in non-cooperative bistatic pulse radar. / Song Jie, He You, Cai Fu-qing, Ge Xian-jun. // 2008. ICSP 2008. 9th International Conference on Signal Processing. - Beijing, 26-29 Oct. 2008. - P. 2457-2460.

C972. Jenkins C. Application of Radial Symmetry for Caldera Detection. / Jenkins C., Wan J., Holden E.-J., Dentith M., Kovesi P., Haederle M. // 2008. DICTA '08.Digital Image Computing: Techniques and Applications. - Canberra, ACT, 1-3 Dec. 2008. - P. 142-147.

C973. Fombellida J. SAR image segmentation algorithms: Performance comparison and improvement proposals. / Fombellida J., Melgar I., Gomez J., Andina D. // 2008. WAC 2008. World Automation Congress. - Hawaii, HI, Sept. 28 2008-Oct. 2 2008. - P. 1-6.

C974. Hong Zhou. Moving target detection and velocity estimation using multiple subband DPCA and ATI method for triple-channel UWB SAR. / Hong Zhou, Yulin Chang, Xiaotao Huang, Zhimin Zhou. // 2008. ICSP 2008. 9th International Conference on Signal Processing. - Beijing, 26-29 Oct. 2008. - P. 2653-2656.

C975. Komar C. Optimization of power consumption using trespassers' favorite path and variable sensing range integrated sleep schedule in surveillance wireless sensor networks. / Komar C., Ersoy C. // 2008. ISCIS '08. 23rd International Symposium on Computer and Information Sciences. - Istanbul, 27-29 Oct. 2008. - P. 1-5.

C976. Fericean S. Development of a microwave proximity sensor for industrial applications. / Fericean S., Dorneich A., Droxler R., Krater D. // 2008 IEEE Sensors. - Lecce, 26-29 Oct. 2008. - P. 1402-1405.

C977. Jin Mo Yang. Performance analysis of a minimum selected cell-averaging CFAR detection. / Jin Mo Yang, Whan Woo Kim. // 2008. ICCT 2008. 11th IEEE International Conference on Communication Technology. - Hangzhou, 10-12 Nov. 2008. - P. 442-445.

C978. Bai Jin-liang. Method of stepped frequency signal processing based on fractional Fourier transform. / Bai Jin-liang, Gao Mei-guo, Xu Cheng-fa. // 2008. ICSP 2008. 9th International Conference on Signal Processing. - Beijing, 26-29 Oct. 2008. - P. 2550-2553.

C979. Lei Li. Study on range window in HPRF Stepped Frequency radar system. / Lei Li, Lixiang Ren, Peikun He, Baojun Zhao. // 2008. ICSP 2008. 9th International Conference on Signal Processing. - Beijing, 26-29 Oct. 2008. - P. 2501-2504.

C980. Chunhong Zhang. Transmitted beam optimization design for the satellite-airship bistatic space based radar system. / Chunhong Zhang, Wei Liu. // 2008. ICSP 2008. 9th International Conference on Signal Processing. - Beijing, 26-29 Oct. 2008. - P. 2497-2500.

C981. Xiong-jun Fu. Geostationary orbital objects detection based on spaceborne radar imaging. / Xiong-jun Fu, Chang-yong Jiang, De-feng Chen, Mei-guo Gao. // 2008. ICSP 2008. 9th International Conference on Signal Processing. - Beijing, 26-29 Oct. 2008. - P. 2461-2464.

C982. Shenghua Zhou. Research for scattering properties of spatial and frequency diversity MIMO radar targets. / Shenghua Zhou, Hui Xu, Liangbing Hu, Hongwei Liu. // 2008. ICSP 2008. 9th International Conference on Signal Processing. - Beijing, 26-29 Oct. 2008. - P. 2533-2537.

C983. Chang Yu-lin. Moving target focusing and parameter estimation based on ROI of multi-channel UWB SAR images. / Chang Yu-lin, Zhou Hong, Huang Xiao-tao, Zhou Zhi-min. // 2008. ICSP 2008. 9th International Conference on Signal Processing. - Beijing, 26-29 Oct. 2008. - P. 2529-2532.

C984. Yu-lin Chang. The representation of moving targets in multi-channel UWB SAR images and it's application in the generalization of image domain GMTI methods. / Yu-lin Chang, Hong Zhou, Xiao-tao Huang, Zhi-min Zhou. // 2008. ICSP 2008. 9th International Conference on Signal Processing. - Beijing, 26-29 Oct. 2008. - P. 2525-2528.

C985. Zhao Zhao. Doppler compensation for orthogonal netted radar systems. / Zhao Zhao, Xiang-quan Shi. // 2008. ICSP 2008. 9th International Conference on Signal Processing. - Beijing, 26-29 Oct. 2008. - P. 2246-2249.

C986. Alekseyev V. Control and signal processing system of hyperspectral FLS LiDAR. / Alekseyev V., Babichenko S., Sobolev I. // 2008. BEC 2008. 11th International Biennial Baltic Electronics Conference. - Tallinn, 6-8 Oct. 2008. - P. 349-352.

C987. Matsunami I. Empirical Study on Ultra-Wideband Vehicle Radar. / Matsunami I., Nakahata Y., Ono K., Noguchi Y., Kajiwara A. // 2008. VTC 2008-Fall. IEEE 68th Vehicular Technology Conference. - Calgary, BC, 21-24 Sept. 2008. - P. 1-5.

C988. Obata Y. Tracking algorithm using N-back scan MHT under dense environments. / Obata Y., Ito M., Kameda H. // 2008 SICE Annual Conference. - Tokyo, 20-22 Aug. 2008. - P. 3436-3440.

C989. Hui Liu. A Novel Approach Research on Low Altitude Passive Acoustic Target Recognition Based on ICA and HMM. / Hui Liu, Jun-an Yang, Hao Chen. // 2008. ICNC '08. Fourth International Conference on Natural Computation. - Jinan, 18-20 Oct. 2008. - Vol. 5. - P. 371-375.

C990. Trischman J.A. Inverse Synthetic Aperture Radar imaging at 580 GHz. / Trischman J.A., Bennett J.R., Melendez K.A., Summers B.F., Sorensen J., Cooper K.B., Siegel P.H. // 2008. IRMMW-THz 2008. 33rd International Conference on Infrared, Millimeter and Terahertz Waves. - Pasadena, CA, 15-19 Sept. 2008. - P. 1-2.

C991. Haitao Jia. A whole scheme for aircraft target identification in HRRP. / Haitao Jia, Wei Zhang, Ke

Zhang, Chi Zhang, Chunyang Dai. // 2008. ICCCAS 2008. International Conference on Communications, Circuits and Systems. - Fujian, 25-27 May 2008. - P. 871-875.

C992. Il-hyoung Lee. Cooperative control of multiple Electronic Combat Air Vehicles for electronic attack. / Il-hyoung Lee, Hyochoong Bang. // 2008 SICE Annual Conference. - Tokyo, 20-22 Aug. 2008. - P. 2127-2130.

C993. Daniel L. Maritime UWB forward scattering radar network: Initial study. / Daniel L., Gashinova M., Cherniakov M. // 2008 International Conference on Radar. - Adelaide, SA, 2-5 Sept. 2008. - P. 658-663.

C994. Dzvonkovskaya A. Low power High Frequency Surface Wave Radar application for ship detection and tracking. / Dzvonkovskaya A., Gurgel K.-W., Rohling H., Schlick T. // 2008 International Conference on Radar. - Adelaide, SA, 2-5 Sept. 2008. - P. 627-632.

C995. Carretero-Moya J. Small-target detection in sea clutter based on the Radon Transform. / Carretero-Moya J., Gismero-Menoyo J., Asensio-Lopez A., Blanco-del-Campo A. // 2008 International Conference on Radar. - Adelaide, SA, 2-5 Sept. 2008. - P. 610-615.

C996. Gambini J. Occlusion Handling for Object Tracking Using a Fast Level Set Method. / Gambini J., Rozichner D., Buemi M.E., Mejail M., Berlles J.J. // 2008. SIBGRAPI 08. XXI Brazilian Symposium on Computer Graphics and Image Processing. - Campo Grande, 12-15 Oct. 2008. - P. 61-68.

C997. Raout J. Sea target detection using passive DVB-T based radar. 2008 International Conference on Radar. - Adelaide, SA, 2-5 Sept. 2008. - P. 695-700.

C998. Coleman C. DAB based passive radar: Performance calculations and trials. / Coleman C., Yardley H. // 2008 International Conference on Radar. - Adelaide, SA, 2-5 Sept. 2008. - P. 691-694.

C999. Malanowski M. PaRaDe-PAssive RAdar DEmonstrator family development at Warsaw University of Technology. / Malanowski M., Kulpa K., Misiurewicz J. // 2008. MRRS 2008 Microwaves, Radar and Remote Sensing Symposium. - Kiev, 22-24 Sept. 2008. - P. 75-78.

C1000. Chunjian Xie. Target Detecting Based on Improved WVD-HT for Radio Frequency Interference to UWB-SAR. / Chunjian Xie, Kai Zhang, Kuisheng Feng, Chenjiang Guo, Jiadong Xu. // 2008. ICINIS '08. First International Conference on Intelligent Networks and Intelligent Systems. - Wuhan, 1-3 Nov. 2008. - P. 604-607.

C1001. Qing Liu. Target Detection Based on Sea Clutter Model Using Neural Network. / Qing Liu, Songhua Yan, Wanling Wang. // 2008. ICINIS '08. First International Conference on Intelligent Networks and Intelligent Systems. - Wuhan, 1-3 Nov. 2008. - P. 600-603.

C1002. Wu Jian-Bin. Feature Extraction and Recognition Based on SVM. / Wu Jian-Bin, Tian Mao, Zhou Hui-Lin. // 2008. WiCOM '08. 4th International Conference on Wireless Communications, Networking and Mobile Computing. - Dalian, 12-14 Oct. 2008. - P. 1-4.

C1003. Alsuwailem A. Hardware realization of a novel Automatic Censored Cell Averaging CFAR detection algorithm using FPGA. / Alsuwailem A., Alshebeili S., Alhowaish M., Qasim S.M. // 2008. ICSP 2008. 9th International Conference on Signal Processing. - Beijing, 26-29 Oct. 2008. - P. 398-401.

C1004. Park S. Multiple data association and tracking using millimeter wave radar. / Park S., Euntai Kim, Heejin Lee, Hogi Jung. // 2008. ICCAS 2008. International Conference on Control, Automation and Systems. - Seoul, 14-17 Oct. 2008. - P. 2218-2221.

C1005. Jianmin Song. Bird flying track estimation based on single marine radar. / Jianmin Song, Huansheng Ning, Weishi Chen, Jun Liu. // 2008. ChinaCom 2008. Third International Conference on Communications and Networking in China. - Hangzhou, 25-27 Aug. 2008. - P. 1122-1126.

C1006. Ning Liu. New Tracking Filter for Single Observer Passive Location and Tracking System. / Ning Liu, Jianhua Li, Xing Wei, Yue Wu, Ping Yi. // 2008. WiCOM '08. 4th International Conference on Wireless Communications, Networking and Mobile Computing. - Dalian, 12-14 Oct. 2008. - P. 1-4.

C1007. Yu Zhi Tang. Calculation of the frequency-shifted signal parameter based on the polynomial phase model. / Yu Zhi Tang, Yuan Liang Ma, Zhong Yi Cai. // 2008. ICSC 2008. Asia Simulation Conference-7th International Conference on System Simulation and Scientific Computing. - Beijing, 10-12 Oct. 2008. - P. 1214-

1218.

C1008. Kulpa K. The CLEAN type algorithms for radar signal processing. 2008. MRRS 2008 Microwaves, Radar and Remote Sensing Symposium. - Kiev, 22-24 Sept. 2008. - P. 152-157.

C1009. Konchenko I. Availability analysis of the multilateration surveillance system in Kiev (Boryspil) airport. 2008. MRRS 2008 Microwaves, Radar and Remote Sensing Symposium. - Kiev, 22-24 Sept. 2008. - P. 83-85.

C1010. Lin Changchuan. AIS Information Decoding and Fuzzy Fusion Processing with Marine Radar. / Lin Changchuan, Dong Fang, Lin Hai, Le Lina, Zhou Jianwen, Ou Yangping. // 2008. WiCOM '08. 4th International Conference on Wireless Communications, Networking and Mobile Computing. - Dalian, 12-14 Oct. 2008. - P. 1-5.

C1011. Huilin Zhou. Time Frequency Representations for Classification of Landmine Using UWB Impulse GPR. / Huilin Zhou, Yuhao Wang. // 2008. WiCOM '08. 4th International Conference on Wireless Communications, Networking and Mobile Computing. - Dalian, 12-14 Oct. 2008. - P. 1-4.

C1012. Binbin Cheng. A computational Model for bats' echolocation based on mammalian auditory system. / Binbin Cheng, Hai Zhang. // 2008. ICSC 2008. Asia Simulation Conference-7th International Conference on System Simulation and Scientific Computing. - Beijing, 10-12 Oct. 2008. - P. 1436-1440.

C1013. Rovnakova J. Signal processing for through wall moving target tracking by M-sequence UWB radar. / Rovnakova J., Svecova M., Kocur D., Trung Thanh Nguyen, Sachs J. // 2008 18th International Conference Radioelektronika. - Prague, 24-25 April 2008. - P. 1-4.

C1014. Taiyang Hu. Study on the detection of coating stealth ground target by millimeter-wave radiometer. / Taiyang Hu, Zelong Xiao, Jianzhong Xu. // 2008. ICMMT 2008. International Conference on Microwave and Millimeter Wave Technology. - Nanjing, 21-24 April 2008. - Vol. 4. - P. 1757-1760.

C1015. Zhao Jian-hong. Impact of signal bandwidth on airborne wideband radar echoes. / Zhao Jian-hong, Yang Jian-yu, Peng Wei, Tang Bin. // 2008. ICMMT 2008. International Conference on Microwave and Millimeter Wave Technology. - Nanjing, 21-24 April 2008. - Vol. 3. - P. 1532-1535.

C1016. Goad A. Landmine detection utilizing an unmanned aerial vehicle. / Goad A., Schorer D., Sullenberger J., Yousuf F., Yu A., Donohue G., Hintz K. // 2008. SIEDS 2008. IEEE Systems and Information Engineering Design Symposium. - Charlottesville, VA, 25-25 April 2008. - P. 231-236.

C1017. De Maio A. Experimental Verification of a Two-State Model for the Cumulative Distribution Function of GSM Passive Radar Clutter. / De Maio A., Foglia G., Pasquino N., Vadursi M. // 2008. IMTC 2008. IEEE Instrumentation and Measurement Technology Conference Proceedings. - Victoria, BC, 12-15 May 2008. - P. 1288-1293.

C1018. Gachter S. Incremental object part detection toward object classification in a sequence of noisy range images. / Gachter S., Harati A., Siegwart R. // 2008. ICRA 2008. IEEE International Conference on Robotics and Automation. - Pasadena, CA, 19-23 May 2008. - P. 4037-4042.

C1019. Chunjian Xie. Multi-component target detecting of SAR based on improved WVD-HT for frequency-modulation jamming. / Chunjian Xie, Chenjiang Guo, Fang Yang, Jiadong Xu. // 2008. ICMMT 2008. International Conference on Microwave and Millimeter Wave Technology. - Nanjing, 21-24 April 2008. - Vol. 3. - P. 1521-1523.

C1020. Nadim G. Clutter reduction and detection of landmine objects in ground penetrating radar data using likelihood method. 2008. ISCCSP 2008. 3rd International Symposium on Communications, Control and Signal Processing. - St Julians, 12-14 March 2008. - P. 98-106.

C1021. Barry A.S. Airport Perimeter Security: Where we've been, Where we are, and Where we're going. / Barry A.S., Mazel D.S. // 2008 IEEE Conference on Technologies for Homeland Security. - Waltham, MA, 12-13 May 2008. - P. 57-62.

C1022. Qilian Liang. UWB Radar Sensor Networks for Sense-Through-Foliage Target Detection. / Qilian Liang, Samn S.W., Xiuzhen Cheng. // 2008. ICC '08. IEEE International Conference on Communications. -

Beijing, 19-23 May 2008. - P. 2228-2232.

C1023. Zhao Zhao. Short-range MMW PRC-CW radar utilizing Doppler compensation. / Zhao Zhao, Xiangquan Shi, Dazhi Ding. // 2008. ICMMT 2008. International Conference on Microwave and Millimeter Wave Technology. - Nanjing, 21-24 April 2008. - Vol. 3. - P. 1384-1387.

C1024. Zhao X.W. Analysis of impulse response of electrically large targets. / Zhao X.W., Liang C.H., Liang L. // 2008. ICMMT 2008. International Conference on Microwave and Millimeter Wave Technology. - Nanjing, 21-24 April 2008. - Vol. 2. - P. 963-966.

C1025. Yan Zhen Liao. Systolic adaptive array with sidelobe control. / Yan Zhen Liao, Fei Huang, Wei Xing Sheng, Xiao Feng Ma. // 2008. ICMMT 2008. International Conference on Microwave and Millimeter Wave Technology. - Nanjing, 21-24 April 2008. - Vol. 1. - P. 447-449.

C1026. Fu Xiongjun. ISAR Imaging for Multiple Targets Based on Randomized Hough Transform. / Fu Xiongjun, Gao Meiguo. // 2008. CISP '08. Congress on Image and Signal Processing. - Sanya, China, 27-30 May 2008. - Vol. 5. - P. 238-241.

C1027. Li Yang. Segmentation of Spectrum Map for HFSWR Based on Feature Extraction. / Li Yang, Zhang Ning, Yang Qiang. // 2008. CISP '08. Congress on Image and Signal Processing. - Sanya, China, 27-30 May 2008. - Vol. 5. - P. 189-193.

C1028. Qu Jin You. Detection Performance of MIMO Radar for Coherent Pulses. / Qu Jin You, Zhang Jian Yun, Wang Xiu, Liu Chun Sheng. // 2008. CISP '08. Congress on Image and Signal Processing. - Sanya, China, 27-30 May 2008. - Vol. 5. - P. 49-53.

C1029. Gong Qing-yong. Study on STAP Algorithm for Radar Target Detection in Heterogeneous Environments. / Gong Qing-yong, Zhu Zhao-da. // 2008. CISP '08. Congress on Image and Signal Processing. - Sanya, China, 27-30 May 2008. - Vol. 5. - P. 531-535.

C1030. Xie Wenchong. Range-Dependence Compensation Method for Bistatic STAP Radar. / Xie Wenchong, Wang Yongliang. // 2008. CISP '08. Congress on Image and Signal Processing. - Sanya, China, 27-30 May 2008. - Vol. 5. - P. 503-506.

C1031. Xu Hongbo. Estimation of Direction-of-Arrival by an Active Array. / Xu Hongbo, Su Yi, Huang Chunlin, Lu Min, Wang Huaijun. // 2008. CISP '08. Congress on Image and Signal Processing. - Sanya, China, 27-30 May 2008. - Vol. 5. - P. 277-280.

C1032. Deng Qiming. Colorization for Polarimetric SAR Image Based on Scattering Mechanisms. / Deng Qiming, Chen Yilun, Zhang Weijie, Yang Jian. // 2008. CISP '08. Congress on Image and Signal Processing. - Sanya, China, 27-30 May 2008. - Vol. 4. - P. 697-701.

C1033. Lupa I. Phased array-Technology and trends. 2008. COMCAS 2008. IEEE International Conference on Microwaves, Communications, Antennas and Electronic Systems. - Tel-Aviv, 13-14 May 2008. - P. 1-8.

C1034. Alejos A.V. Design and Implementation of Ground Peneration Radar System using Coded Sequences and Improved Target Detection using Golay Codes. / Alejos A.V., Muhammad D., Mohammed H.U.R. // 2008 IEEE Region 5 Conference. - Kansas City, MO, 17-20 April 2008. - P. 1-3.

C1035. Norgard J. Three-dimensional Microwave Tomography: Waveform diversity and distributed sensors for detecting and imaging buried objects with suppressed electromagnetic interference. / Norgard J., Musselman R., Drozd A. // 2008. APEMC 2008. Asia-Pacific Symposium on Electromagnetic Compatibility and 19th International Zurich Symposium on Electromagnetic Compatibility. - Singapore, 19-23 May 2008. - P. 371-374.

C1036. Youming Li. A Novel Technique for Preventing Signal Cancellation in Space-Time Adaptive Processing. / Youming Li, Rangding Wang. // 2008. CISP '08. Congress on Image and Signal Processing. - Sanya, Hainan, 27-30 May 2008. - Vol. 1. - P. 55-59.

C1037. Sadjadi F. Detection of buried objects using GPR change detection in polarimetric Huynen spaces. / Sadjadi F., Sullivan A., Gaunaurd G. // 2008. CVPRW '08. IEEE Computer Society Conference on Computer Vision and Pattern Recognition Workshops. - Anchorage, AK, 23-28 June 2008. - P. 1-6.

C1038. Levanon N. Inter-pulse coding for ideal range response. 2008. COMCAS 2008. IEEE International

Conference on Microwaves, Communications, Antennas and Electronic Systems. - Tel-Aviv, 13-14 May 2008. - P. 1-9.

C1039. Jing Liang. A Differential Based Approach for Sense-Through-Foliage Target Detection Using UWB Radar Sensor Networks. / Jing Liang, Qilian Liang. // 2008. ICC '08. IEEE International Conference on Communications. - Beijing, 19-23 May 2008. - P. 1952-1956.

C1040. Kreucher C. An information theoretic approach to processing management. / Kreucher C., Carter K. // 2008. ICASSP 2008. IEEE International Conference on Acoustics, Speech and Signal Processing. - Las Vegas, NV, March 31 2008-April 4 2008. - P. 1869-1872.

C1041. Greco M. Radar target doa estimation: Moving window VS AML estimator. / Greco M., Gini F., Farina A., Timmoneri L. // 2008. ICASSP 2008. IEEE International Conference on Acoustics, Speech and Signal Processing. - Las Vegas, NV, March 31 2008-April 4 2008. - P. 1501-1504.

C1042. Suvorova S. Application of Doppler resilient complementary waveforms to target tracking. / Suvorova S., Moran B., Howard S., Calderbank R. // 2008. ICASSP 2008. IEEE International Conference on Acoustics, Speech and Signal Processing. - Las Vegas, NV, March 31 2008-April 4 2008. - P. 1497-1500.

C1043. Dehmollaian M. Analytical, numerical, and experimental methods for through-the-wall radar imaging. / Dehmollaian M., Sarabandi K. // 2008. ICASSP 2008. IEEE International Conference on Acoustics, Speech and Signal Processing. - Las Vegas, NV, March 31 2008-April 4 2008. - P. 5181-5184.

C1044. Stoica P. Transmit codes and receive filters for pulse compression radar systems. / Stoica P., Jian Li, Ming Xue. // 2008. ICASSP 2008. IEEE International Conference on Acoustics, Speech and Signal Processing. - Las Vegas, NV, March 31 2008-April 4 2008. - P. 3649-3652.

C1045. Oreshkin B.N. Optimization of loading factor preventing target cancellation. / Oreshkin B.N., Bakulev P.A. // 2008. ICASSP 2008. IEEE International Conference on Acoustics, Speech and Signal Processing. - Las Vegas, NV, March 31 2008-April 4 2008. - P. 2329-2332.

C1046. Zhang L. An experimental millimetre wave imaging system. / Zhang L., Hao Y., Parini C.G., Dupuy J. // 2008. LAPC 2008. Loughborough Antennas and Propagation Conference. - Loughborough, 17-18 March 2008. - P. 229-232.

C1047. Alabaster C.M. Clutter Mapping for Airborne Pulse Doppler Radar. / Alabaster C.M., Hughes E.J. // 2008 IET Seminar on Radar Clutter Modelling. - London, 19-19 Feb. 2008. - P. 49-55.

C1048. Dawber W. Modelling of the Impact of Antenna Rotation on Clutter Improvement Factor in Naval Radars Operating in Littoral Environments. 2008 IET Seminar on Radar Clutter Modelling. - London, 19-19 Feb. 2008. - P. 9-17.

C1049. Stavroulakis P. Anti-Jamming Transmitter Independent Radar Networks. / Stavroulakis P., Farsaris N., Xenos T.D. // 2008. ICSCN '08. International Conference on Signal Processing, Communications and Networking. - Chennai, 4-6 Jan. 2008. - P. 269-273.

C1050. Xianghui Yuan. A Maneuver Detection Method using Multiple Doppler Radars. / Xianghui Yuan, Zhansheng Duan, Chongzhao Han. // 2008. SSST 2008. 40th Southeastern Symposium on System Theory. - New Orleans, LA, 16-18 March 2008. - P. 298-302.

C1051. Donnie Smith L. Parameter Estimation for Censored Exponential Random Variables. / Donnie Smith L., Blair W.D. // 2008. SSST 2008. 40th Southeastern Symposium on System Theory. - New Orleans, LA, 16-18 March 2008. - P. 289-292.

C1052. Herbert G.M. Clutter Modelling for Space-Time Adaptive Processing. 2008 IET Seminar on Radar Clutter Modelling. - London, 19-19 Feb. 2008. - P. 73-79.

C1053. Yin Chen. Image Quality Measures for Predicting Automatic Target Recognition Performance. / Yin Chen, Chen G., Blum R.S., Blasch E., Lynch R.S. // 2008 IEEE Aerospace Conference. - Big Sky, MT, 1-8 March 2008. - P. 1-9.

C1054. Golestani Y. Optimized Bernoulli Trial Technique for M Out of N Binary Integration of Radar Signals. /

Golestani Y., Mallean G. // 2008 IEEE Aerospace Conference. - Big Sky, MT, 1-8 March 2008. - P. 1-8.

C1055. Turnbaugh M.A. HRR Signature Classification using Syntactic Pattern Recognition. / Turnbaugh M.A., Bauer K.W., Oxley M.E., Miller J.O. // 2008 IEEE Aerospace Conference. - Big Sky, MT, 1-8 March 2008. - P. 1-9.

C1056. Saidi M.N. Automatic recognition of ISAR Images: Target shapes features extraction. / Saidi M.N., Hoeltzener B., Toumi A., Khecnhaf A., Aboutajdine D. // 2008. ICTTA 2008. 3rd International Conference on Information and Communication Technologies: From Theory to Applications. - Damascus, 7-11 April 2008. - P. 1-6.

C1057. Jida B. Bayesian Networks and Probabilistic Data Association Methods for Multi-Object Tracking: Application to Road Safety. / Jida B., Lherbier R., Wahl M., Noyer J.-C. // 2008. ICTTA 2008. 3rd International Conference on Information and Communication Technologies: From Theory to Applications. - Damascus, 7-11 April 2008. - P. 1-6.

C1058. Isaac A. Detecting and Tracking Separating Objects Using Direct Monopulse Measurements. / Isaac A., Willett P., Bar-Shalom Y. // 2008 IEEE Aerospace Conference. - Big Sky, MT, 1-8 March 2008. - P. 1-11.

C1059. Hafez A.S. Adaptive Threshold Mapping Technique for Moving Target Detector in Modern Radar. / Hafez A.S., Salem A.I. // 2008 IEEE Aerospace Conference. - Big Sky, MT, 1-8 March 2008. - P. 1-5.

C1060. Jing Hu. Multi-scale Modeling Approach for Detecting Low Observable Targets within Sea Clutter. / Jing Hu, Jianbo Gao, Lynch R.S., Genshe Chen. // 2008 IEEE Aerospace Conference. - Big Sky, MT, 1-8 March 2008. - P. 1-7.

C1061. Ahmad F. Multi-location wideband through-the-wall beamforming. 2008. ICASSP 2008. IEEE International Conference on Acoustics, Speech and Signal Processing. - Las Vegas, NV, March 31 2008-April 4 2008. - P. 5193-5196.

C1062. Narayanan R.M. Through wall radar imaging using UWB noise waveforms. 2008. ICASSP 2008. IEEE International Conference on Acoustics, Speech and Signal Processing. - Las Vegas, NV, March 31 2008-April 4 2008. - P. 5185-5188.

C1063. Bergin J. MIMO Phased-Array for SMTI Radar. / Bergin J., McNeil S., Fomundam L., Zulch P.A. // 2008 IEEE Aerospace Conference. - Big Sky, MT, 1-8 March 2008. - P. 1-7.

C1064. Lombardo P. Dual Channel Adaptive Antenna Nulling with Auxiliary Selection for Spaceborne Radar. / Lombardo P., Sedehi M., Colone F., Bucciarelli M., Cristallini D. // 2008 IEEE Aerospace Conference. - Big Sky, MT, 1-8 March 2008. - P. 1-8.

C1065. Zulch P. Performance Metric Issues for Space Time Adaptive Processing Methods. / Zulch P., Goldstein J.S. // 2008 IEEE Aerospace Conference. - Big Sky, MT, 1-8 March 2008. - P. 1-8.

C1066. Khan J. An MPSoC architecture for the Multiple Target Tracking application in driver assistant system. / Khan J., Niar S., Menhaj A., Elhillali Y., Dekeyser J.L. // 2008. ASAP 2008. International Conference on Application-Specific Systems, Architectures and Processors. - Leuven, 2-4 July 2008. - P. 126-131.

C1067. Shang Gao. Research on Optimum Deployment Problem of Radar. 2008. CCCM '08. ISECS International Colloquium on Computing, Communication, Control, and Management. - Guangzhou, 3-4 Aug. 2008. - Vol. 2. - P. 466-469.

C1068. Bo Yang. The target location study of multistatic radar base on non-cooperative emitter illuminating. / Bo Yang, Jun Li, Yiyu Zhou. // 2008. ICIA 2008. International Conference on Information and Automation. - Changsha, 20-23 June 2008. - P. 1433-1436.

C1069. Sun Xiaokun. Polarization filtering enhancement of buried landmine. / Sun Xiaokun, Zhou Zhimin. // 2008. ICIA 2008. International Conference on Information and Automation. - Changsha, 20-23 June 2008. - P. 646-649.

C1070. Chao-Hsiang Liao. A UWB microwave imaging radar system for a small target detection. / Chao-Hsiang Liao, Li-Der Fang, Powen Hsu, Dau-Chyrh Chang. // 2008. AP-S 2008. IEEE Antennas and Propagation

Society International Symposium. - San Diego, CA, 5-11 July 2008. - P. 1-4.

C1071. Maaref N. Experimental through-the-wall detection in cluttered environment using time reversal processing. / Maaref N., Millot P., Ferrieres X., Pichot C., Picon O. // 2008. AP-S 2008. IEEE Antennas and Propagation Society International Symposium. - San Diego, CA, 5-11 July 2008. - P. 1-4.

C1072. Kidera S. High-resolution 3-D imaging algorithm without derivative operations for UWB through-the-wall radars. / Kidera S., Sakamoto T., Sato T. // 2008. AP-S 2008. IEEE Antennas and Propagation Society International Symposium. - San Diego, CA, 5-11 July 2008. - P. 1-4.

C1073. Shujuan Peng. Fractional Fourier Transform for moving target detection and location in spaceborne SAR. / Shujuan Peng, Debao Ma, Jianlin Lin. // 2008. ICIA 2008. International Conference on Information and Automation. - Changsha, 20-23 June 2008. - P. 485-488.

C1074. Chong E.K.P. Monte-Carlo-based partially observable Markov decision process approximations for adaptive sensing. / Chong E.K.P., Kreucher C.M., Hero A.O. // 2008. WODES 2008. 9th International Workshop on Discrete Event Systems. - Goteborg, 28-30 May 2008. - P. 173-180.

C1075. Beklaouz H.L. Study and analysis of a new detector of radar targets using CFAR with Gabor transform. / Beklaouz H.L., Hamadouch M., Mimi M., Ahmed A.T. // 2008. IWSSIP 2008. 15th International Conference on Systems, Signals and Image Processing. - Bratislava, 25-28 June 2008. - P. 437-440.

C1076. Li Zhu-lin. Road recognition in high resolution SAR image based on genetic algorithm. / Li Zhu-lin, Zhang Xian-wei, Zhang Hong-lei. // 2008. WCICA 2008. 7th World Congress on Intelligent Control and Automation. - Chongqing, 25-27 June 2008. - P. 6783-6788.

C1077. Shunsheng Zhang. Multiple targets' detection in terms of Keystone transform at the low SNR level. / Shunsheng Zhang, Wei Zhang, Yang Wang. // 2008. ICIA 2008. International Conference on Information and Automation. - Changsha, 20-23 June 2008. - P. 1-4.

C1078. Abramovich Y.I. MIMO radar performance in clutter: Limitations imposed by bounds on the volume and height distributions for the MIMO radar ambiguity function. / Abramovich Y.I., Frazer G.J. // 2008. SAM 2008. 5th IEEE Sensor Array and Multichannel Signal Processing Workshop. - Darmstadt, 21-23 July 2008. - P. 441-445.

C1079. McGarry D.P. Using a clustering technique for detection of moving targets in clutter-cancelled QuickSAR images. / McGarry D.P., Zasada D.M., Sanyal P.K., Perry R.P. // 2008. SAM 2008. 5th IEEE Sensor Array and Multichannel Signal Processing Workshop. - Darmstadt, 21-23 July 2008. - P. 252-256.

C1080. Young-Chul Lim. Distance estimation algorithm for both long and short ranges based on stereo vision system. / Young-Chul Lim, Chung-Hee Lee, Soon Kwon, Woo-Young Jung. // 2008 IEEE Intelligent Vehicles Symposium. - Eindhoven, 4-6 June 2008. - P. 841-846.

C1081. Feng Liu. IMMPDA vehicle tracking system using asynchronous sensor fusion of radar and vision. / Feng Liu, Sparbert J., Stiller C. // 2008 IEEE Intelligent Vehicles Symposium. - Eindhoven, 4-6 June 2008. - P. 168-173.

C1082. Shunguang Wu. Collision sensing by stereo vision and radar sensor fusion. / Shunguang Wu, Decker S., Chang P., Camus T., Eledath J. // 2008 IEEE Intelligent Vehicles Symposium. - Eindhoven, 4-6 June 2008. - P. 404-409.

C1083. Trung-Dung Vu. Grid-based localization and online mapping with moving objects detection and tracking: new results. / Trung-Dung Vu, Burlet J., Aycard O. // 2008 IEEE Intelligent Vehicles Symposium. - Eindhoven, 4-6 June 2008. - P. 684-689.

C1084. Richter E. Radar and vision based data fusion-Advanced filtering techniques for a multi object vehicle tracking system. / Richter E., Schubert R., Wanielik G. // 2008 IEEE Intelligent Vehicles Symposium. - Eindhoven, 4-6 June 2008. - P. 120-125.

C1085. Nashashibi F. Laser-based vehicles tracking and classification using occlusion reasoning and confidence estimation. / Nashashibi F., Bargeton A. // 2008 IEEE Intelligent Vehicles Symposium. - Eindhoven, 4-6 June 2008. - P. 847-852.

C1086. Zhijun Liu. Detection and tracking of a moving point target in infrared image sequence using auxiliary particle filter. / Zhijun Liu, Shengli Xie, Xianyi Ren. // 2008 International Conference on Machine Learning and Cybernetics. - Kunming, 12-15 July 2008. - Vol. 5. - P. 2530-2533.

C1087. Bradaric I. Multistatic ambiguity function-A tool for waveform selection in distributed radar systems. / Bradaric I., Capraro G.T., Wicks M.C. // 2008. AP-S 2008. IEEE Antennas and Propagation Society International Symposium. - San Diego, CA, 5-11 July 2008. - P. 1.

C1088. Chauveau J. Use of resonance parameters of air-intakes for the identification of aircrafts. / Chauveau J., de Beaucoudrey N., Saillard J. // 2008. AP-S 2008. IEEE Antennas and Propagation Society International Symposium. - San Diego, CA, 5-11 July 2008. - P. 1-4.

C1089. Shengli Jiang. Image feature-based space-time processing (IFSTP) for bistatic ground moving target detection and clutter rejection. / Shengli Jiang, Zhong Liu, Hai Deng. // 2008. AP-S 2008. IEEE Antennas and Propagation Society International Symposium. - San Diego, CA, 5-11 July 2008. - P. 1-4.

C1090. Li-Wei Wang. The research on selection of attack target for arm. / Li-Wei Wang, Xiao-Song Jiang, Yuan-Qing Zhu. // 2008 International Conference on Machine Learning and Cybernetics. - Kunming, 12-15 July 2008. - Vol. 3. - P. 1500-1504.

C1091. Hui-Lin Zhou. Constructive neural network for landmine classification using ultra wideband GPR. / Hui-Lin Zhou, Wei-Ping Wang, Yu-Hao Wang. // 2008 International Conference on Machine Learning and Cybernetics. - Kunming, 12-15 July 2008. - Vol. 2. - P. 1197-1201.

C1092. Wenyu Gong. Detecting ground deformation with Permanent scatterer of Suzhou region. / Wenyu Gong, Jixian Zhang, Yonghong Zhang. // 2008. EORSA 2008. International Workshop on Earth Observation and Remote Sensing Applications. - Beijing, June 30 2008-July 2 2008. - P. 1-5.

C1093. Ishiguro K. Simultaneous clustering and tracking unknown number of objects. / Ishiguro K., Yamada T., Ueda N. // 2008. CVPR 2008. IEEE Conference on Computer Vision and Pattern Recognition. - Anchorage, AK, 23-28 June 2008. - P. 1-8.

C1094. Doukovska L. Hough detector analysis by means of Monte Carlo simulation approach. / Doukovska L., Behar V., Kabakchiev C. // 2008 International Radar Symposium. - Wroclaw, 21-23 May 2008. - P. 1-4.

C1095. Malek Mohammadi M. Surveillance radar target detection with the Fourier-Hough transform. / Malek Mohammadi M., Moqiseh A., Nayebi M.M. // 2008 International Radar Symposium. - Wroclaw, 21-23 May 2008. - P. 1-4.

C1096. Sheikhi A. Model based adaptive detector with low secondary data support. / Sheikhi A., Zamani A., Hatam M., Karimi M. // 2008 International Radar Symposium. - Wroclaw, 21-23 May 2008. - P. 1-4.

C1097. Garvanov I. Improvement in radar detection through window processing in the Hough space. / Garvanov I., Kabakchievz C., Doukovska L., Kyovtorov V., Rohling H. // 2008 International Radar Symposium. - Wroclaw, 21-23 May 2008. - P. 1-4.

C1098. Tkac J. The probability of target detection. / Tkac J., Spirko S., Sedivy P. // 2008 International Radar Symposium. - Wroclaw, 21-23 May 2008. - P. 1-4.

C1099. Schimpf H. Polarimetric calibration-a comparison of different approaches. / Schimpf H., Fuchs H.-H. // 2008 International Radar Symposium. - Wroclaw, 21-23 May 2008. - P. 1-4.

C1100. Jing Peng. A multi-scaled registration algorithm for radar image and electronic chart. / Jing Peng, Chaojian Shi. // 2008 International Radar Symposium. - Wroclaw, 21-23 May 2008. - P. 1-4.

C1101. Le Chevalier F. Smart beamforming and wideband signals for ground surveillance. 2008 International Radar Symposium. - Wroclaw, 21-23 May 2008. - P. 1-4.

C1102. Dai Huan-yao. Efficiency evaluation model on the damage of radiation source by Anti-Radiation UAV. / Dai Huan-yao, Jiang Hong-yu. // 2008. ICIEA 2008. 3rd IEEE Conference on Industrial Electronics and Applications. - Singapore, 3-5 June 2008. - P. 1333-1338.

C1103. Golikov V. CFAR robust detection of moving target in presence of fluctuating background. / Golikov V., Castillejos A., Lebedeva O., Ponomaryov V., Cruz-Irisson M. // 2008. MMET 2008. 12th International Conference on Mathematical Methods in Electromagnetic Theory. - Odesa, June 29 2008-July 2 2008. - P. 144-146.

C1104. Neumann C. STAP/GMTI analysis using SAR data from simulated scenarios. / Neumann C., Meyer-Hilberg J., Senkowski H. // 2008 International Radar Symposium. - Wroclaw, 21-23 May 2008. - P. 1-4.

C1105. Gorski T. Practical problems with covariance matrix estimation for adaptive MTI and space-time adaptive processing for target detection in HF surface wave radars. / Gorski T., Fabrizio G., Le Caillec J.-M., Kawalec A., Thomas N. // 2008 International Radar Symposium. - Wroclaw, 21-23 May 2008. - P. 1-4.

C1106. Reiher M. On the occurrence of ghost targets in linear FMCW radar: A worst case study. / Reiher M., Bin Yang. // 2008 International Radar Symposium. - Wroclaw, 21-23 May 2008. - P. 1-4.

C1107. Mansouri H. Performance analysis of a weighted max CFAR processor. / Mansouri H., Hamadouche M., Ettoumi F.Y., Magaz B. // 2008 International Radar Symposium. - Wroclaw, 21-23 May 2008. - P. 1-4.

C1108. Magaz B. DSP implementation of a Range Azimuth CFAR processor. / Magaz B., Bencheikh M.L. // 2008 International Radar Symposium. - Wroclaw, 21-23 May 2008. - P. 1-4.

C1109. Morabito A.N. Post-processing phase noise mitigation performance comparison in a coherent distributed passive radar system. / Morabito A.N., Sahr J.D., Berkowitz Z.M.P., Vertatschitsch L.E. // 2008 International Radar Symposium. - Wroclaw, 21-23 May 2008. - P. 1-4.

C1110. Xiaogang Wang. Trajectory analysis and semantic region modeling using a nonparametric Bayesian model. / Xiaogang Wang, Keng Teck Ma, Gee-Wah Ng, Grimson W.E.L. // 2008. CVPR 2008. IEEE Conference on Computer Vision and Pattern Recognition. - Anchorage, AK, 23-28 June 2008. - P. 1-8.

C1111. Magaz B. Design and real time implementation of a radar data extractor. 2008 International Radar Symposium. - Wroclaw, 21-23 May 2008. - P. 1-4.

C1112. Gui Renzhou. Detecting targets of variable acceleration with High Frequency Surface Wave Radar. / Gui Renzhou, Weigel R. // 2008 International Radar Symposium. - Wroclaw, 21-23 May 2008. - P. 1-4.

C1113. Angelova D. A Bayesian algorithm for object detection in GPR data. 2008 International Radar Symposium. - Wroclaw, 21-23 May 2008. - P. 1-4.

C1114. Zhen Ding. Comparison of the EKF and the IMM estimator for HFSWR tracking applications. 2008 International Radar Symposium. - Wroclaw, 21-23 May 2008. - P. 1-6.

C1115. Stateczny A. Determining manoeuvre detection threshold of GRNN filter in the process of tracking in marine navigational radars. / Stateczny A., Kazimierski W. // 2008 International Radar Symposium. - Wroclaw, 21-23 May 2008. - P. 1-4.

C1116. Sosulin Yu.G. Subaperture processing in SAR: Choice of the synthesizing interval length and moving target detection. / Sosulin Yu.G., Delektorsky A.A. // 2008 International Radar Symposium. - Wroclaw, 21-23 May 2008. - P. 1-4.

C1117. Sosulin Y.G. Comparative analysis of dimension estimation methods of fractal surfases and fractal target detection. / Sosulin Y.G., Russkin A.B. // 2008 International Radar Symposium. - Wroclaw, 21-23 May 2008. - P. 1.

C1118. van Genderen P. Extended object detection and extraction in a high resolution polarimetric surveillance radar. / van Genderen P., Kovalenko V. // 2008 International Radar Symposium. - Wroclaw, 21-23 May 2008. - P. 1-4.

C1119. Janczak D. The GLR failure detection algorithm for a class of nonlinear dynamic models with application to radar tracking problems. / Janczak D., Grishin Y.P. // 2008 International Radar Symposium. - Wroclaw, 21-23 May 2008. - P. 1-4.

C1120. Hersey R.K. Dismount modeling and detection from small aperture moving radar platforms. / Hersey R.K., Melvin W.L., Culpepper E. // 2008. RADAR 08. IEEE Radar Conference. - Rome, 26-30 May 2008. - P. 1-

6.

C1121. Takayama K. NRD Guide Pulse Radar Front-End for Range Estimation at 60 GHz. / Takayama K., Kuroki F., Yoneyama T. // 2008 China-Japan Joint Microwave Conference. - Shanghai, 10-12 Sept. 2008. - P. 652-656.

C1122. Zeng Rui. The Time-Domain Scattering Characteristics Analysis of the Typical Satellites in Different Space Attitudes. / Zeng Rui, Li Mingzhi, Zhou Lezhu. // 2008 China-Japan Joint Microwave Conference. - Shanghai, 10-12 Sept. 2008. - P. 647-651.

C1123. Gui Renzhou. Optimizing Estimation of Target's Direction of Arrival after Disturbance Suppression by Exploiting Far Distance Cell's Data. / Gui Renzhou, Weigel R. // 2008 China-Japan Joint Microwave Conference. - Shanghai, 10-12 Sept. 2008. - P. 323-326.

C1124. Erfanian S. Performance of excision switching-CFAR in K distributed sea clutter. / Erfanian S., Faramarzi S. // 2008. APCC 2008. 14th Asia-Pacific Conference on Communications. - Tokyo, 14-16 Oct. 2008. - P. 1-4.

C1125. Erfanian S. Optimum detection of multiple targets by improved switching CFAR processor. / Erfanian S., Vakili V.T. // 2008. APCC 2008. 14th Asia-Pacific Conference on Communications. - Tokyo, 14-16 Oct. 2008. - P. 1-5.

C1126. Lu Rong. The Re-Radiation Characteristics Of Nonlinear Target in Harmonic Radar Detection. / Lu Rong, Wang Hai-yong. // 2008 China-Japan Joint Microwave Conference. - Shanghai, 10-12 Sept. 2008. - P. 661-664.

C1127. Fefilatyev S. Detection and tracking of marine vehicles in video. / Fefilatyev S., Goldgof D. // 2008. ICPR 2008. 19th International Conference on Pattern Recognition. - Tampa, FL, 8-11 Dec. 2008. - P. 1-4.

C1128. Battistelli G. Traffic intensity estimation via PHD filtering. / Battistelli G., Chisci L., Morrocchi S., Papi F., Benavoli A., Di Lallo A., Farina A., Graziano A. // 2008. EuRAD 2008. European Radar Conference. - Amsterdam, 30-31 Oct. 2008. - P. 340-343.

C1129. Daniel L. Maritime target cross section estimation for an ultra-wideband forward scatter radar network. / Daniel L., Gashinova M., Cherniakov M. // 2008. EuRAD 2008. European Radar Conference. - Amsterdam, 30-31 Oct. 2008. - P. 316-319.

C1130. Burganov B.T. Simulation of GPR returns from finite-length dielectric cylinders. / Burganov B.T., Vinogradov A.G., Sazonov V.V., Yarovoy A.G., Ligthart L.P. // 2008. EuRAD 2008. European Radar Conference. - Amsterdam, 30-31 Oct. 2008. - P. 292-295.

C1131. Sachs J. Detection and tracking of moving or trapped people hidden by obstacles using ultra-wideband pseudo-noise radar. / Sachs J., Aftanas M., Crabbe S., Drutarovsky M., Klukas R., Kocur D., Nguyen T.T., Peyerl P., Rovnakova J., Zaikov E. // 2008. EuRAD 2008. European Radar Conference. - Amsterdam, 30-31 Oct. 2008. - P. 408-411.

C1132. Takayama K. Signal processing to eliminate multi-reflected pulses for NRD guide pulse radar at 60 GHz. / Takayama K., Kuroki F. // 2008. EuRAD 2008. European Radar Conference. - Amsterdam, 30-31 Oct. 2008. - P. 372-375.

C1133. Hao-Hsien Ko. Range resolution improvement for FMCW radars. / Hao-Hsien Ko, Kai-Wen Cheng, Hsuan-Jung Su. // 2008. EuRAD 2008. European Radar Conference. - Amsterdam, 30-31 Oct. 2008. - P. 352-355.

C1134. Kohlleppel R. Enhancement of Along-Track Interferometry for Ground Moving Target Indication. / Kohlleppel R., Gierull C.H. // 2008. IGARSS 2008. IEEE International Geoscience and Remote Sensing Symposium. - Boston, MA, 7-11 July 2008. - Vol. 2. - P. II-229-II-232-229.

C1135. Gunnala S.K. Subsurface Sensing of Near Surface Object Using Cavity Backed Slot (CBS) Antenna. / Gunnala S.K., Mingyu Lu, Bredow J.W., Tjuatja S. // 2008. IGARSS 2008. IEEE International Geoscience and Remote Sensing Symposium. - Boston, MA, 7-11 July 2008. - Vol. 2. - P. II-189-II-192-189.

C1136. Thayaparan T. S-Method-Based Approach for Image Formation, Motion Compensation, and Image

Enhancement of Moving Targerts in ISAR and SAR. / Thayaparan T., Stankovic L., Dakovic M. // 2008. IGARSS 2008. IEEE International Geoscience and Remote Sensing Symposium. - Boston, MA, 7-11 July 2008. - Vol. 2. - P. II-29-II-32-29.

C1137. Lambers M. Automatic Point Target Detection for Interactive Visual Analysis of SAR Images. / Lambers M., Kolb A. // 2008. IGARSS 2008. IEEE International Geoscience and Remote Sensing Symposium. - Boston, MA, 7-11 July 2008. - Vol. 2. - P. II-903-II-906-903.

C1138. Shao Yun. SAR Remote Sensing Data for Subsurface Targets Detection and Lop Nur Lake Evolution and Extinction Study. / Shao Yun, Gong Huaze, Dong Qing. // 2008. IGARSS 2008. IEEE International Geoscience and Remote Sensing Symposium. - Boston, MA, 7-11 July 2008. - Vol. 2. - P. II-738-II-741-738.

C1139. Frey O. Combining Time-Domain Back-Projection and Capon Beamforming for Tomographic SAR Processing. / Frey O., Meier E. // 2008. IGARSS 2008. IEEE International Geoscience and Remote Sensing Symposium. - Boston, MA, 7-11 July 2008. - Vol. 2. - P. II-445-II-448-445.

C1140. Baumgartner S.V. SAR Traffic Monitoring Using Time-Frequency Analysis for Detection and Parameter Estimation. / Baumgartner S.V., Krieger G. // 2008. IGARSS 2008. IEEE International Geoscience and Remote Sensing Symposium. - Boston, MA, 7-11 July 2008. - Vol. 2. - P. II-25-II-28-25.

C1141. Shen Chiu. Radarsat-2 Moving Object Detection Experiment (MODEX). / Shen Chiu, Livingstone C., Sikaneta I., Gierull C., Beaulne P. // 2008. IGARSS 2008. IEEE International Geoscience and Remote Sensing Symposium. - Boston, MA, 7-11 July 2008. - Vol. 1. - P. I-13-I-16-13.

C1142. Awais S. Effect of band limited filter on receiver performance. / Awais S., Malik M.B. // 2008. ICET 2008. 4th International Conference on Emerging Technologies. - Rawalpindi, 18-19 Oct. 2008. - P. 104-109.

C1143. Anfu Zhu. Data fusion of infrared and radar for target tracking. / Anfu Zhu, Zhanrong Jing, Weijun Chen, Liguang Wang, Yunfei Li, Zhenlin Cao. // 2008. ISSCAA 2008. 2nd International Symposium on Systems and Control in Aerospace and Astronautics. - Shenzhen, 10-12 Dec. 2008. - P. 1-4.

C1144. Vesecky J.F. Monitoring of Coastal Vessels Using Surface Wave HF Radars: Multiple Frequency, Multiple Site and Multiple Antenna Considerations. / Vesecky J.F., Laws K., Paduan J.D. // 2008. IGARSS 2008. IEEE International Geoscience and Remote Sensing Symposium. - Boston, MA, 7-11 July 2008. - Vol. 1. - P. I-405-I-408-405.

C1145. Debes C. Target Detection in Multiple-Viewing Through-the-Wall Radar Imaging. / Debes C., Zoubir A.M., Amin M.G. // 2008. IGARSS 2008. IEEE International Geoscience and Remote Sensing Symposium. - Boston, MA, 7-11 July 2008. - Vol. 1. - P. I-173-I-176-173.

C1146. Vu V.T. Moving Target Detection by Forcusing for Frequency Domain Algorithms in UWB Low Frequency SAR. / Vu V.T., Sjogren T.K., Pettersson M.I. // 2008. IGARSS 2008. IEEE International Geoscience and Remote Sensing Symposium. - Boston, MA, 7-11 July 2008. - Vol. 1. - P. I-161-I-164-161.

C1147. Reijmers J.J. A statistical model of the effects of angular fluctuations of multi-point scatterer targets on radar detection and tracking performances. / Reijmers J.J., Pusone E.G., Coccia A., Ligthart L.P. // 2008. EuRAD 2008. European Radar Conference. - Amsterdam, 30-31 Oct. 2008. - P. 260-263.

C1148. Ephrath A. Using vertical and horizontal multipath models in radar simulations. 2008. EuMC 2008. 38th European Microwave Conference. - Amsterdam, 27-31 Oct. 2008. - P. 971-974.

C1149. Erfanian S. Analysis of improved switching CFAR in the presence of clutter and multiple targets. / Erfanian S., Vakili V.T. // 2008. 50th International Symposium ELMAR. - Zadar, 10-12 Sept. 2008. - Vol. 1. - P. 257-260.

C1150. Cherouat S. Radar signal detection using fractal analysis in K-distributed clutter. / Cherouat S., Soltani F. // 2008. SCS 2008. 2nd International Conference on Signals, Circuits and Systems. - Monastir, 7-9 Nov. 2008. - P. 1-4.

C1151. Foroozan F. Time reversal: Algorithms for M-ARY target classification using array signal processing. / Foroozan F., Asif A. // 2008. MILCOM 2008. IEEE Military Communications Conference. - San Diego, CA, 16-19 Nov. 2008. - P. 1-7.

C1152. Friedman J. Angle-of-arrival assisted Radio Interferometry (ARI) target localization. / Friedman J., Charbiwala Z., Schmid T., Young Cho, Srivastava M. // 2008. MILCOM 2008. IEEE Military Communications Conference. - San Diego, CA, 16-19 Nov. 2008. - P. 1-7.

C1153. Otten M.P.G. Spectral target classification with SOSTAR-X. / Otten M.P.G., de Koster E., Groot J.S., de Jong A.J., van den Akker M., Vriend P. // 2008. EuMC 2008. 38th European Microwave Conference. - Amsterdam, 27-31 Oct. 2008. - P. 1655-1658.

C1154. Naghibi T. Optimal signals for MIMO RADAR in the presence of clutter. / Naghibi T., Behnia F. // 2008. SCS 2008. 2nd International Conference on Signals, Circuits and Systems. - Monastir, 7-9 Nov. 2008. - P. 1-6.

C1155. Yijia Yang. Waveform design for MIMO radar using Kronecker structured matrix estimation. / Yijia Yang, Zishu He, Wei Xia. // 2008. ICCS 2008. 11th IEEE Singapore International Conference on Communication Systems. - Guangzhou, 19-21 Nov. 2008. - P. 431-435.

C1156. Scherz P. Embedded Sensor Fusion System for Unmanned Vehicle Navigation. / Scherz P., Haderer A., Pourvoyeur K., Stelzer A. // 2008. MESA 2008. IEEE/ASME International Conference on Mechtronic and Embedded Systems and Applications. - Beijing, 12-15 Oct. 2008. - P. 192-197.

C1157. Ying-hong Luan. Target identification and signal processing of millimeter-wave active/passive detecting system based on TMS320LF2812. / Ying-hong Luan, Yue-hua Li, Bing Gong. // 2008. ISAPE 2008. 8th International Symposium on Antennas, Propagation and EM Theory. - Kunming, 2-5 Nov. 2008. - P. 1505-1507.

C1158. Naghibi T. Convex optimization and MIMO RADAR waveform design in the presence of clutter. / Naghibi T., Behnia F. // 2008. SCS 2008. 2nd International Conference on Signals, Circuits and Systems. - Monastir, 7-9 Nov. 2008. - P. 1-6.

C1159. Nakayama Y. Novel variable spreading sequence length system for improving the processing speed of DS-UWB radar. / Nakayama Y., Kohno R. // 2008. ITST 2008. 8th International Conference on ITS Telecommunications. - Phuket, 24-24 Oct. 2008. - P. 357-361.

C1160. Chaojian Shi. Architecture of vision enhancement system for maritime search and rescue. / Chaojian Shi, Kaiyu Xu, Jing Peng, Lei Ren. // 2008. ITST 2008. 8th International Conference on ITS Telecommunications. - Phuket, 24-24 Oct. 2008. - P. 12-17.

C1161. Cresp A. Investigation of time-reversal processing for surface-penetrating radar detection in a multiple-target configuration. / Cresp A., Aliferis I., Yedlin M.J., Pichot C., Dauvignac J.-Y. // 2008. EuRAD 2008. European Radar Conference. - Amsterdam, 30-31 Oct. 2008. - P. 144-147.

C1162. Thanh N.T. Comparison of basic inversion techniques for through-wall imaging using UWB radar. / Thanh N.T., van Kempen L., Savelyev T.G., Zhuge X., Aftanas M., Zaikov E., Drutarovsky M., Sahli H. // 2008. EuRAD 2008. European Radar Conference. - Amsterdam, 30-31 Oct. 2008. - P. 140-143.

C1163. Ruggiano M. Performance of reiterated LMMSE filtering and coded radar waveforms. / Ruggiano M., Stolp E., van Genderen P. // 2008. EuRAD 2008. European Radar Conference. - Amsterdam, 30-31 Oct. 2008. - P. 132-135.

C1164. Kulpa K. The concept of simple MIMO PCL radar. / Kulpa K., Malanowski M. // 2008. EuRAD 2008. European Radar Conference. - Amsterdam, 30-31 Oct. 2008. - P. 240-243.

C1165. Kovalenko V. Robustness of polarimetric detection algorithms against steering mismatches. / Kovalenko V., van Genderen P. // 2008. EuRAD 2008. European Radar Conference. - Amsterdam, 30-31 Oct. 2008. - P. 220-223.

C1166. Tamminen A. Indirect holographic imaging at 310 GHz. / Tamminen A., Ala-Laurinaho J., Raisanen A.V. // 2008. EuRAD 2008. European Radar Conference. - Amsterdam, 30-31 Oct. 2008. - P. 168-171.

C1167. Misiurewicz J. Strong complex echo removal in noise radar. / Misiurewicz J., Kulpa K. // 2008. EuRAD 2008. European Radar Conference. - Amsterdam, 30-31 Oct. 2008. - P. 120-123.

C1168. Pham Trung Dung. Combined neural networks for radar target recognition from radar range profiles. 2008. ATC 2008. International Conference on Advanced Technologies for Communications. - Hanoi, 6-9 Oct. 2008. - P. 353-355.

C1169. Tran Cao Quyen. An approach for passive radar using a smart antenna system. / Tran Cao Quyen, Bach Gia Duong, Fortier P., Phan Anh. // 2008. ATC 2008. International Conference on Advanced Technologies for Communications. - Hanoi, 6-9 Oct. 2008. - P. 266-269.

C1170. Ranjani J.J. Edge Detection in Speckled SAR Images with Improved ROEWA. / Ranjani J.J., Gokila M., Thiruvengadam S.J. // 2008. ICVGIP '08. Sixth Indian Conference on Computer Vision, Graphics & Image Processing. - Bhubaneswar, 16-19 Dec. 2008. - P. 644-649.

C1171. Mohamed K.H. Automatic target detection using wavelet technique in forward scattering radar. / Mohamed K.H., Cherniakov M., Rasid M.F.A., Raja Abdullah R.S.A. // 2008. EuRAD 2008. European Radar Conference. - Amsterdam, 30-31 Oct. 2008. - P. 76-79.

C1172. Rashid N.E.A. Automatic target classification in a low frequency FSR network. / Rashid N.E.A., Antoniou M., Jancovic P., Sizov V., Abdullah R., Cherniakov M. // 2008. EuRAD 2008. European Radar Conference. - Amsterdam, 30-31 Oct. 2008. - P. 68-71.

C1173. Gashinova M. Target resolution enhancement in UWB radar for security system. / Gashinova M., Daniel L., Zegang Ding, Cherniakov M. // 2008. EuRAD 2008. European Radar Conference. - Amsterdam, 30-31 Oct. 2008. - P. 17-20.

C1174. Bin Zou. Super-Resolution of Polarimetric SAR Images Based on Target Decomposition and Polarimetric Spatial Correlation. / Bin Zou, Huijun Hao, Xingjie Guo. // 2008. IGARSS 2008. IEEE International Geoscience and Remote Sensing Symposium. - Boston, MA, 7-11 July 2008. - Vol. 2. - P. II-911-II-914-911.

C1175. Chen W.C. Resonance based radar target identification using principal component analysis. / Chen W.C., Shuley N. // 2008. APMC 2008. Asia-Pacific Microwave Conference. - Macau, 16-20 Dec. 2008. - P. 1-4.

C1176. Takayama K. Range finding for multi-layered targets using NRD guide pulse radar system at 60 GHz. / Takayama K., Kuroki F., Yoneyama T. // 2008. APMC 2008. Asia-Pacific Microwave Conference. - Macau, 16-20 Dec. 2008. - P. 1-4.

C1177. Yan Zhang. An improved STAP algorithm by applying APES. / Yan Zhang, Yunhua Zhang, Xiang Gu. // 2008. APMC 2008. Asia-Pacific Microwave Conference. - Macau, 16-20 Dec. 2008. - P. 1-4.

C1178. Haykin S. Optimal waveform design for cognitive radar. / Haykin S., Yanbo Xue, Davidson T.N. // 2008 42nd Asilomar Conference on Signals, Systems and Computers. - Pacific Grove, CA, 26-29 Oct. 2008. - P. 3-7.

C1179. Hong-yin Shi. Performance Analysis and Improved Method for Airborne Three-Channel SAR/GMTI System. / Hong-yin Shi, Yin-qing Zhou. // 2008. and 2008 International Workshop on Geoscience and Remote Sensing. ETT and GRS 2008. International Workshop on Education Technology and Training. - Shanghai, 21-22 Dec. 2008. - Vol. 2. - P. 336-339.

C1180. Rujiang Guo. Small targets detection in low resolution sea clutter. / Rujiang Guo, Ming Hao, Ming Li, Yinghong Ni, Zhenbang Cheng. // 2008. APMC 2008. Asia-Pacific Microwave Conference. - Macau, 16-20 Dec. 2008. - P. 1-4.

C1181. Lozovskiy I.F. Difference-time processing characteristics in systems with pulse noise censoring. 2008. APEIE 2008. 9th International Conference on Actual Problems of Electronic Instrument Engineering. - Novosibirsk, 23-25 Sept. 2008. - Vol. 01. - P. 189.

C1182. Matsunami I. Ranging error of ultra-wideband vehicle radar. / Matsunami I., Nakahata Y., Ono K., Kajiwara A. // 2008. ISITA 2008. International Symposium on Information Theory and Its Applications. - Auckland, 7-10 Dec. 2008. - P. 1-5.

C1183. Taimori A. Vision based flying vehicle tracking. / Taimori A., Sabouri S. // 2008. SMC 2008. IEEE International Conference on Systems, Man and Cybernetics. - Singapore, 12-15 Oct. 2008. - P. 330-335.

C1184. Fan Wei. A Novel Adaptive Ground Clutter Removal Algorithm for High Range Resolution MMW Radar. / Fan Wei, Cao Yunxia, Bi Xin, Ma Yue, Chen Shuai. // 2008. KAM Workshop 2008. IEEE International Symposium on Knowledge Acquisition and Modeling Workshop. - Wuhan, 21-22 Dec. 2008. - P. 363-366.

C1185. Lozovskiy I.F. In a period compensation characteristics in the pulsed noise censoring system. 2008. APEIE 2008. 9th International Conference on Actual Problems of Electronic Instrument Engineering. - Novosibirsk, 23-25 Sept. 2008. - Vol. 01. - P. 189.

C1186. Lozovskiy I.F. Difference-time processing characteristics in systems with pulsed noise censoring. 2008. APEIE 2008. 9th International Conference on Actual Problems of Electronic Instrument Engineering. - Novosibirsk, 23-25 Sept. 2008. - Vol. 01. - P. 56-58.

C1187. Lozovskiy I.F. In a period compensation characteristics in the pulsed noise censoring systems. 2008. APEIE 2008. 9th International Conference on Actual Problems of Electronic Instrument Engineering. - Novosibirsk, 23-25 Sept. 2008. - Vol. 01. - P. 52-55.

C1188. Wachowski N. Buried underwater target classification using frequency subband coherence analysis. / Wachowski N., Azimi-Sadjadi M.R. // OCEANS 2008. - Quebec City, QC, 15-18 Sept. 2008. - P. 1-8.

C1189. Shengbiao An. Study of High-Precision Altimetry Arithmetic in LFMCW Radar System. / Shengbiao An, Shuwang Chen. // 2008. FBIE '08. International Seminar on Future BioMedical Information Engineering. - Wuhan, Hubei, 18-18 Dec. 2008. - P. 407-410.

C1190. Zhe Zhang. Complex point target models for multistatic radar. / Zhe Zhang, Fuhrmann D.R. // 2008 42nd Asilomar Conference on Signals, Systems and Computers. - Pacific Grove, CA, 26-29 Oct. 2008. - P. 624-628.

C1191. Jayalaksahmi U. Difference patterns from continuous line sources. / Jayalaksahmi U., Raju G.S.N. // 2008. INCEMIC 2008. 10th International Conference on Electromagnetic Interference & Compatibility. - Bangalore, 26-27 Nov. 2008. - P. 341-345.

C1192. Ravindra V.C. Removing ping timing ambiguity via data association. / Ravindra V.C., Guerriero M., Willett P., Shengli Zhou, Coraluppi S. // OCEANS 2008. - Quebec City, QC, 15-18 Sept. 2008. - P. 1-6.

C1193. Jangal F. Morphological operator and Empirical Mode Decomposition for clutter mitigation. / Jangal F., Mandereau F. // OCEANS 2008. - Quebec City, QC, 15-18 Sept. 2008. - P. 1-5.

C1194. Day D. Nonlinear decision rules for robust noncoherent integration. 2008 42nd Asilomar Conference on Signals, Systems and Computers. - Pacific Grove, CA, 26-29 Oct. 2008. - P. 528-532.

C1195. Wenshu Zhang. Communication-inspired sensing. / Wenshu Zhang, Liuqing Yang. // 2008 42nd Asilomar Conference on Signals, Systems and Computers. - Pacific Grove, CA, 26-29 Oct. 2008. - P. 193-197.

C1196. Chun-Yang Chen. Compressed sensing in MIMO radar. / Chun-Yang Chen, Vaidyanathan P.P. // 2008 42nd Asilomar Conference on Signals, Systems and Computers. - Pacific Grove, CA, 26-29 Oct. 2008. - P. 41-44.

C1197. Jun Zhang. Dynamic waveform design for target tracking using MIMO radar. / Jun Zhang, Manjunath B., Maalouli G., Papandreou-Suppappola A., Morrell D. // 2008 42nd Asilomar Conference on Signals, Systems and Computers. - Pacific Grove, CA, 26-29 Oct. 2008. - P. 31-35.

C1198. Takahashi R. Preprocessing by eigenbeams and Doppler filters to improve performance of detection of signal number. / Takahashi R., Hirata K., Maniwa H. // 2008 42nd Asilomar Conference on Signals, Systems and Computers. - Pacific Grove, CA, 26-29 Oct. 2008. - P. 388-392.

C1199. Berger C.R. Compressed sensing for OFDM/MIMO radar. / Berger C.R., Shengli Zhou, Willett P., Demissie B., Heckenbach J. // 2008 42nd Asilomar Conference on Signals, Systems and Computers. - Pacific Grove, CA, 26-29 Oct. 2008. - P. 213-217.

C1200. Akcakaya M. MIMO radar detection of targets in compound-Gaussian clutter. / Akcakaya M., Hurtado M., Nehorai A. // 2008 42nd Asilomar Conference on Signals, Systems and Computers. - Pacific Grove, CA, 26-29 Oct. 2008. - P. 208-212.

C1201. Wu T.X. Networked Multi-target Detection Using Electromagnetic Modeling and Neural Network. / Wu T.X., Shan Wan. // 2008. NAECON 2008. IEEE National Aerospace and Electronics Conference. - Dayton, OH, 16-18 July 2008. - P. 123-126.

C1202. Sato R. Polarimetric Scattering Analysis for Simplified Man-Made Structure Model on Rough and/or Inclined Ground Plane. / Sato R., Yamaguchi Y., Yamada H. // 2008. IGARSS 2008. IEEE International Geoscience and Remote Sensing Symposium. - Boston, MA, 7-11 July 2008. - Vol. 4. - P. IV-483 - IV - 486-483.

C1203. Giacovazzo V.M. Identification of Coherent Scatterers: Spectral Correlation vs. Multi-Chromatic Phase Analysis. / Giacovazzo V.M., Refice A., Bovenga F., Veneziani N. // 2008. IGARSS 2008. IEEE International Geoscience and Remote Sensing Symposium. - Boston, MA, 7-11 July 2008. - Vol. 4. - P. IV-411 - IV - 414-411.

C1204. Guo Wei. A New Method of SAR Image Target Recognition based on AdaBoost Algorithm. / Guo Wei, Qi Qingwen, Jiang Lili, Zhang Ping. // 2008. IGARSS 2008. IEEE International Geoscience and Remote Sensing Symposium. - Boston, MA, 7-11 July 2008. - Vol. 3. - P. III-1194 - III - 1197-1194.

C1205. Dupuis X. Very High Resolution Interferogram Acquisition Campaign and Analysis. / Dupuis X., Oriot H., Angelliaume S. // 2008. IGARSS 2008. IEEE International Geoscience and Remote Sensing Symposium. - Boston, MA, 7-11 July 2008. - Vol. 4. - P. IV-810 - IV - 813-810.

C1206. Russell K. Integration of RADARSAT-2 Dual and Quad Polarization Data into Pipeline Third Party Encroachment Monitoring. / Russell K., Howell C., Bobby P., McHugh S., Power D., Rizkalla M. // 2008. IGARSS 2008. IEEE International Geoscience and Remote Sensing Symposium. - Boston, MA, 7-11 July 2008. - Vol. 4. - P. IV-675 - IV - 678-675.

C1207. Xi Chen. Change Detection with Multi-Polarization SAR Imagery. / Xi Chen, Fan Wu, Chao Wang, Hong Zhang, Bo Zhang, Yixian Tang. // 2008. IGARSS 2008. IEEE International Geoscience and Remote Sensing Symposium. - Boston, MA, 7-11 July 2008. - Vol. 4. - P. IV-659 - IV - 662-659.

C1208. Bin Zou. Moving Targets Detection and Analysis on Multi-Look Polarimetric SAR Images using PWF Method. / Bin Zou, Tao Wei, Lamei Zhang. // 2008. IGARSS 2008. IEEE International Geoscience and Remote Sensing Symposium. - Boston, MA, 7-11 July 2008. - Vol. 3. - P. III-1190 - III - 1193-1190.

C1209. Howell C. Dual Polarization Detection of Ships and Icebergs-Recent Results with ENVISAT ASAR and Data Simulations of RADARSAT-2. / Howell C., Power D., Lynch M., Dodge K., Bobby P., Randell C., Vachon P., Staples G. // 2008. IGARSS 2008. IEEE International Geoscience and Remote Sensing Symposium. - Boston, MA, 7-11 July 2008. - Vol. 3. - P. III-206 - III - 209-206.

C1210. Hongtao Yu. A DCT-based Change Detection Method for Multi-Temporal SAR Images. / Hongtao Yu, Zhiping Lin, Geok Ling Chai, Chye Hwang Yan, Raman N. // 2008. IGARSS 2008. IEEE International Geoscience and Remote Sensing Symposium. - Boston, MA, 7-11 July 2008. - Vol. 3. - P. III-166 - III - 169-166.

C1211. Xia Y. CR-Based SAR-Interferometry for Landslide Monitoring. 2008. IGARSS 2008. IEEE International Geoscience and Remote Sensing Symposium. - Boston, MA, 7-11 July 2008. - Vol. 2. - P. II-1239-II-1242-1239.

C1212. Li Lin-lin. Computation of Optimum Azimuth Sampling Time for Dual-Channel DPCA System based on Signal-to-Noise Ratio. / Li Lin-lin, Li Jing-wen. // 2008. IGARSS 2008. IEEE International Geoscience and Remote Sensing Symposium. - Boston, MA, 7-11 July 2008. - Vol. 3. - P. III-1186 - III - 1189-1186.

C1213. Budillon A. Moving Target Detection in along Track SAR Interferometry from In-Phase and Quadrature Components Data. / Budillon A., Pascazio V., Schirinzi G. // 2008. IGARSS 2008. IEEE International Geoscience and Remote Sensing Symposium. - Boston, MA, 7-11 July 2008. - Vol. 3. - P. III-1178 - III - 1181-1178.

C1214. Feng Xu. Region Feature Extraction Based on Improved Regularization Method in SAR Image. / Feng Xu, Shirong Chen, Yida Fan, Chao Wang. // 2008. IGARSS 2008. IEEE International Geoscience and Remote Sensing Symposium. - Boston, MA, 7-11 July 2008. - Vol. 3. - P. III-1147 - III - 1149-1147.

C1215. Thomas J.M. HF passive bistatic radar potential and applications for remote sensing. / Thomas J.M.,

Baker C.J., Griffiths H.D. // 2008 New Trends for Environmental Monitoring Using Passive Systems. - Hyeres, French Riviera, 14-17 Oct. 2008. - P. 1-5.

C1216. O'Hagan D.W. Passive Bistatic Radar (PBR) using FM radio illuminators of opportunity. / O'Hagan D.W., Baker C.J. // 2008 New Trends for Environmental Monitoring Using Passive Systems. - Hyeres, French Riviera, 14-17 Oct. 2008. - P. 1-6.

C1217. Naghibi T. MMSE based waveform design for MIMO radars. / Naghibi T., Behnia F. // 2008 IET Waveform Diversity & Digital Radar Conference-Day 1: Waveform Diversity & Design. - London, 8-8 Dec. 2008. - P. 1-5.

C1218. Guangping Zhu. Improved support vectors machine for signal detection in non-reverberation. / Guangping Zhu, Hui Sun. // 2008. IUS 2008. IEEE Ultrasonics Symposium. - Beijing, 2-5 Nov. 2008. - P. 1508-1511.

C1219. Bera R. Modeling and Implementation Of Wireless Embedded System For Intelligent Transport System Application. / Bera R., Dhar S., Kandar D., Sinha N.B., Mitra M. // 2008. ICIIS 2008. IEEE Region 10 and the Third international Conference on Industrial and Information Systems. - Kharagpur, 8-10 Dec. 2008. - P. 1-6.

C1220. Ranjani J.J. ROEWA based detector for SAR automatic target recognition. / Ranjani J.J., Iyalkanimozhi E., Priyadharshini D., Thiruvengadam S.J., Babu M. // 2008. ICCCn 2008. International Conference on Computing, Communication and Networking. - St. Thomas, VI, 18-20 Dec. 2008. - P. 1-5.

C1221. Ebert R. Applications for remote laser vibration sensing. / Ebert R., Lutzmann P., Hebel M. // 2008. IPGC 2008. IEEE PhotonicsGlobal@Singapore. - Singapore, 8-11 Dec. 2008. - P. 1-5.

C1222. Garcia-Pineda O. Synthetic Aperture Radar Image Processing using the Supervised Textural-Neural Network Classification Algorithm. / Garcia-Pineda O., MacDonald I., Zimmer B. // 2008. IGARSS 2008. IEEE International Geoscience and Remote Sensing Symposium. - Boston, MA, 7-11 July 2008. - Vol. 4. - P. IV-1265 - IV - 1268-1265.

C1223. Yan Wang. Surface Subsidence Monitoring with Coherent Point Target SAR Ineterferometry. / Yan Wang, Daqing Ge, Qiong Hu, Xiaofang Guo. // 2008. IGARSS 2008. IEEE International Geoscience and Remote Sensing Symposium. - Boston, MA, 7-11 July 2008. - Vol. 4. - P. IV-1205 - IV - 1208-1205.

C1224. Sant'Anna S.J.S. Polarimetric Characterization of Magnetic Flat Dipole Embedded in Multilayer Structures. / Sant'Anna S.J.S., da S. Lacava J.C., Fernandes D. // 2008. IGARSS 2008. IEEE International Geoscience and Remote Sensing Symposium. - Boston, MA, 7-11 July 2008. - Vol. 4. - P. IV-1145 - IV - 1148-1145.

C1225. Fei C. A Markov Chain CFAR Detector for Polarimetric Data using Adaptive Linear Discriminant Analysis. / Fei C., Liu T., Lampropoulos G.A., Sabry R., Murnaghan K. // 2008. IGARSS 2008. IEEE International Geoscience and Remote Sensing Symposium. - Boston, MA, 7-11 July 2008. - Vol. 5. - P. V-358 - V - 361-358.

C1226. Lavigne D.A. Enhanced Military Target Discrimination using Active and Passive Polarimetric Imagery. / Lavigne D.A., Breton M., Pichette M., Larochelle V., Simard J.-R. // 2008. IGARSS 2008. IEEE International Geoscience and Remote Sensing Symposium. - Boston, MA, 7-11 July 2008. - Vol. 5. - P. V-354 - V - 357-354.

C1227. Fan Zhang. SAR Image Simulation of Man-Made Scenes based on Computer Graphics. / Fan Zhang, Wen Hong, Daojing Li. // 2008. IGARSS 2008. IEEE International Geoscience and Remote Sensing Symposium. - Boston, MA, 7-11 July 2008. - Vol. 4. - P. IV-1395 - IV - 1397-1395.

C1228. Ray P. A false discovery rate based detector for detection of targets in clutter and noise. / Ray P., Varshney P.K. // 2008. RADAR 08. IEEE Radar Conference. - Rome, 26-30 May 2008. - P. 1-6.

C1229. Pourmottaghi A. A robust CFAR detection with ML estimation. / Pourmottaghi A., Taban M.R., Norouzi Y., Sadeghi M.T. // 2008. RADAR 08. IEEE Radar Conference. - Rome, 26-30 May 2008. - P. 1-5.

C1230. Yanfei Zhang. Adaptive subspace detection of range distributed targets in compound-Gaussian clutter. / Yanfei Zhang, Jian Guan. // 2008. RADAR 08. IEEE Radar Conference. - Rome, 26-30 May 2008. - P. 1-6.

C1231. Zhu Yongfeng. Stepped-frequency range profiling of multiple overlapped targets. / Zhu Yongfeng, Zhao Hongzhong, Fu Qiang, Le Daobin. // 2008. RADAR 08. IEEE Radar Conference. - Rome, 26-30 May 2008. - P. 1-4.

C1232. Jun He. ATR performance assessment of target type number for HRR radar. / Jun He, Hong-zhong Zhao, Qiang Fu. // 2008. RADAR 08. IEEE Radar Conference. - Rome, 26-30 May 2008. - P. 1-5.

C1233. Chongyi Fan. Multiple moving targets real-time detection in single-channel SAR using median filter. / Chongyi Fan, Xiaotao Huang, Liang Wang, Wenge Chang. // 2008. RADAR 08. IEEE Radar Conference. - Rome, 26-30 May 2008. - P. 1-6.

C1234. Moqiseh A. 3-D Hough transform for surveillance radar target detection. / Moqiseh A., Nayebi M.M. // 2008. RADAR 08. IEEE Radar Conference. - Rome, 26-30 May 2008. - P. 1-5.

C1235. Emery D.J. The operation and performance of a multi-frequency HF Surfacewave Radar. / Emery D.J., Dickel G. // 2008. RADAR 08. IEEE Radar Conference. - Rome, 26-30 May 2008. - P. 1-6.

C1236. Anitori L. Performance of low-rank STAP detectors. / Anitori L., Srinivasan R., Rangaswamy M. // 2008. RADAR 08. IEEE Radar Conference. - Rome, 26-30 May 2008. - P. 1-6.

C1237. Aboutanios E. Heterogeneity detection for hybrid STAP algorithm. / Aboutanios E., Mulgrew B. // 2008. RADAR 08. IEEE Radar Conference. - Rome, 26-30 May 2008. - P. 1-4.

C1238. Moqiseh A. Combinational Hough transform for surveillance radar target detection in a 3-D data map. / Moqiseh A., Nayebi M.M. // 2008. RADAR 08. IEEE Radar Conference. - Rome, 26-30 May 2008. - P. 1-6.

C1239. Fabrizio G. Passive radar in the high frequency band. / Fabrizio G., Colone F., Lombardo P., Farina A. // 2008. RADAR '08. IEEE Radar Conference. - Rome, 26-30 May 2008. - P. 1-6.

C1240. Riddolls R.J. Limits on the detection of low-Doppler targets by a High Frequency hybrid sky-surface wave radar system. 2008. RADAR 08. IEEE Radar Conference. - Rome, 26-30 May 2008. - P. 1-4.

C1241. Pillai S.U. Efficient wideband processing without subbanding. / Pillai S.U., Ke Yong Li, Guerci J.R. // 2008. RADAR 08. IEEE Radar Conference. - Rome, 26-30 May 2008. - P. 1-5.

C1242. Barbaresco F. Innovative tools for radar signal processing Based on Cartan's geometry of SPD matrices & Information Geometry. 2008. RADAR 08. IEEE Radar Conference. - Rome, 26-30 May 2008. - P. 1-6.

C1243. Raout J. Space-Time Adaptive Processing for noise-radar. 2008. RADAR 08. IEEE Radar Conference. - Rome, 26-30 May 2008. - P. 1-6.

C1244. Ball J.E. Low SNR radar signal detection using the continuous wavelet transform (CWT) and a Morlet wavelet. / Ball J.E., Tolley A. // 2008. RADAR 08. IEEE Radar Conference. - Rome, 26-30 May 2008. - P. 1-6.

C1245. Mezache A. Estimation of the parameters of the K-distribution using Fuzzy Neural Networks. / Mezache A., Soltani F. // 2008. RADAR 08. IEEE Radar Conference. - Rome, 26-30 May 2008. - P. 1-6.

C1246. Bonanni F. High Range Resolution (HRR) profiling within low elevation search mode. / Bonanni F., Ponzi C., Pham Q.H. // 2008. RADAR 08. IEEE Radar Conference. - Rome, 26-30 May 2008. - P. 1-6.

C1247. Kehu Yangy. Robust target localization with multiple sensors using time difference of arrivals. / Kehu Yangy, Zhi-Quan Luo. // 2008. RADAR 08. IEEE Radar Conference. - Rome, 26-30 May 2008. - P. 1-6.

C1248. Erricolo D. A radar target for calibration and for codes validation. / Erricolo D., Graglia R.D., Stoia T., Uslenghi P.L.E. // 2008. RADAR 08. IEEE Radar Conference. - Rome, 26-30 May 2008. - P. 1-3.

C1249. Gashinova M. Adaptive calibration in UWB radar. / Gashinova M., Djigan V., Daniel L.Y., Cherniakov M. // 2008. RADAR 08. IEEE Radar Conference. - Rome, 26-30 May 2008. - P. 1-6.

C1250. Moya J.C. Real-time signal processing system for high resolution CWLFM millimeter-wave radars. / Moya J.C., Wang Zongbo, del Campo A.B., Menoyo J.G., Lopez A.A. // 2008. RADAR 08. IEEE Radar

Conference. - Rome, 26-30 May 2008. - P. 1-5.

C1251. Godrich H. Target localization techniques and tools for MIMO radar. / Godrich H., Haimovich A.M., Blum R.S. // 2008. RADAR 08. IEEE Radar Conference. - Rome, 26-30 May 2008. - P. 1-6.

C1252. Tom A. Switched order statistics CFAR test for target detection. / Tom A., Viswanathan R. // 2008. RADAR 08. IEEE Radar Conference. - Rome, 26-30 May 2008. - P. 1-5.

C1253. Karystinos G.N. Auxiliary-vector detection on measured radar data. / Karystinos G.N., Pados D.A., Batalama S.N., Matyjas J.D. // 2008. RADAR 08. IEEE Radar Conference. - Rome, 26-30 May 2008. - P. 1-5.

C1254. Budillon A. Amplitude/phase approach for target velocity estimation in AT-InSAR systems. / Budillon A., Pascazio V., Schirinzi G. // 2008. RADAR 08. IEEE Radar Conference. - Rome, 26-30 May 2008. - P. 1-5.

C1255. Yildirim A. A MAP estimator for target position estimation in high resolution radars. / Yildirim A., Efe M. // 2008. RADAR 08. IEEE Radar Conference. - Rome, 26-30 May 2008. - P. 1-5.

C1256. McDonald M. Impact of measurement model mismatch on nonlinear Track-Before-Detect performance. / McDonald M., Balaji B. // 2008. RADAR 08. IEEE Radar Conference. - Rome, 26-30 May 2008. - P. 1-6.

C1257. Bradaric I. Sensor placement for improved target resolution in distributed radar systems. / Bradaric I., Capraro G.T., Wicks M.C. // 2008. RADAR 08. IEEE Radar Conference. - Rome, 26-30 May 2008. - P. 1-6.

C1258. Namyoon Lee. Orthogonal pulse compression code design for waveform iversity in multistatic radar systems. / Namyoon Lee, Joohwan Chun. // 2008. RADAR 08. IEEE Radar Conference. - Rome, 26-30 May 2008. - P. 1-6.

C1259. Sebt M.A. OFDM radar signal design with optimized Ambiguity Function. / Sebt M.A., Norouzi Y., Sheikhi A., Nayebi M.M. // 2008. RADAR 08. IEEE Radar Conference. - Rome, 26-30 May 2008. - P. 1-5.

C1260. Kapfer R. Along track interferometry for foliage penetration Moving Target Indication. / Kapfer R., Davis M.E. // 2008. RADAR 08. IEEE Radar Conference. - Rome, 26-30 May 2008. - P. 1-6.

C1261. Mertens M. Precision GMTI tracking using road constraints with visibility information and a refined sensor model. / Mertens M., Ulmke M. // 2008. RADAR 08. IEEE Radar Conference. - Rome, 26-30 May 2008. - P. 1-6.

C1262. Levanon N. Inter-pulese coding for ideal range response. 2008. RADAR 08. IEEE Radar Conference. - Rome, 26-30 May 2008. - P. 1-6.

C1263. Foglia G. ECM counteracting SLB: Analysis and effectiveness evaluation. / Foglia G., Marcantoni D., Trotta F., De Maio A. // 2008. RADAR 08. IEEE Radar Conference. - Rome, 26-30 May 2008. - P. 1-6.

C1264. Showman G.A. Radar detection and angle estimation of over-resolved ground vehicles. / Showman G.A., Melvin W.L., Greenspan M. // 2008. RADAR 08. IEEE Radar Conference. - Rome, 26-30 May 2008. - P. 1-6.

C1265. Jahangir M. PodSAR: A versatile real-time SAR GMTI surveillance and targeting system. / Jahangir M., Coe D., Blake A.P., Kealey P.G., Moate C.P. // 2008. RADAR 08. IEEE Radar Conference. - Rome, 26-30 May 2008. - P. 1-6.

C1266. Guohua Wei. Detection and localization of high speed moving targets using a short-range UWB impulse radar. / Guohua Wei, Yuxiang Zhou, Siliang Wu. // 2008. RADAR 08. IEEE Radar Conference. - Rome, 26-30 May 2008. - P. 1-4.

C1267. Simi A. Hough transform based automatic pipe detection for array GPR: Algorithm development and on-site tests. / Simi A., Bracciali S., Manacorda G. // 2008. RADAR 08. IEEE Radar Conference. - Rome, 26-30 May 2008. - P. 1-6.

C1268. Daun M. Tracking of ground targets with bistatic airborne radar. / Daun M., Koch W., Klemm R. // 2008. RADAR 08. IEEE Radar Conference. - Rome, 26-30 May 2008. - P. 1-6.

C1269. Wilcox D. Subspace methods and spatial diversity in radars. / Wilcox D., Sellathurai M., Ratnarajah T.

// 2008. RADAR 08. IEEE Radar Conference. - Rome, 26-30 May 2008. - P. 1-5.

C1270. Sedehi M. A reduced order jammer cancellation scheme based on double adaptivity. / Sedehi M., Colone F., Cristallini D., Lombardo P. // 2008. RADAR 08. IEEE Radar Conference. - Rome, 26-30 May 2008. - P. 1-6.

C1271. Sanyal P.K. Direct, channel-to-channel clutter cancellation (DC4) with phase-interferometry in multi-channel SAR for detecting surface moving targets. / Sanyal P.K., Zasada D.M., Perry R.P. // 2008. RADAR 08. IEEE Radar Conference. - Rome, 26-30 May 2008. - P. 1-6.

C1272. Anderson S. Multiple scattering of HF skywave radar signals: Physics, interpretation and exploitation. 2008. RADAR 08. IEEE Radar Conference. - Rome, 26-30 May 2008. - P. 1-5.

C1273. Headrick J. The development of over-the-horizon radar at the Naval Research Laboratory. / Headrick J., Thomason J. // 2008. RADAR 08. IEEE Radar Conference. - Rome, 26-30 May 2008. - P. 1-5.

C1274. Maresca S. Radar tracking of a move-stop-move maneuvering target in clutter. / Maresca S., Greco M., Gini F., Verrazzani L. // 2008. RADAR 08. IEEE Radar Conference. - Rome, 26-30 May 2008. - P. 1-6.

C1275. Byung Wook Jung. Frequency diversity in multistatic radars. / Byung Wook Jung, Adve R.S., Joohwan Chun. // 2008. RADAR 08. IEEE Radar Conference. - Rome, 26-30 May 2008. - P. 1-6.

C1276. Giompapa S. Study of the classification task into an integrated multisensor system for maritime border control. / Giompapa S., Farina A., Gini F., Graziano A., Croci R., Di Stefano R. // 2008. RADAR 08. IEEE Radar Conference. - Rome, 26-30 May 2008. - P. 1-6.

C1277. Bongioanni C. Performance analysis of a multi-frequency FM based Passive Bistatic Radar. / Bongioanni C., Colone F., Lombardo P. // 2008. RADAR 08. IEEE Radar Conference. - Rome, 26-30 May 2008. - P. 1-6.

C1278. Liu Chunbo. RF interference suppression for bistatic HF surface wave SIAR. / Liu Chunbo, Chen Baixiao, Zhang Shouhong. // 2008. RADAR 08. IEEE Radar Conference. - Rome, 26-30 May 2008. - P. 1-4.

C1279. Sammartino P.F. Moving target localization with multistatic radar systems. / Sammartino P.F., Baker C.J., Rangaswamy M. // 2008. RADAR 08. IEEE Radar Conference. - Rome, 26-30 May 2008. - P. 1-6.

C1280. Guo H. Evaluation of WiFi beacon transmissions for wireless based passive radar. / Guo H., Woodbridge K., Baker C.J. // 2008. RADAR 08. IEEE Radar Conference. - Rome, 26-30 May 2008. - P. 1-6.

C1281. Ahmed F.M. Analytical performance evaluation of an enhanced frequency domain radar detector. / Ahmed F.M., Elbarbary K.A., Elbardawiny A. // 2008. RADAR 08. IEEE Radar Conference. - Rome, 26-30 May 2008. - P. 1-5.

C1282. Klemm R. STAP I-Architectures and algorithms. / Klemm R., Ward J. // 2008. RADAR 08. IEEE Radar Conference. - Rome, 26-30 May 2008. - P. 1.

C1283. Griffiths Hugh. New directions in bistatic radar. 2008. RADAR '08. IEEE Radar Conference. - Rome, Italy, 26-30 May 2008. - P. 1.

C1284. Rohling H. Radar waveform for automotive radar systems and applications. / Rohling H., Moller C. // 2008. RADAR 08. IEEE Radar Conference. - Rome, 26-30 May 2008. - P. 1-4.

C1285. Novak L. Target recognition and polarimetric SAR. 2008. RADAR '08. IEEE Radar Conference. - Rome, 26-30 May 2008. - P. 1.

C1286. Ristic B. Tracking systems. / Ristic B., Hernandez M.L. // 2008. RADAR '08. IEEE Radar Conference. - Rome, 26-30 May 2008. - P. 1-2.

C1287. Goldstein S. STAP II-Advanced concepts. / Goldstein S., Picciolo M. // 2008. RADAR '08. IEEE Radar Conference. - Rome, 26-30 May 2008. - P. 1.

C1288. Greco M. Adaptive waveform diversity for cross-channel interference mitigation. / Greco M., Gini F., Stinco P., Farina A., Verrazzani L. // 2008. RADAR 08. IEEE Radar Conference. - Rome, 26-30 May 2008. - P.

1-6.

C1289. Grossi E. Multi-frame sequential procedures in early warning surveillance radar systems. / Grossi E., Lops M. // 2008. RADAR 08. IEEE Radar Conference. - Rome, 26-30 May 2008. - P. 1-6.

C1290. Battistelli G. Multiscan association as a multi-commodity flow optimization problem. / Battistelli G., Chisci L., Papi F., Benavoli A., Farina A. // 2008. RADAR 08. IEEE Radar Conference. - Rome, 26-30 May 2008. - P. 1-6.

C1291. Moulton J. Target and change detection in synthetic aperture radar sensing of urban structures. / Moulton J., Kassam S., Ahmad F., Amin M., Yemelyanov K. // 2008. RADAR 08. IEEE Radar Conference. - Rome, 26-30 May 2008. - P. 1-6.

C1292. Wicks M.C. Adaptive tomographic sensors for below ground imaging. / Wicks M.C., Norgard J.D., Cushman T.N. // 2008. RADAR 08. IEEE Radar Conference. - Rome, 26-30 May 2008. - P. 1-5.

C1293. Qun Zhang. Avian detection and identification with high-resolution radar. / Qun Zhang, Yue-sheng Zeng, Yuan-qiao He, Ying Luo. // 2008. RADAR 08. IEEE Radar Conference. - Rome, 26-30 May 2008. - P. 1-6.

C1294. Besada J. TRES: Multiradar-multisensor data processing assessment using opportunity targets. / Besada J., de Miguel G., Soto A., Garcia J., Alcazar R., Voet E. // 2008. RADAR 08. IEEE Radar Conference. - Rome, 26-30 May 2008. - P. 1-6.

C1295. Wang Qin. Range sidelobes suppression for HF surface wave radar with discontinuous spectra. / Wang Qin, Yang Zijie, Wan Xianrong, Xiong Junzhi. // 2008. ISAPE 2008. 8th International Symposium on Antennas, Propagation and EM Theory. - Kunming, 2-5 Nov. 2008. - P. 645-648.

C1296. Qu Wei. Principle and experiment of air target detection based on Signal Power Disturbance. / Qu Wei, Wu Yan-hong, Wang Hongyan, Jia Xin. // 2008. ISAPE 2008. 8th International Symposium on Antennas, Propagation and EM Theory. - Kunming, 2-5 Nov. 2008. - P. 604-607.

C1297. Zong Hua. Data association of monostatic-bistatic composite HF radar network under ionospheric interference. / Zong Hua, Quan Taifan, Ma Yinging, Zong Chengge. // 2008. ISAPE 2008. 8th International Symposium on Antennas, Propagation and EM Theory. - Kunming, 2-5 Nov. 2008. - P. 290-293.

C1298. Wu Yan-hong. Study on bistatic (multi) radar system using navigation satellites. / Wu Yan-hong, Qu Wei, Wang Hong-yan, Jia Xin, Shang Ji-liang. // 2008. ISAPE 2008. 8th International Symposium on Antennas, Propagation and EM Theory. - Kunming, 2-5 Nov. 2008. - P. 1286-1289.

C1299. Hong Wang. FMCW V-band radar nonlinear analysis and solutions. / Hong Wang, Xing-Guo Li, Guang-Feng Zhang. // 2008. ISAPE 2008. 8th International Symposium on Antennas, Propagation and EM Theory. - Kunming, 2-5 Nov. 2008. - P. 682-685.

C1300. Qiu Qi-Ming. Study on ship-formation detection by missile-borne radar using DBS imaging algorithm. / Qiu Qi-Ming, Zhang Lin-Rang, Yi Yu-Sheng. // 2008. ISAPE 2008. 8th International Symposium on Antennas, Propagation and EM Theory. - Kunming, 2-5 Nov. 2008. - P. 653-656.

C1301. Wang Ben-qing. Near range MMW synthetic aperture radiometer 3D passive imaging. / Wang Ben-qing, Li Xing-guo, Qian Song-song. // 2008. ISAPE 2008. 8th International Symposium on Antennas, Propagation and EM Theory. - Kunming, 2-5 Nov. 2008. - P. 233-236.

C1302. Zhuo Sun. Adaptive Localization through Transfer Learning in Indoor Wi-Fi Environment. / Zhuo Sun, Yiqiang Chen, Juan Qi, Junfa Liu. // 2008. ICMLA '08. Seventh International Conference on Machine Learning and Applications. - San Diego, CA, 11-13 Dec. 2008. - P. 331-336.

C1303. Xiao-yan Zhang. Automatic Detection and Tracking of Maneuverable Birds in Videos. / Xiao-yan Zhang, Xiao-juan Wu, Xin Zhou, Xiao-gang Wang, Yuan-yuan Zhang. // 2008. CIS '08. International Conference on Computational Intelligence and Security. - Suzhou, 13-17 Dec. 2008. - Vol. 1. - P. 185-189.

C1304. Hamdulla A. High-Resolution Bayes Detection of Dim Moving Point Target in IR Image Sequence Using Probabilistic Data Association Filter. / Hamdulla A., Xingke Lian. // 2008 International Conference on

Computer Science and Software Engineering. - Wuhan, Hubei, 12-14 Dec. 2008. - Vol. 6. - P. 365-368.

C1305. Sihua He. A Novel Image Moving Sea Targets Detection Method Based on the Natural Measure Feature. / Sihua He, Shaoqing Yang, Aiguo Shi, Tianwei Li. // 2008. ISISE '08. International Symposium on Information Science and Engineering. - Shanghai, 20-22 Dec. 2008. - Vol. 2. - P. 397-400.

C1306. Bin Wang. ADP-Based Optimal Adaptive Waveform Selection in Cognitive Radar. / Bin Wang, Jinkuan Wang, Jing Li. // 2008. IITAW '08. International Symposium on Intelligent Information Technology Application Workshops. - Shanghai, 21-22 Dec. 2008. - P. 788-790.

C1307. Yang Li. Cognitive detector: A new architecture for target detection and tracking in complex environment. / Yang Li, Ning Zhang, Qiang Yang. // 2008. ISKE 2008. 3rd International Conference on Intelligent System and Knowledge Engineering. - Xiamen, 17-19 Nov. 2008. - Vol. 1. - P. 685-688.

C1308. Pillai S.U. Effect of wind on space-based radar performance. / Pillai S.U., Ke Yong Li, Himed B. // 2008. RADAR 08. IEEE Radar Conference. - Rome, 26-30 May 2008. - P. 1-5.

C1309. Immediata S. New approach to 2d Medium PRF ambiguity resolution with application to air surveillance radar. / Immediata S., Petrucci R., Timmoneri L., Vigilante D. // 2008. RADAR 08. IEEE Radar Conference. - Rome, 26-30 May 2008. - P. 1-4.

C1310. Daniels D.J. Classification of landmines using GPR. / Daniels D.J., Curtis P., Lockwood O. // 2008. RADAR 08. IEEE Radar Conference. - Rome, 26-30 May 2008. - P. 1-6.

C1311. Raout J. Multi-target detection using noise-like signals. / Raout J., Preaux J.-P. // 2008. RADAR 08. IEEE Radar Conference. - Rome, 26-30 May 2008. - P. 1-5.

C1312. Damini A. Image-while-scan results from the X-band Wideband Experimental Airborne Radar. / Damini A., McDonald M., Mantle V. // 2008. RADAR 08. IEEE Radar Conference. - Rome, 26-30 May 2008. - P. 1-5.

C1313. Lombardo P. PBR activity at INFOCOM: Adaptive processing techniques and experimental results. / Lombardo P., Colone F., Bongioanni C., Lauri A., Bucciarelli T. // 2008. RADAR 08. IEEE Radar Conference. - Rome, 26-30 May 2008. - P. 1-6.

C1314. Malanowski M. Acceleration estimation for Passive Coherent Location radar. / Malanowski M., Kulpa K., Misiurewicz J. // 2008. RADAR 08. IEEE Radar Conference. - Rome, 26-30 May 2008. - P. 1-5.

C1315. Di Lallo A. Design, development and test on real data of an FM based prototypical passive radar. / Di Lallo A., Farina A., Fulcoli R., Genovesi P., Lalli R., Mancinelli R. // 2008. RADAR 08. IEEE Radar Conference. - Rome, 26-30 May 2008. - P. 1-6.

C1316. Butler T.B. Multistatic target classification with adaptive waveforms. / Butler T.B., Goodman N.A. // 2008. RADAR 08. IEEE Radar Conference. - Rome, 26-30 May 2008. - P. 1-6.

C1317. Pierucci L. Detection of snow clutter in ATC ground radar signal. / Pierucci L., Bocchi L., Anania G., Acciai D. // 2008. RADAR 08. IEEE Radar Conference. - Rome, 26-30 May 2008. - P. 1-5.

C1318. Nohara T.J. Affordable High-Performance Radar Networks for Homeland Security Applications. / Nohara T.J., Weber P., Jones G., Ukrainec A., Premji A. // 2008. RADAR 08. IEEE Radar Conference. - Rome, 26-30 May 2008. - P. 1-6.

C1319. Kuschel H. On the potentials of passive, multistatic, low frequency radars to counter stealth and detect low flying targets. / Kuschel H., Heckenbach J., Muller S., Appel R. // 2008. RADAR 08. IEEE Radar Conference. - Rome, 26-30 May 2008. - P. 1-6.

C1320. Jouny I. Target identification in a MIMO environment. 2008. RADAR 08. IEEE Radar Conference. - Rome, 26-30 May 2008. - P. 1-4.

C1321. Zazo S. Virtual MIMO radar using OFDM-CDM waveforms. / Zazo S., Bejar B., Grajal J. // 2008. RADAR 08. IEEE Radar Conference. - Rome, 26-30 May 2008. - P. 1-5.

C1322. Xin Guo. Performance evaluation of radio frequency interference cancellation techniques in HFSWR. /

Xin Guo, Hongbo Sun, Yilong Lu. // 2008. RADAR 08. IEEE Radar Conference. - Rome, 26-30 May 2008. - P. 1-6.

C1323. Lapuyade-Lahorgue J. Radar detection using Siegel distance between autoregressive processes, application to HF and X-band radar. / Lapuyade-Lahorgue J., Barbaresco F. // 2008. RADAR 08. IEEE Radar Conference. - Rome, 26-30 May 2008. - P. 1-6.

C1324. Kabakchiev C. Data association algorithm in multiradar system. / Kabakchiev C., Garvanov I., Doukovska L., Kyovtorov V., Rohling H. // 2008. RADAR 08. IEEE Radar Conference. - Rome, 26-30 May 2008. - P. 1-4.

C1325. Cheng Hu. Quasi-optimal signal processing in ground Forward Scattering Radar. / Cheng Hu, Antoniou M., Cherniakov M., Sizov V. // 2008. RADAR 08. IEEE Radar Conference. - Rome, 26-30 May 2008. - P. 1-6.

C1326. Pillai S.U. Waveform design optimization using bandwidth and energy considerations. / Pillai S.U., Ke Yong Li, Beyer H. // 2008. RADAR 08. IEEE Radar Conference. - Rome, 26-30 May 2008. - P. 1-5.

C1327. Rosenberg L. Analysis of medium grazing angle X-band sea-clutter Doppler spectra. / Rosenberg L., Stacy N.J. // 2008. RADAR 08. IEEE Radar Conference. - Rome, 26-30 May 2008. - P. 1-6.

C1328. Doyuran U.C. detection of multiple targets in non-Gaussian clutter. / Doyuran U.C., Tanik Y. // 2008. RADAR 08. IEEE Radar Conference. - Rome, 26-30 May 2008. - P. 1-5.

C1329. Zaimbashi A. A robust CFAR detector in non-homogenous environment. / Zaimbashi A., Norouzi Y. // 2008. RADAR 08. IEEE Radar Conference. - Rome, 26-30 May 2008. - P. 1-4.

C1330. Bandiera F. Adaptive radar detection of distributed targets under conic constraints. / Bandiera F., Orlando D., Ricci G. // 2008. RADAR 08. IEEE Radar Conference. - Rome, 26-30 May 2008. - P. 1-6.

C1331. Kai-Wen Cheng. Multi-target signal processing in FMCW radar system with antenna array. / Kai-Wen Cheng, Hsuan-Jung Su. // 2008. RADAR 08. IEEE Radar Conference. - Rome, 26-30 May 2008. - P. 1-5.

C1332. Mata-Moya D. MLP solutions for approximating the Average Likekihood Ratio detector in radar applications. / Mata-Moya D., Jarabo-Amores P., Vicen-Bueno R., Nieto-Borge J.C., Rosa-Zurera M., Lopez-Ferreras F. // 2008. RADAR 08. IEEE Radar Conference. - Rome, 26-30 May 2008. - P. 1-6.

C1333. Laroussi T. Performance analysis of TM-CFAR detection in time diversity systems for pulse-to-pulse correlated targets in presence of clutter edges and outlying targets: A comparison through extensive simulations. / Laroussi T., Barkat M., Benadjina N. // 2008. RADAR 08. IEEE Radar Conference. - Rome, 26-30 May 2008. - P. 1-6.

C1334. Vicen-Bueno R. Detection of known targets in Weibull clutter based on Neural Networks. Robustness study against target parameters changes. / Vicen-Bueno R., Jarabo-Amores M.P., Rosa-Zurera M., Gil-Pita R., Mata-Moya D. // 2008. RADAR 08. IEEE Radar Conference. - Rome, 26-30 May 2008. - P. 1-6.

C1335. Yaman C. Long-Range Target Classification in a Cluttered Environment Using Multi-Sensor Image Sequences. / Yaman C., Asari V. // 2007. RAST '07. 3rd International Conference on Recent Advances in Space Technologies. - Istanbul, 14-16 June 2007. - P. 304-308.

C1336. Kurnaz S. Earth Observation Remote Sensing and GIS Services for Monitoring of Integration Systems. / Kurnaz S., Rustamov R.B. // 2007. RAST '07. 3rd International Conference on Recent Advances in Space Technologies. - Istanbul, 14-16 June 2007. - P. 268-270.

C1337. Catapano I. Shape reconstruction of three dimensional buried objects from stepped frequency data. / Catapano I., Crocco L., Isernia T. // 2007 4th International Workshop on Advanced Ground Penetrating Radar. - Aula Magna Partenope, 27-29 June 2007. - P. 179-184.

C1338. Maehlisch M. De-cluttering with Integrated Probabilistic Data Association for Multisensor Multitarget ACC Vehicle Tracking. / Maehlisch M., Ritter W., Dietmayer K. // 2007 IEEE Intelligent Vehicles Symposium. - Istanbul, 13-15 June 2007. - P. 178-183.

C1339. Yang Yang. Routing for Emitter/Reflector Signal Detection in Wireless Sensor Network Systems. /

Yang Yang, Blum R.S. // 2007. ICC '07. IEEE International Conference on Communications. - Glasgow, 24-28 June 2007. - P. 4919-4924.

C1340. Hong Lin. A Data Fusion Algorithm for Large Heterogeneous Sensor Networks. / Hong Lin, Rushing J., Graves S., Criswell E. // 2007. WASA 2007. International Conference on Wireless Algorithms, Systems and Applications. - Chicago, IL, 1-3 Aug. 2007. - P. 225-232.

C1341. Liebelt J. Precise Registration of 3D Models To Images by Swarming Particles. / Liebelt J., Schertler K. // 2007. CVPR '07. IEEE Conference on Computer Vision and Pattern Recognition. - Minneapolis, MN, 17-22 June 2007. - P. 1-8.

C1342. Huadong Sun. Parameter Estimation of Moving Targets in Airborne SAR Based on Fractional Fourier Transform. / Huadong Sun, Fulin Su, Weiyi Wang, Shouhe Tang. // 2007. ICMMT '07. International Conference on Microwave and Millimeter Wave Technology. - Builin, 18-21 April 2007. - P. 1-4.

C1343. Li Tao. A Study on Scatter-Wave Jamming for Countering SAR. / Li Tao, Chen Weidong, Lu Guanghua, Wang Dongjin. // 2007. ICMMT '07. International Conference on Microwave and Millimeter Wave Technology. - Builin, 18-21 April 2007. - P. 1-4.

C1344. Lopera O. Time-frequency domain signature analysis of GPR data for landmine identification. / Lopera O., Milisavljevie N., Daniels D., Macq B. // 2007 4th International Workshop on Advanced Ground Penetrating Radar. - Aula Magna Partenope, 27-29 June 2007. - P. 159-162.

C1345. Takayama T. Analysis of Directional Borehole Radar Measurement Data. / Takayama T., Sato M., Kim J. H. // 2007 4th International Workshop on Advanced Ground Penetrating Radar. - Aula Magna Partenope, 27-29 June 2007. - P. 32-35.

C1346. Pack K. Automated False Track Identification. 2007. ICNS '07 Integrated Communications, Navigation and Surveillance Conference. - Herndon, VA, April 30 2007-May 3 2007. - P. 1-7.

C1347. Huo Zhihua. The Application of KL Transform to Remove Direct Wave in Ground Penetrating Radar Records. / Huo Zhihua, Wang Minghui. // 2007. ICIG 2007. Fourth International Conference on Image and Graphics. - Sichuan, 22-24 Aug. 2007. - P. 133-138.

C1348. Golikov V. CFAR Matched Detector of Signals in Autoregressive Noise. / Golikov V., Moreno A.C., Lebedeva O., Ponomaryov V. // 2007. MSMW '07. The Sixth International Kharkov Symposium on Physics and Engineering of Microwaves, Millimeter and Submillimeter Waves and Workshop on Terahertz Technologies. - Kharkov, 25-30 June 2007. - Vol. 2. - P. 995-997.

C1349. Ksendzuk A.V. Detection of the Stochastic Objects in Multiposition SAR. 2007. MSMW '07. The Sixth International Kharkov Symposium on Physics and Engineering of Microwaves, Millimeter and Submillimeter Waves and Workshop on Terahertz Technologies. - Kharkov, 25-30 June 2007. - Vol. 1. - P. 481-483.

C1350. Yang Yang. MIMO Radarwaveform Design. / Yang Yang, Blum Rick S. // 2007. SSP '07. IEEE/SP 14th Workshop on Statistical Signal Processing. - Madison, WI, USA, 26-29 Aug. 2007. - P. 468-472.

C1351. Li Y. Maximizing Detection Performancewithwaveform Design for Sensing in Heavy Sea Clutter. / Li Y., Sira S. P., Papandreou-Suppappola A., Cochran D., Scharf L. L. // 2007. SSP '07. IEEE/SP 14th Workshop on Statistical Signal Processing. - Madison, WI, USA, 26-29 Aug. 2007. - P. 249-253.

C1352. Gurbuz S.Z. Spectrogram-Based Methods for Human Identification in Single-Channel SAR Data. / Gurbuz S.Z., Melvin W.L., Williams D.B. // 2007. SIU 2007. IEEE 15th Signal Processing and Communications Applications. - Eskisehir, 11-13 June 2007. - P. 1-4.

C1353. Ho Gi Jung. Light Stripe Projection based Parking Space Detection for Intelligent Parking Assist System. / Ho Gi Jung, Dong Suk Kim, Pal Joo Yoon, Jaihie Kim. // 2007 IEEE Intelligent Vehicles Symposium. - Istanbul, 13-15 June 2007. - P. 962-968.

C1354. Gunnarsson J. Tracking vehicles using radar detections. / Gunnarsson J., Svensson L., Danielsson L., Bengtsson F. // 2007 IEEE Intelligent Vehicles Symposium. - Istanbul, 13-15 June 2007. - P. 296-302.

C1355. Trung-Dung Vu. Online Localization and Mapping with Moving Object Tracking in Dynamic Outdoor

Environments. / Trung-Dung Vu, Aycard O., Appenrodt N. // 2007 IEEE Intelligent Vehicles Symposium. - Istanbul, 13-15 June 2007. - P. 190-195.

C1356. Zhixi Li. Cross-band Inverse Synthetic Aperture Radar (ISAR) Image Fusion. / Zhixi Li, Narayanan R.M. // 2007. ISSSE '07. International Symposium on Signals, Systems and Electronics. - Montreal, Que., July 30 2007-Aug. 2 2007. - P. 111-114.

C1357. Zhenli Ma. A Knowledge-Based Target Recognition Method For Remote Sensing Image. / Zhenli Ma, Huibin Wang, Xinyao Lao, Min Tang, Fengchen Huang. // 2007. ICIT '07. IEEE International Conference on Integration Technology. - Shenzhen, 20-24 March 2007. - P. 414-417.

C1358. Boumediene M. Lane Boundary Detection and Tracking using NNF and HMM Approaches. / Boumediene M., Ouamri A., Dahnoun N. // 2007 IEEE Intelligent Vehicles Symposium. - Istanbul, 13-15 June 2007. - P. 1107-1111.

C1359. Knepp D.L. Ionospheric Propagation Effects on Ground and Space Based Radars. / Knepp D.L., Hausman M.A. // 2007 IEEE Radar Conference. - Boston, MA, 17-20 April 2007. - P. 916-921.

C1360. Haliloglu O. Successive Target Cancelation in Pulse Compression Radars. / Haliloglu O., Yilmaz A.O. // 2007 IEEE Radar Conference. - Boston, MA, 17-20 April 2007. - P. 885-890.

C1361. Linnehan R. Dynamic Logic Applied to SAR Data for Parameter Estimation Behind Walls. / Linnehan R., Schindler J., Brady D., Kozma R., Deming R., Perlovsky L. // 2007 IEEE Radar Conference. - Boston, MA, 17-20 April 2007. - P. 850-855.

C1362. Kronhamn T. Angle-Only Tracking of Manoeuvring Targets using Double Sets of Multiple Range Models and Probability Mass Diffusion. 2007. IDC '07 Information, Decision and Control. - Adelaide, Qld., 12-14 Feb. 2007. - P. 41-46.

C1363. Anderson S. Optimising bistatic HF radar configurations for target and environmental signature discrimination. 2007. IDC '07 Information, Decision and Control. - Adelaide, Qld., 12-14 Feb. 2007. - P. 29-33.

C1364. Griffiths H. The Signal and Interference Environment in Passive Bistatic Radar. / Griffiths H., Baker C. // 2007. IDC '07 Information, Decision and Control. - Adelaide, Qld., 12-14 Feb. 2007. - P. 1-10.

C1365. Burintramart S. Multiple Constraint Space-Time Adaptive Processing Using Direct Data Domain Least Squares (D3LS) Approach. / Burintramart S., Yilmazer N., Sarkar T.K. // 2007 IEEE Radar Conference. - Boston, MA, 17-20 April 2007. - P. 768-771.

C1366. Griffiths H.D. Developments in Modern Synthetic Aperture Radar. 2007 IEEE Radar Conference. - Boston, MA, 17-20 April 2007. - P. 734-739.

C1367. Sanyal P.K. Tracking Moving Ground Targets from Airborne SAR via Keystoning and Multiple Phase Center Interferometry. / Sanyal P.K., Zasada D.M., Perry R.P. // 2007 IEEE Radar Conference. - Boston, MA, 17-20 April 2007. - P. 723-728.

C1368. Henschel M.D. Characterization of Vessel Heave and Horizontal Velocities with Airborne SAR. / Henschel M.D., Dragosevic M.V., Livingstone C.E. // 2007 IEEE Radar Conference. - Boston, MA, 17-20 April 2007. - P. 794-799.

C1369. Wen Yang. Automatic Detection of Power Transmission Series in Full Polarimetric SAR Imagery. / Wen Yang, Haijian Zhang, Jiayu Chen, Hong Sun. // 2007 IEEE Radar Conference. - Boston, MA, 17-20 April 2007. - P. 789-793.

C1370. Jia Xu. Adaptive detection of moving target based on velocity synthetic aperture radar. / Jia Xu, Gang Li, Ying-Ning Peng, Xiang-Gen Xia, Yong-liang Wang. // 2007 IEEE Radar Conference. - Boston, MA, 17-20 April 2007. - P. 783-788.

C1371. Song lizhong. Study on a Nonlinear Frequency Modulation Signal with Polarization-Coded Modulation. / Song lizhong, Wang Miao. // 2007. ICMMT '07. International Conference on Microwave and Millimeter Wave Technology. - Builin, 18-21 April 2007. - P. 1-4.

C1372. Yi Jiang. Antenna Array Detection in Highly Cluttered Environment Using Time Reversal Method. / Yi Jiang, Stancil D.D., Jian-Gang Zhu. // 2007. IEEE/MTT-S International Microwave Symposium. - Honolulu, HI, 3-8 June 2007. - P. 1731-1734.

C1373. Hantscher S. An UWB Wall Scanner Based on a Shape Estimating SAR Algorithm. / Hantscher S., Reisenzahn A., Diskus C.G. // 2007. IEEE/MTT-S International Microwave Symposium. - Honolulu, HI, 3-8 June 2007. - P. 1463-1466.

C1374. Zhao Jianhong. LFM extended target echoes detecting using Radon-Wigner Method. / Zhao Jianhong, Yang Jianyu. // 2007. ICMMT '07. International Conference on Microwave and Millimeter Wave Technology. - Builin, 18-21 April 2007. - P. 1-4.

C1375. Li Ting-jun. Fast Extraction of Hyperbolic Signatures in GPR. / Li Ting-jun, Zhou Zheng-ou. // 2007. ICMMT '07. International Conference on Microwave and Millimeter Wave Technology. - Builin, 18-21 April 2007. - P. 1-3.

C1376. Hong Wang. Wall Parameters Estimation for Moving Target Localization with Through-the-Wall Radar. / Hong Wang, Zheng'ou Zhou, Lingjiang Kong. // 2007. ICMMT '07. International Conference on Microwave and Millimeter Wave Technology. - Builin, 18-21 April 2007. - P. 1-4.

C1377. Sun-Mog Hong. Parameter Optimization for Load-Optimal Agile Beam Radar Tracking. / Sun-Mog Hong, Won-Yong Choi, Young-Hun Jung. // 2007. IDC '07 Information, Decision and Control. - Adelaide, Qld., 12-14 Feb. 2007. - P. 320-325.

C1378. Finn A. Design Challenges for an Autonomous Cooperative of UAVs. / Finn A., Kabacinski K., Drake S.P. // 2007. IDC '07 Information, Decision and Control. - Adelaide, Qld., 12-14 Feb. 2007. - P. 160-169.

C1379. Roughan M. Data fusion without data fusion: localization and tracking without sharing sensitive information. / Roughan M., Arnold J. // 2007. IDC '07 Information, Decision and Control. - Adelaide, Qld., 12-14 Feb. 2007. - P. 136-141.

C1380. Cojocaru V. A 24GHz Low-Cost, Long-Range, Narrow-Band, Monopulse Radar Front End System for Automotive ACC Applications. / Cojocaru V., Kurata H., Humphrey D., Clarke B., Yokoyama T., Napijalo V., Young T., Adachi T. // 2007. IEEE/MTT-S International Microwave Symposium. - Honolulu, HI, 3-8 June 2007. - P. 1327-1330.

C1381. Brown E.R. Retrodirective Radar for Small Projectile Detection. / Brown E.R., Sinclair R.F., Brown E.B. // 2007. IEEE/MTT-S International Microwave Symposium. - Honolulu, HI, 3-8 June 2007. - P. 777-780.

C1382. Ristic B. CramГґB©r-Rao Bound for Multiple Target Tracking Using Intensity Measurements. / Ristic B., Morelande M. // 2007. IDC '07 Information, Decision and Control. - Adelaide, Qld., 12-14 Feb. 2007. - P. 354-359.

C1383. Bilik I. Comparative Theoretical Performance of Maneuverable Unmanned Vehicles versus Conventional Towed-Arrays for Passive Sonar. / Bilik I., Krolik J. // OCEANS 2007-Europe. - Aberdeen, 18-21 June 2007. - P. 1-5.

C1384. Hou Xuan. Study of Detection Technique Simulation of High Resolution Radar Based on BP Neural Network. / Hou Xuan, He Mingyi. // 2007. ICNC 2007. Third International Conference on Natural Computation. - Haikou, 24-27 Aug. 2007. - Vol. 1. - P. 426-430.

C1385. Zou Xue-yu. Collaborative Detection Probability of Mobile Target for Coverage in Large-Scale WSN. / Zou Xue-yu, Cao Yang. // 2007. WiCom 2007. International Conference on Wireless Communications, Networking and Mobile Computing. - Shanghai, 21-25 Sept. 2007. - P. 2710-2714.

C1386. Liu Congfeng. Canonical Framework for ATI and DPCA. / Liu Congfeng, Liao Guisheng, Zeng Cao. // 2007. WiCom 2007. International Conference on Wireless Communications, Networking and Mobile Computing. - Shanghai, 21-25 Sept. 2007. - P. 714-717.

C1387. Yingxi Zheng. Design of the High-powered Clutter Suppression System Based on ADSP-TS203. / Yingxi Zheng, Zhulin Zong. // 2007. ICCCAS 2007. International Conference on Communications, Circuits and Systems. - Kokura, 11-13 July 2007. - P. 816-818.

C1388. Xinxiang Zhang. Noise-Linear Frequency Modulation Shared Waveform for Integrated Radar and Jammer System. / Xinxiang Zhang, Tianqi Chen. // 2007. ICCCAS 2007. International Conference on Communications, Circuits and Systems. - Kokura, 11-13 July 2007. - P. 644-648.

C1389. Chen Ying. Multi-sensor Based Lane Detection and Object Tracking Method. / Chen Ying, Wu Dinghui. // 2007. CCC 2007. Chinese Control Conference. - Hunan, July 26 2007-June 31 2007. - P. 137-140.

C1390. Jun Hyeong Bae. Adaptive waveforms for target class discrimination. / Jun Hyeong Bae, Goodman N.A. // 2007. International Waveform Diversity and Design Conference. - Pisa, 4-8 June 2007. - P. 395-399.

C1391. Subotic N. Conditional and constrained joint optimization of RADAR waveforms. / Subotic N., Cooper K., Zulch P. // 2007. International Waveform Diversity and Design Conference. - Pisa, 4-8 June 2007. - P. 387-394.

C1392. Hurtado M. Polarization diversity for detecting targets in inhomogeneous clutter. / Hurtado M., Nehorai A. // 2007. International Waveform Diversity and Design Conference. - Pisa, 4-8 June 2007. - P. 382-386.

C1393. Shentang Li. Detection of Moving Target in FM Broadcast-Based Passive Radar. / Shentang Li, Hong Wan, Haichang Yin, Yuqi Huang. // 2007. WiCom 2007. International Conference on Wireless Communications, Networking and Mobile Computing. - Shanghai, 21-25 Sept. 2007. - P. 649-652.

C1394. Yimin Zhang. Concurrent operation and cross-radar interference cancellation of two over-the-horizon radars. / Yimin Zhang, Amin M.G. // 2007. International Waveform Diversity and Design Conference. - Pisa, 4-8 June 2007. - P. 428-432.

C1395. Gumas S. Computationally efficient waveform diversity. / Gumas S., Himed B. // 2007. International Waveform Diversity and Design Conference. - Pisa, 4-8 June 2007. - P. 400-406.

C1396. Farsaris N.J. Operability Aspects of a Transmitter-Independent Receiver Network Against Radar and Communication Jamming. / Farsaris N.J., Stavroulakis P.P., Xenos T.D. // 2007 7th International Symposium on Electromagnetic Compatibility and Electromagnetic Ecology. - Saint-Petersburg, 26-29 June 2007. - P. 118-122.

C1397. Deming R. Neural Modeling Fields for Multitarget/Multisensor Tracking. / Deming R., Schindler J., Perlovsky L. // 2007. IJCNN 2007. International Joint Conference on Neural Networks. - Orlando, FL, 12-17 Aug. 2007. - P. 442-447.

C1398. Lin-Ru You. Knowledge-Based Space-Time Adaptive Processing. / Lin-Ru You, Xiao-Qin Wen, Shu-E Bi. // 2007 International Conference on Machine Learning and Cybernetics. - Hong Kong, 19-22 Aug. 2007. - Vol. 5. - P. 2431-2435.

C1399. Gagnon A. Recent Developments in Ground Based Millimeter Wave Radars. / Gagnon A., Kwong M.P. // 2007 41st Annual IEEE International Carnahan Conference on Security Technology. - Ottawa, Ont., 8-11 Oct. 2007. - P. 189-192.

C1400. Butler W. Benefits of Wide Area Intrusion Detection Systems using FMCW Radar. / Butler W., Poitevin P., Bjomholt J. // 2007 41st Annual IEEE International Carnahan Conference on Security Technology. - Ottawa, Ont., 8-11 Oct. 2007. - P. 176-182.

C1401. Loney Gord. Border Intrusion Detection: Thinking outside the perimeter. 2007 41st Annual IEEE International Carnahan Conference on Security Technology. - Ottawa, ON, Canada, 8-11 Oct. 2007. - P. 103-108.

C1402. Lin Changchuan. Development of a Display Platform of the AIS Information. / Lin Changchuan, Sun Tengda, Zhou Jianwen, Lin Hai. // 2007. ICEMI '07. 8th International Conference on Electronic Measurement and Instruments. - Xi'an, Aug. 16 2007-July 18 2007. - P. 2-890-2-893-890.

C1403. Zhao Ying. Design of Embedded Display Control Terminal Based on Windows Mobile 5.0. / Zhao Ying, Wang Zhiyun. // 2007. ICEMI '07. 8th International Conference on Electronic Measurement and Instruments. - Xi'an, Aug. 16 2007-July 18 2007. - P. 2-288-2-291-288.

C1404. Chen JianYun. Wide-Band High Resolution Homing Sonar Echo Detect Based On Spread Spectrum

Technology. / Chen JianYun, Zhong XiaoPen, Fen XuZhe, Yan JianWei. // 2007. ICEMI '07. 8th International Conference on Electronic Measurement and Instruments. - Xi'an, Aug. 16 2007-July 18 2007. - P. 1-588-1-590-588.

C1405. Monastyrev E.A. MM-Wave Modules for Short Range Radar Systems. / Monastyrev E.A., Malakhovskiy O.Yu., Korablin M.A. // 2007. CriMiCo 2007. 17th International Crimean Conference Microwave & Telecommunication Technology. - Crimea, 10-14 Sept. 2007. - P. 49-50.

C1406. Yi Tan. A Radar Guided Vision System for Vehicle Validation and Vehicle Motion Characterization. / Yi Tan, Feng Han, Ibrahim F. // 2007. ITSC 2007. IEEE Intelligent Transportation Systems Conference. - Seattle, WA, Sept. 30 2007-Oct. 3 2007. - P. 1059-1066.

C1407. Yimin Wei. Vehicle Frontal Collision Warning System based on Improved Target Tracking and Threat Assessment. / Yimin Wei, Huadong Meng, Hao Zhang, Xiqin Wang. // 2007. ITSC 2007. IEEE Intelligent Transportation Systems Conference. - Seattle, WA, Sept. 30 2007-Oct. 3 2007. - P. 167-172.

C1408. Jin Tao. Polarimetric Monopulse Radar Intelligent Emulator. / Jin Tao, Qi Xiaohui, Yuan Shuqing, Qiao Xiaolin, Zhang Min, Zhang Qunxing. // 2007. ICIEA 2007. 2nd IEEE Conference on Industrial Electronics and Applications. - Harbin, 23-25 May 2007. - P. 2660-2665.

C1409. Huadong Sun. Parameter Estimations of SAR Moving Target Based on DPCA-FrFT Algorithm. / Huadong Sun, Fulin Su, Jianjun Gao, Xinghui Cao. // 2007. ICIEA 2007. 2nd IEEE Conference on Industrial Electronics and Applications. - Harbin, 23-25 May 2007. - P. 1779-1784.

C1410. Parikh S. Node-Replacement Policies to Maintain Threshold-Coverage in Wireless Sensor Networks. / Parikh S., Vokkarane V.M., Liudong Xing, Kasilingam D. // 2007. ICCCN 2007. Proceedings of 16th International Conference on Computer Communications and Networks. - Honolulu, HI, 13-16 Aug. 2007. - P. 760-765.

C1411. Landi L. Time-orthogonal-waveform-space-time adaptive processing for distributed aperture radars. / Landi L., Adve R.S. // 2007. International Waveform Diversity and Design Conference. - Pisa, 4-8 June 2007. - P. 13-17.

C1412. Odabaee M. A new signal detection with unknown doppler in an unknown background using spectrogram. / Odabaee M., Ghorbani A., Amindavar H. // 2007. ATNAC 2007. Australasian Telecommunication Networks and Applications Conference. - Christchurch, 2-5 Dec. 2007. - P. 225-229.

C1413. Guigen Nie. Research on LEO Satellites Time Synchronization with GPS Receivers Onboard. / Guigen Nie, Falin Wu, Kefei Zhang, Bo Zhu. // 2007 Joint with the 21st European Frequency and Time Forum. IEEE International Frequency Control Symposium. - Geneva, May 29 2007-June 1 2007. - P. 896-900.

C1414. Mellema G.R. A Structured Approach to Passive Sonar Track Association. OCEANS 2007-Europe. - Aberdeen, 18-21 June 2007. - P. 1-6.

C1415. Kohut J.T. A Nested Multi-static HF Radar Testbed for the New York Bight and Beyond. / Kohut J.T., Glenn S.M., Roarty H.J., Schofield O.M. // OCEANS 2007-Europe. - Aberdeen, 18-21 June 2007. - P. 1-3.

C1416. Gorski T. Target Detection Using HF Radar Data. / Gorski T., Le Caillec J.-M., Kawalec A., Czarnecki W., Lennon M., Thomas N. // OCEANS 2007-Europe. - Aberdeen, 18-21 June 2007. - P. 1-5.

C1417. Hurtado M. Polarization Diversity for Detecting Targets in Heavy Inhomogeneous Clutter. / Hurtado M., Nehorai A. // 2007. EMC 2007. IEEE International Symposium on Electromagnetic Compatibility. - Honolulu, HI, 9-13 July 2007. - P. 1-7.

C1418. Norgard J. Detection/Imaging of Buried Objects: Using Spatial/Angular Diversity with Distributed/Embedded Sub-Surface Sensors for Reduced Mutual Coupling and Suppressed EM Emissions. / Norgard J., Magde K., Wicks M., Drozd A., Musselman R. // 2007. EMC 2007. IEEE International Symposium on Electromagnetic Compatibility. - Honolulu, HI, 9-13 July 2007. - P. 1-5.

C1419. Jangal F. Remote Sensing of the Sea and Target Detection Improvement Using a Wavelet-based Extraction of Sea Echoes from High Frequency Radars. / Jangal F., Saillant S., Dorey P., Helier M. // OCEANS 2007-Europe. - Aberdeen, 18-21 June 2007. - P. 1-5.

C1420. Prodi F. Motion compensation for a frequency stepped radar. / Prodi F., Tilli E. // 2007. International Waveform Diversity and Design Conference. - Pisa, 4-8 June 2007. - P. 255-259.

C1421. De Maio A. Code selection for radar performance optimization. / De Maio A., Farina A. // 2007. International Waveform Diversity and Design Conference. - Pisa, 4-8 June 2007. - P. 219-223.

C1422. Kwang June Sohn. Multichannel parametric detectors for airborne radar applications. / Kwang June Sohn, Hongbin Li, Himed B., Markow J.S. // 2007. International Waveform Diversity and Design Conference. - Pisa, 4-8 June 2007. - P. 178-182.

C1423. Kyriakides I. Target tracking using particle filtering and CAZAC sequences. / Kyriakides I., Konstantinidis I., Morrell D., Benedetto J.J., Papandreou-Suppappola A. // 2007. International Waveform Diversity and Design Conference. - Pisa, 4-8 June 2007. - P. 367-371.

C1424. Morrison K. Use of frequency-randomized SAR waveforms for the detection and mitigation of small-motion effects in precision RCS measurement. 2007. International Waveform Diversity and Design Conference. - Pisa, 4-8 June 2007. - P. 321-325.

C1425. Fabrizio G. Experimental HF radar trial of real-time STAP. / Fabrizio G., Holdsworth D., Farina A. // 2007. International Waveform Diversity and Design Conference. - Pisa, 4-8 June 2007. - P. 316-320.

C1426. Byung Wook Jung. Discrete Suppression with ΣΔ-STAP. / Byung Wook Jung, Joohwan Chun, Adve R.S., Jonghoon Chun. // 2007. International Waveform Diversity and Design Conference. - Pisa, 4-8 June 2007. - P. 107-110.

C1427. Lock E. Varying FM rates in adaptive processing for distributed radar apertures. / Lock E., Adve R.S. // 2007. International Waveform Diversity and Design Conference. - Pisa, 4-8 June 2007. - P. 74-78.

C1428. Soldani F. The benefits of matched illumination for radar detection of ground based targets. / Soldani F., Alabaster C.M. // 2007. International Waveform Diversity and Design Conference. - Pisa, 4-8 June 2007. - P. 23-27.

C1429. Ravenni V. An approach for interference detection and rejection from other sensors by using Hough Transform and image processing. / Ravenni V., Cantini L., Bertacca M. // 2007. International Waveform Diversity and Design Conference. - Pisa, 4-8 June 2007. - P. 136-140.

C1430. Lu Y.L. Air target detection and tracking using a multi-channel GSM based passive radar. / Lu Y.L., Tan D.K.P., Sun H.B. // 2007. International Waveform Diversity and Design Conference. - Pisa, 4-8 June 2007. - P. 122-126.

C1431. Jae Woong Yi. Real-time PRF selection for medium PRF airborne pulsed-doppler radars in tracking phase. / Jae Woong Yi, Young Jin Byun. // 2007. International Waveform Diversity and Design Conference. - Pisa, 4-8 June 2007. - P. 116-121.

C1432. Borkar M. A Monte-Carlo Approach for Tracking Mobile Personnel. / Borkar M., Cevher V., McClellan J.H. // 2007 IEEE Aerospace Conference. - Big Sky, MT, 3-10 March 2007. - P. 1-10.

C1433. Blanding W.R. Multiple Target Tracking Using Maximum Likelihood Probabilistic Data Association. / Blanding W.R., Willett P.K., Bar-Shalom Y. // 2007 IEEE Aerospace Conference. - Big Sky, MT, 3-10 March 2007. - P. 1-12.

C1434. Serva S. A Study for a Space-Based Passive Multi-Channel SAR. / Serva S., Colone F., Lombardo P. // 2007 IEEE Aerospace Conference. - Big Sky, MT, 3-10 March 2007. - P. 1-11.

C1435. Schaum A. Advanced Methods of Multivariate Anomaly Detection. 2007 IEEE Aerospace Conference. - Big Sky, MT, 3-10 March 2007. - P. 1-7.

C1436. Stottler R. Intelligent Surface Threat Identification System (ISTIS). / Stottler R., Ball B., Richards R. // 2007 IEEE Aerospace Conference. - Big Sky, MT, 3-10 March 2007. - P. 1-13.

C1437. Ng W. Online Multisensor-Multitarget Detection and Tracking Using Variable Rate Particle Filters. / Ng W., Li J., Godsill S. // 2007 IEEE Aerospace Conference. - Big Sky, MT, 3-10 March 2007. - P. 1-16.

C1438. Fabrizio G.A. A robust adaptive detection scheme for radar Doppler processing. / Fabrizio G.A., Farina A. // 2007 IET International Conference on Radar Systems. - Edinburgh, UK, 15-18 Oct. 2007. - P. 1-5.

C1439. Xiongjun Fu. Sidelobe suppression of LPI phase-coded radar signal. / Xiongjun Fu, Liyu Tian, Meiguo Gao. // 2007 IET International Conference on Radar Systems. - Edinburgh, UK, 15-18 Oct. 2007. - P. 1-5.

C1440. Landi L. Range Doppler correlation for time-orthogonal distributed aperture radars. / Landi L., Adve R. S. // 2007 IET International Conference on Radar Systems. - Edinburgh, UK, 15-18 Oct. 2007. - P. 1-5.

C1441. Dzvonkovskaya A.L. HF radar ship detection and tracking using WERA system. / Dzvonkovskaya A.L., Rohling H. // 2007 IET International Conference on Radar Systems. - Edinburgh, UK, 15-18 Oct. 2007. - P. 1-5.

C1442. Alabaster C.M. The dependence of radar target detectability on array weighting function. / Alabaster C.M., Hughes E.J. // 2007 IET International Conference on Radar Systems. - Edinburgh, UK, 15-18 Oct. 2007. - P. 1-5.

C1443. Deng H. Target detection using orthogonal netted radar system (ONRS). / Deng H., Himed B. // 2007 IET International Conference on Radar Systems. - Edinburgh, UK, 15-18 Oct. 2007. - P. 1-4.

C1444. Xin Kang. Clustering Polarimetric SAR Image Under Deorientation Theory. / Xin Kang, Chongzhao Han, Feng Xu. // 2007. ICASSP 2007. IEEE International Conference on Acoustics, Speech and Signal Processing. - Honolulu, HI, 15-20 April 2007. - Vol. 1. - P. I-877-I-880-877.

C1445. Zattouta B. Automatic Censoring Detection Using Binary Clutter-Map Estimation for NonGaussian Environments. / Zattouta B., Farrouki A., Barkat M. // 2007. ICSPC 2007. IEEE International Conference on Signal Processing and Communications. - Dubai, 24-27 Nov. 2007. - P. 205-208.

C1446. Derakhtian M. Rapid-fluctuating Radar Signal Detection with Unknown Arrival Time. / Derakhtian M., Tadaion A.A., Gazor S., Nayebi M.M. // 2007. ICSPC 2007. IEEE International Conference on Signal Processing and Communications. - Dubai, 24-27 Nov. 2007. - P. 213-216.

C1447. Chin-Heng Lim. Non-Linear Prediction of Inverse Covariance Matrix for Stap. / Chin-Heng Lim, Chong-Meng Samson See, Mulgrew B. // 2007. ICASSP 2007. IEEE International Conference on Acoustics, Speech and Signal Processing. - Honolulu, HI, 15-20 April 2007. - Vol. 2. - P. II-921-II-924-921.

C1448. Durand R. SAR Processor based on a CFAR Signal or Interference Subspace Detector Matched to Man Made Target Detection in a Forest. / Durand R., Ginolhac G., Thirion L., Forster P. // 2007. ICASSP 2007. IEEE International Conference on Acoustics, Speech and Signal Processing. - Honolulu, HI, 15-20 April 2007. - Vol. 2. - P. II-293-II-296-293.

C1449. Kennedy H.L. Detecting and Tracking Moving Objects in Sequences of Color Images. 2007. ICASSP 2007. IEEE International Conference on Acoustics, Speech and Signal Processing. - Honolulu, HI, 15-20 April 2007. - Vol. 1. - P. I-1197-I-1200-1197.

C1450. Lauri A. Analysis and Emulation of FM Radio Signals for Passive Radar. / Lauri A., Colone F., Cardinali R., Bongioanni C., Lombardo P. // 2007 IEEE Aerospace Conference. - Big Sky, MT, 3-10 March 2007. - P. 1-10.

C1451. Santori A. Array Shape Self-Calibration for Large Flexible Antenna. / Santori A., Barrere J., Chabriel G., Jauffret C., Medynski D. // 2007 IEEE Aerospace Conference. - Big Sky, MT, 3-10 March 2007. - P. 1-9.

C1452. Bergin J.S. Evaluation of Knowledge-Aided STAP Using Experimental Data. / Bergin J.S., Kirk D.R., Chaney G., McNeil S., Zulch P.A. // 2007 IEEE Aerospace Conference. - Big Sky, MT, 3-10 March 2007. - P. 1-13.

C1453. Laroussi T. A Performance Comparison of Two Time Diversity Systems using TM-CFAR Detection for Partially Correlated Chi-Square Targets in Nonuniform Clutter and Multiple Target Situations. / Laroussi T., Barkat M., Benadjina N. // 2007. ICSPC 2007. IEEE International Conference on Signal Processing and Communications. - Dubai, 24-27 Nov. 2007. - P. 1511-1514.

C1454. Hatano H. A Simple Estimator of Multiple Target Positions for Automotive Short Range Radar Networks. / Hatano H., Yamazato T., Okada H., Katayama M. // 2007. VTC2007-Spring. IEEE 65th Vehicular

Technology Conference. - Dublin, 22-25 April 2007. - P. 2511-2515.

C1455. Baud O. Trajectory Comparison for Civil Aircraft. / Baud O., El-Bied Y., Honore N., Taupin O. // 2007 IEEE Aerospace Conference. - Big Sky, MT, 3-10 March 2007. - P. 1-9.

C1456. Ritter Henning. Pedestrian detection based on automotive radar. / Ritter Henning, Rohling Hermann. // 2007 IET International Conference on Radar Systems. - Edinburgh, UK, 15-18 Oct. 2007. - P. 1-4.

C1457. Jahangir M. Moving target detection for synthetic aperture radar via shadow detection. 2007 IET International Conference on Radar Systems. - Edinburgh, UK, 15-18 Oct. 2007. - P. 1-5.

C1458. Gould Dale. Developments to a multiband passive radar demonstrator system. / Gould Dale, Pollard Robert, Sarno Carlos, Tittensor Paul. // 2007 IET International Conference on Radar Systems. - Edinburgh, UK, 15-18 Oct. 2007. - P. 1-5.

C1459. Rashid L. S. Impact modelling of wind farms on marine navigational radar. / Rashid L. S., Brown A.K. // 2007 IET International Conference on Radar Systems. - Edinburgh, UK, 15-18 Oct. 2007. - P. 1-5.

C1460. Guo H. Passive radar detection using wireless networks. / Guo H., Coetzee S., Mason D., Woodbridge K., Baker C. // 2007 IET International Conference on Radar Systems. - Edinburgh, UK, 15-18 Oct. 2007. - P. 1-4.

C1461. Aboutanios E. Regularisation methods for covariance matrix estimation in low sample support stap. / Aboutanios E., Mulgrew B. // 2007 IET International Conference on Radar Systems. - Edinburgh, UK, 15-18 Oct. 2007. - P. 1-5.

C1462. Lim Chin-Heng. Bistatic JDL-STAP for ground moving target detection. / Lim Chin-Heng, Mulgrew Bernard, Aboutanios Elias. // 2007 IET International Conference on Radar Systems. - Edinburgh, UK, 15-18 Oct. 2007. - P. 1-5.

C1463. Kealey Paul G. Robust radar detection of moving ground targets with STAP. / Kealey Paul G., Carrington David M. // 2007 IET International Conference on Radar Systems. - Edinburgh, UK, 15-18 Oct. 2007. - P. 1-5.

C1464. Saxena Akhilesh. RFInD: An RFID-Based System to Manage Virtual Spaces. / Saxena Akhilesh, Ganguly Samrat, Bhatnagar Sudeept, Izmailov Rauf. // 2007. PerCom Workshops '07. Fifth Annual IEEE International Conference on Pervasive Computing and Communications Workshops. - White Plains, NY, 19-23 March 2007. - P. 382-387.

C1465. Benavoli A. Design and development of a signal and data processor test bed for a passive radar in the FM band. / Benavoli A., Chisci L., Di Lallo A., Farina A., Fulcoli R., Mancinelli R., Timmoneri L. // 2007 IET International Conference on Radar Systems. - Edinburgh, UK, 15-18 Oct. 2007. - P. 1-5.

C1466. Gorski T. Space-Time Adaptive Processing in the presence of non-Gaussian sea clutteR. / Gorski T., Le Caillec J-M., Kawalec A., Czarnecki W. // 2007 IET International Conference on Radar Systems. - Edinburgh, UK, 15-18 Oct. 2007. - P. 1-4.

C1467. Cao T.V. A rare event approach to the detection of target-like signals in CFAR training data. / Cao T.V., Sinnott D. // 2007 IET International Conference on Radar Systems. - Edinburgh, UK, 15-18 Oct. 2007. - P. 1-5.

C1468. De Maio Antonio. Constrained adaptive detection of range spread targets. / De Maio Antonio, De Nicola Silvio, Farina Alfonso. // 2007 IET International Conference on Radar Systems. - Edinburgh, UK, 15-18 Oct. 2007. - P. 1-6.

C1469. RezaZadeh Ahmad. Maximum likelihood CFAR for lognormal clutter with censored samples. / RezaZadeh Ahmad, Norouzi Yaser, Nayebi Mohammad Mahdi. // 2007 IET International Conference on Radar Systems. - Edinburgh, UK, 15-18 Oct. 2007. - P. 1-4.

C1470. Vu V. T. Experimental results on moving target detection by focusing in UWB low frequency SAR. / Vu V. T., Sjogren 1T. K., Pettersson M. I., Zepernick H.-J., Gustavsson A. // 2007 IET International Conference on Radar Systems. - Edinburgh, UK, 15-18 Oct. 2007. - P. 1-5.

C1471. Sheikhi A. GLRT based adaptive detection for MIMO radars. / Sheikhi A., Zamani A. // 2007 IET International Conference on Radar Systems. - Edinburgh, UK, 15-18 Oct. 2007. - P. 1-4.

C1472. Greco Maria. Radar detection and classification of jamming signals based on cone classes. / Greco Maria, Gini Fulvio, Farina Alfonso. // 2007 IET International Conference on Radar Systems. - Edinburgh, UK, 15-18 Oct. 2007. - P. 1-5.

C1473. Sohn Kwang June. Performance of multichannel parametric detectors with MCARM data. / Sohn Kwang June, Hongbin Li, Himed Braham, Markow Joshua S. // 2007 IET International Conference on Radar Systems. - Edinburgh, UK, 15-18 Oct. 2007. - P. 1-5.

C1474. Tough Robert. Modelling sea clutter temporal correlation in detection calculations. / Tough Robert, Ward Keith, Watts Simon. // 2007 IET International Conference on Radar Systems. - Edinburgh, UK, 15-18 Oct. 2007. - P. 1-4.

C1475. Morris J. T. Polarisation filtering for small target discrimination in ground clutter. / Morris J. T., Anderson W.C., Anderson S.J. // 2007 IET International Conference on Radar Systems. - Edinburgh, UK, 15-18 Oct. 2007. - P. 1-4.

C1476. Hoi-Shun Lui. Time-frequency analysis of late time electromagnetic transients from radar targets. / Hoi-Shun Lui, Shuley N.V., Longstaff I. D. // 2007 IET International Conference on Radar Systems. - Edinburgh, UK, 15-18 Oct. 2007. - P. 1-5.

C1477. Matthiesen Duane J. Optimal search and optimal detection. 2007 IET International Conference on Radar Systems. - Edinburgh, UK, 15-18 Oct. 2007. - P. 1-7.

C1478. Stevens M.B. The effect of land clutter statistics on automatic gain control. 2007 IET International Conference on Radar Systems. - Edinburgh, UK, 15-18 Oct. 2007. - P. 1-3.

C1479. Kabakchiev Chr. Netted radar hough detector in randomly arriving impulse interference. / Kabakchiev Chr., Garvanov I., Rohling H. // 2007 IET International Conference on Radar Systems. - Edinburgh, UK, 15-18 Oct. 2007. - P. 1-5.

C1480. Fabrizio G.A. GLRT-Based Adaptive Doppler Processing for HF Radar Systems. / Fabrizio G.A., Farina A. // 2007. ICASSP 2007. IEEE International Conference on Acoustics, Speech and Signal Processing. - Honolulu, HI, 15-20 April 2007. - Vol. 2. - P. II-949-II-952-949.

C1481. Giompapa S. Computer Simulation of an Integrated Multi-Sensor System for Maritime Border Control. / Giompapa S., Farina A., Gini F., Graziano A., Di Stefano R. // 2007 IEEE Radar Conference. - Boston, MA, 17-20 April 2007. - P. 308-313.

C1482. Sheikhi A. Coherent Detection for MIMO Radars. / Sheikhi A., Zamani A. // 2007 IEEE Radar Conference. - Boston, MA, 17-20 April 2007. - P. 302-307.

C1483. Lu X. A Co-Channel Signal Detector Based on Phase Tracking for Pulse Doppler Radar. / Lu X., Kirlin R.L., Wang J. // 2007 IEEE Radar Conference. - Boston, MA, 17-20 April 2007. - P. 254-258.

C1484. Doyuran U.C. Detection in Range-Heterogeneous Weibull Clutter. / Doyuran U.C., Tanik Y. // 2007 IEEE Radar Conference. - Boston, MA, 17-20 April 2007. - P. 343-347.

C1485. Yong Liu. Computationally Efficient Angle Estimation Using Maximum Likelihood In A Digital Beam-Forming Radar. / Yong Liu, Wong G., Kennedy W. // 2007 IEEE Radar Conference. - Boston, MA, 17-20 April 2007. - P. 337-342.

C1486. Tiwari K.C. Algorithm Overview Based On Image Processing with Electromagnetic (EM) Techniques in X Band and GA Approach for Depth Estimation of Shallow Burried Dummy Mines. / Tiwari K.C., Singhb D., Arora M. // 2007 IEEE Radar Conference. - Boston, MA, 17-20 April 2007. - P. 331-336.

C1487. Buzzi S. Detection of an Unknown Number of Targets via Track-Before-Detect Procedures. / Buzzi S., Lops M., Venturino L., Ferri M. // 2007 IEEE Radar Conference. - Boston, MA, 17-20 April 2007. - P. 180-185.

C1488. Peer U. Compression Waveforms for Non-Coherent Radar. / Peer U., Levanon N. // 2007 IEEE Radar

Conference. - Boston, MA, 17-20 April 2007. - P. 104-109.

C1489. Hall T.M. Statistics of Clutter Residue in MTI Radars with IF Limiting. / Hall T.M., Shrader W.W. // 2007 IEEE Radar Conference. - Boston, MA, 17-20 April 2007. - P. 81-87.

C1490. Deming R. Track-Before-Detect of Multiple Slowly Moving Targets. / Deming R., Schindler J., Perlovsky L. // 2007 IEEE Radar Conference. - Boston, MA, 17-20 April 2007. - P. 238-243.

C1491. Roy T. Comparison of Efficient Design Techniques for Surveillance Radars. / Roy T., Meena D., Prakasam L.G.M. // 2007 IEEE Radar Conference. - Boston, MA, 17-20 April 2007. - P. 197-202.

C1492. Ramdaras U.D. Target Tracking in Sensor Networks: Criteria for Sensor Selection. / Ramdaras U.D., Absil F.G.J. // 2007 IEEE Radar Conference. - Boston, MA, 17-20 April 2007. - P. 192-196.

C1493. Ram S.S. Human Tracking Using Doppler Processing and Spatial Beamforming. / Ram S.S., Yang Li, Lin A., Hao Ling. // 2007 IEEE Radar Conference. - Boston, MA, 17-20 April 2007. - P. 546-551.

C1494. Johnsen T. Hitchhiking bistatic radar: principles, processing and experimental findings. / Johnsen T., Olsen K.E. // 2007 IEEE Radar Conference. - Boston, MA, 17-20 April 2007. - P. 518-523.

C1495. Jangal F. Wavelets: a Versatile Tool for the High Frequency Surface Wave Radar. / Jangal F., Saillant S., Helier M. // 2007 IEEE Radar Conference. - Boston, MA, 17-20 April 2007. - P. 497-502.

C1496. Maciel J.J. MEMS Electronically Steerable Antennas for Fire Control Radars. / Maciel J.J., Slocum J.F., Smith J.K., Turtle J. // 2007 IEEE Radar Conference. - Boston, MA, 17-20 April 2007. - P. 677-682.

C1497. Paine A.S. An Adaptive Beamforming Technique for Countering Synthetic Aperture Radar (SAR) Jamming Threats. 2007 IEEE Radar Conference. - Boston, MA, 17-20 April 2007. - P. 630-634.

C1498. Li Lei. Ionospheric clutter mitigation with knowledge aided pre-whiten in High Frequency Surface Wave Radar. / Li Lei, Xu Rongqing, Li Gaopeng. // 2007 IEEE Radar Conference. - Boston, MA, 17-20 April 2007. - P. 558-561.

C1499. de Forest Boyer D. An Analysis of Measurement Derived Sea Clutter Simulations at Very Low Grazing Angles, in the Presence of Surface Based Ducting. / de Forest Boyer D., Spaulding B., LeFurjah G. // 2007 IEEE Radar Conference. - Boston, MA, 17-20 April 2007. - P. 391-395.

C1500. Pados D.A. Short-data-record Adaptive Detection. / Pados D.A., Karystinos G.N., Batalama S.N., Matyjas J.D. // 2007 IEEE Radar Conference. - Boston, MA, 17-20 April 2007. - P. 357-361.

C1501. Capraro C.T. Knowledge Aided Detection and Tracking. / Capraro C.T., Capraro G.T., Wicks M.C. // 2007 IEEE Radar Conference. - Boston, MA, 17-20 April 2007. - P. 352-356.

C1502. Sheikholeslami A. Soft Decision M-Pulse CFAR Detection in Weibull Clutter. / Sheikholeslami A., Norouzi Y., Nayebi M.M. // 2007 IEEE Radar Conference. - Boston, MA, 17-20 April 2007. - P. 487-490.

C1503. Madanizadeh S.A. Signal Detection using the Correlation Coefficient in Fractal Geometry. / Madanizadeh S.A., Nayebi M.M. // 2007 IEEE Radar Conference. - Boston, MA, 17-20 April 2007. - P. 481-486.

C1504. Boryssenko A.O. Ultra-Wide Band Near-Field Imaging System. / Boryssenko A.O., Craeye C., Schaubert D.H. // 2007 IEEE Radar Conference. - Boston, MA, 17-20 April 2007. - P. 402-407.

C1505. Maeda F. Development of diver detection and sensor integration for wharf surveillance software. / Maeda F., Asada A., Kuramoto K., Kurashige Y., Nanri M., Kawashima Y., Imai R., Hantani K. // 2007. Symposium on Underwater Technology and Workshop on Scientific Use of Submarine Cables and Related Technologies. - Tokyo, 17-20 April 2007. - P. 133-141.

C1506. Hiryu S. Compensation behaviors in echolocating bats measured by a telemetry microphone during flight. / Hiryu S., Hagino T., Shiori Y., Riquimaroux H., Watanabe Y. // 2007. Symposium on Underwater Technology and Workshop on Scientific Use of Submarine Cables and Related Technologies. - Tokyo, 17-20 April 2007. - P. 535-539.

C1507. Weiqun Shi. Development of an Experimental Prototype Multi-Modal Netted Sensor Fence for Homeland Defense and Border Integrity. / Weiqun Shi, Arabadjis G., Bishop B., Hill P., Plasse R. // 2007 IEEE Conference on Technologies for Homeland Security. - Woburn, MA, 16-17 May 2007. - P. 221-226.

C1508. Hafez A.S. A New Differential Clutter Map Processing in Modern Surveillance Radars. 2007. NRSC 2007. National Radio Science Conference. - Cairo, 13-15 March 2007. - P. 1-6.

C1509. Atteia G.E. Design and Analysis of Wideband Antenna with Application to Ground Penetrating Radar System. / Atteia G.E., Hussein K.F.A., Shaalan A.A. // 2007. NRSC 2007. National Radio Science Conference. - Cairo, 13-15 March 2007. - P. 1-8.

C1510. Moustafa K. Performance Evaluation of Separated Aperture Sensor GPR System for Land Mine Detection. / Moustafa K., Al Hussein K.F., Ammar A.-E.-H.A. // 2007. NRSC 2007. National Radio Science Conference. - Cairo, 13-15 March 2007. - P. 1-9.

C1511. Sira S.P. Improving Detection in Sea Clutter using Waveform Scheduling. / Sira S.P., Cochran D., Papandreou-Suppappola A., Morrell D., Moran B., Howard S., Calderbank R. // 2007. ICASSP 2007. IEEE International Conference on Acoustics, Speech and Signal Processing. - Honolulu, HI, 15-20 April 2007. - Vol. 3. - P. III-1241-III-1244-1241.

C1512. Morelande M.R. Performance Bounds and Algorithms for Tracking with a Radar Array. / Morelande M.R., Suvarova S., Moran B. // 2007. ICASSP 2007. IEEE International Conference on Acoustics, Speech and Signal Processing. - Honolulu, HI, 15-20 April 2007. - Vol. 2. - P. II-1105-II-1108-1105.

C1513. Bin Liu. Blind Adaptive Algorithm for M-Ary Distributed Detection. / Bin Liu, Jeremic A., Kon Max Wong. // 2007. ICASSP 2007. IEEE International Conference on Acoustics, Speech and Signal Processing. - Honolulu, HI, 15-20 April 2007. - Vol. 2. - P. II-1025-II-1028-1025.

C1514. Deming R. Concurrent Tracking and Detection of Slowly Moving Targets using Dynamic Logic. / Deming R., Schindler J., Perlovsky L. // 2007. KIMAS 2007. International Conference on Integration of Knowledge Intensive Multi-Agent Systems. - Waltham, MA, April 30 2007-May 3 2007. - P. 7-11.

C1515. Lidicky L. Fourier Approach to Moving Target Indication and Detection in Multichannel SAR Data. 2007. CIISP 2007. IEEE Symposium on Computational Intelligence in Image and Signal Processing. - Honolulu, HI, 1-5 April 2007. - P. 397-402.

C1516. Xiaoxiang Liu. Through the Wall Imaging using Chaotic Modulated Ultra Wideband Synthetic Aperture Radar. / Xiaoxiang Liu, Henry Leung. // 2007. ICASSP 2007. IEEE International Conference on Acoustics, Speech and Signal Processing. - Honolulu, HI, 15-20 April 2007. - Vol. 3. - P. III-1257-III-1260-1257.

C1517. Yarovoy A.G. UWB Radars: Recent Technological Advances and Applications. / Yarovoy A.G., Ligthart L.P. // 2007 IEEE Radar Conference. - Boston, MA, 17-20 April 2007. - P. 43-48.

C1518. Xianhe Shao. A Target Recognition Method Based on Non-Linear Polarization Transformation. / Xianhe Shao, Hai Du, Jinghong Xue. // 2007 IEEE International Workshop on Anti-counterfeiting, Security, Identification. - Xiamen, Fujian, 16-18 April 2007. - P. 157-163.

C1519. Shao Xianhe. Theoretical Analysis of Polarization Recognition between Chaff cloud and ship. / Shao Xianhe, Xue Jinghong, Du Hai. // 2007 IEEE International Workshop on Anti-counterfeiting, Security, Identification. - Xiamen, Fujian, 16-18 April 2007. - P. 125-129.

C1520. Theil A. Radar Performance Degradation due to the Presence of Wind Turbines. / Theil A., van Ewijk L.J. // 2007 IEEE Radar Conference. - Boston, MA, 17-20 April 2007. - P. 75-80.

C1521. Holloway R.F. Next-Generation W-Band Radar Testbed. / Holloway R.F., Weedon W.H., Houshmand B., Roll A. // 2007 IEEE Radar Conference. - Boston, MA, 17-20 April 2007. - P. 65-71.

C1522. Blyakhman A. Nanosecond Gigawatt Radar: Indication of Small Targets Moving Among Heavy Clutters. / Blyakhman A., Clunie D., Harris R., Mesyats G., Petelin M., Postoenko G., Wardrop B. // 2007 IEEE Radar Conference. - Boston, MA, 17-20 April 2007. - P. 61-64.

C1523. Weihing D. An Integral Detection Scheme for Moving Object Indication in Dual-Channel High

Resolution Spaceborne SAR Data. / Weihing D., Hinz S., Meyer F., Suchandt S., Bamler R. // 2007 Urban Remote Sensing Joint Event. - Paris, 11-13 April 2007. - P. 1-6.

C1524. Jerabek J. Moving Target UWB Radar Demonstration using Real-Time Sampling. / Jerabek J., Dvorak D., Mrkvica J., Sikl R. // 2007. 17th International Conference Radioelektronika. - Brno, 24-25 April 2007. - P. 1-4.

C1525. Aftanas M. An Analysis of 2D Target Positioning Accuracy for M-sequence UWB Radar System under Ideal Conditions. / Aftanas M., Rovnakova J., Riskova M., Kocur D., Drutarovsky M. // 2007. 17th International Conference Radioelektronika. - Brno, 24-25 April 2007. - P. 1-6.

C1526. Whitewood A. Resource Management for Airborne Surveillance Radars. / Whitewood A., Davidson G., Stove A. // 2007 3rd Institution of Engineering and Technology Seminar on Intelligent Sensor Management. - London, 10-10 May 2007. - P. 1-8.

C1527. Du Peijun. Applications of Multi-source Remote Sensing Information to Urban Environment Monitoring in Mining Industrial Cities. / Du Peijun, Zhang Huapeng, Pan Chen, Liu Pei. // 2007 Urban Remote Sensing Joint Event. - Paris, 11-13 April 2007. - P. 1-12.

C1528. Reigber A. Detection and classification of urban structures based on high-resolution SAR imagery. / Reigber A., Jager M., He W., Ferro-Famil L., Hellwich O. // 2007 Urban Remote Sensing Joint Event. - Paris, 11-13 April 2007. - P. 1-6.

C1529. Chamma W.A. FDTD Modelling of a Realistic Room for Through-the-Wall Radar Applications. 2007. CEM-TD 2007. Workshop on Computational Electromagnetics in Time-Domain. - Perugia, 15-17 Oct. 2007. - P. 1-4.

C1530. Bishop A.N. Target Tracking with Range and Bearing Measurements via Robust Linear Filtering. / Bishop A.N., Pathirana P.N., Savkin A.V. // ---. - Melbourne, Qld., 3-6 Dec. 2007. - P. 131-135.

C1531. Pathirana P.N. Stereo-Vision-Based Moving Object Tracking via Robust Linear Filtering. / Pathirana P.N., Bishop A.N., Savkin A.V. // ---. - Melbourne, Qld., 3-6 Dec. 2007. - P. 221-226.

C1532. Hui Ma. Distributive Target Tracking in Wireless Sensor Networks under Measurement Origin Uncertainty. / Hui Ma, Ng B.W.-H. // ---. - Melbourne, Qld., 3-6 Dec. 2007. - P. 299-304.

C1533. Yuanwei Jin. Time Reversal Transmission in MIMO Radar. / Yuanwei Jin, Moura J.M.F., O'Donoughue N. // 2007. ACSSC 2007. Conference Record of the Forty-First Asilomar Conference on Signals, Systems and Computers. - Pacific Grove, CA, 4-7 Nov. 2007. - P. 2204-2208.

C1534. Bandiera F. Derivation and Analysis of an Adaptive Detector With Enhanced Mismatched Signals Rejection Capabilities. / Bandiera F., Besson O., Orlando D., Ricci G. // 2007. ACSSC 2007. Conference Record of the Forty-First Asilomar Conference on Signals, Systems and Computers. - Pacific Grove, CA, 4-7 Nov. 2007. - P. 2182-2186.

C1535. Kazanci O. Wavefront Adaptive Raymode Processing for Over-the-Horizon HF Radar Clutter Mitigation. / Kazanci O., Bilik I., Krolik J. // 2007. ACSSC 2007. Conference Record of the Forty-First Asilomar Conference on Signals, Systems and Computers. - Pacific Grove, CA, 4-7 Nov. 2007. - P. 2191-2194.

C1536. Zubeyde Gurbtiz S. Comparison of Radar-Based Human Detection Techniques. / Zubeyde Gurbtiz S., Melvin W.L., Williams D.B. // 2007. ACSSC 2007. Conference Record of the Forty-First Asilomar Conference on Signals, Systems and Computers. - Pacific Grove, CA, 4-7 Nov. 2007. - P. 2199-2203.

C1537. Li Y. Adaptive Sensing of Dynamic Target State in Heavy Sea Clutter. / Li Y., Sira S.P., Moran B., Suvorova S., Cochran D., Morrell D., Papandreou-Suppappola A. // 2007. CAMPSAP 2007. 2nd IEEE International Workshop on Computational Advances in Multi-Sensor Adaptive Processing. - St. Thomas, VI, 12-14 Dec. 2007. - P. 9-12.

C1538. {no data available}. Target identification and signal processing of millimeter-wave. 2007 and the 2007 15th International Conference on Terahertz Electronics. IRMMW-THz. Joint 32nd International Conference on Infrared and Millimeter Waves. - Cardiff, 2-9 Sept. 2007. - P. 926-927.

C1539. Yang Zhi-guo. Multiresolution feature extraction in target detection of UWB SAR. / Yang Zhi-guo,

Huang Xiao-tao, Zhou Zhi-min. // 2007. APSAR 2007. 1st Asian and Pacific Conference on Synthetic Aperture Radar. - Huangshan, 5-9 Nov. 2007. - P. 457-461.

C1540. Lamei Zhang. Targets detection and analysis in coastal area using Polarimetric SAR images. / Lamei Zhang, Bin Zou, Tao Wei, Ye Zhang. // 2007. APSAR 2007. 1st Asian and Pacific Conference on Synthetic Aperture Radar. - Huangshan, 5-9 Nov. 2007. - P. 453-456.

C1541. Cooper K.B. Submillimeter-wave active radar imager. / Cooper K.B., Dengler R.J., Chattopadhyay G., Schlecht E., Gill J., Skalare A., Mehdi I., Siegel P.H. // 2007 and the 2007 15th International Conference on Terahertz Electronics. IRMMW-THz. Joint 32nd International Conference on Infrared and Millimeter Waves. - Cardiff, 2-9 Sept. 2007. - P. 922-923.

C1542. Bilik I. Wavefront Adaptive Sensing for Radar Spread Clutter Mitigation. / Bilik I., Kazanci O., Krolik J. // 2007. CAMPSAP 2007. 2nd IEEE International Workshop on Computational Advances in Multi-Sensor Adaptive Processing. - St. Thomas, VI, 12-14 Dec. 2007. - P. 185-188.

C1543. Hoehmann L. Laser range finder based obstacle tracking by means of a two-dimensional Kalman filter. / Hoehmann L., Kummert A. // 2007 International Workshop on Multidimensional (nD) Systems. - Aveiro, 27-29 June 2007. - P. 9-14.

C1544. Shi Xiang. Target's radiation cross section modeling and analysis for passive millimeter wave detection. / Shi Xiang, Lou Guo-Wei, Li Xing-Guo. // 2007 and the 2007 15th International Conference on Terahertz Electronics. IRMMW-THz. Joint 32nd International Conference on Infrared and Millimeter Waves. - Cardiff, 2-9 Sept. 2007. - P. 825-826.

C1545. Lanying Cao. An unsupervised target detection algorithm in SAR images. 2007. APSAR 2007. 1st Asian and Pacific Conference on Synthetic Aperture Radar. - Huangshan, 5-9 Nov. 2007. - P. 529-532.

C1546. Dong Yin. Multi-scale feature analysis method for bridge recognition in SAR images. / Dong Yin, Yuqing Miao, Guiqin Li, Bin Cheng. // 2007. APSAR 2007. 1st Asian and Pacific Conference on Synthetic Aperture Radar. - Huangshan, 5-9 Nov. 2007. - P. 517-520.

C1547. Li Yu. Sequential discrimination with multi-features to remove false ROIs in SAR ATR. / Li Yu, Ji Kefeng, Wu Yonghui, Su Yi. // 2007. APSAR 2007. 1st Asian and Pacific Conference on Synthetic Aperture Radar. - Huangshan, 5-9 Nov. 2007. - P. 465-468.

C1548. Shi Hongyin. An algorithm of SAR GMTI in the presence of blanketing jamming. 2007. APSAR 2007. 1st Asian and Pacific Conference on Synthetic Aperture Radar. - Huangshan, 5-9 Nov. 2007. - P. 559-562.

C1549. Jahangir M. Extracting information from shadows in SAR imagery. / Jahangir M., Blacknell D., Moate C.P., Hill R.D. // 2007. ICMV 2007. International Conference on Machine Vision. - Islamabad, 28-29 Dec. 2007. - P. 107-112.

C1550. Schaum A. Adapting to Change: The CFAR Problem in Advanced Hyperspectral Detection. 2007. AIPR 2007. 36th IEEE Applied Imagery Pattern Recognition Workshop. - Washington, DC, 10-12 Oct. 2007. - P. 15-21.

C1551. Cai-sheng Zhang. An experimental independent bistatic radar system for wideband application. / Cai-sheng Zhang, Jia-hui Ding. // 2007. APSAR 2007. 1st Asian and Pacific Conference on Synthetic Aperture Radar. - Huangshan, 5-9 Nov. 2007. - P. 630-633.

C1552. Luzhou Xu. Parameter Estimation and Number Detection of MIMO Radar Targets. / Luzhou Xu, Stoica P., Jian Li. // 2007. ACSSC 2007. Conference Record of the Forty-First Asilomar Conference on Signals, Systems and Computers. - Pacific Grove, CA, 4-7 Nov. 2007. - P. 177-181.

C1553. Lawrence Marple S. Multi-Channel Fast Parametric Algorithms and Performance for Adaptive Radar. / Lawrence Marple S., Corbell P.M., Rangaswamy M. // 2007. ACSSC 2007. Conference Record of the Forty-First Asilomar Conference on Signals, Systems and Computers. - Pacific Grove, CA, 4-7 Nov. 2007. - P. 1835-1838.

C1554. Wicks M.C. RF Tomography with Application to Ground Penetrating Radar. 2007. ACSSC 2007. Conference Record of the Forty-First Asilomar Conference on Signals, Systems and Computers. - Pacific Grove,

CA, 4-7 Nov. 2007. - P. 2017-2022.

C1555. Pados D.A. Auxiliary-Vector RADAR on MCARM Data. / Pados D.A., Karystinos G.N., Batalama S.N., Matyjas J.D. // 2007. ACSSC 2007. Conference Record of the Forty-First Asilomar Conference on Signals, Systems and Computers. - Pacific Grove, CA, 4-7 Nov. 2007. - P. 2028-2032.

C1556. Xumin Zhu. Knowledge-Aided Space-Time Adaptive Processing. / Xumin Zhu, Jian Li, Stoica P., Guerci J.R. // 2007. ACSSC 2007. Conference Record of the Forty-First Asilomar Conference on Signals, Systems and Computers. - Pacific Grove, CA, 4-7 Nov. 2007. - P. 1830-1834.

C1557. Davis M.S. Statistical Modeling and ML Parameter Estimation of Complex SAR Imagery. / Davis M.S., Bidigare P., Chang D. // 2007. ACSSC 2007. Conference Record of the Forty-First Asilomar Conference on Signals, Systems and Computers. - Pacific Grove, CA, 4-7 Nov. 2007. - P. 500-502.

C1558. Wilcox D. A Comparison of MIMO and Phased Array Radar with the Application of Music. / Wilcox D., Sellathurai M., Ratnarajah T. // 2007. ACSSC 2007. Conference Record of the Forty-First Asilomar Conference on Signals, Systems and Computers. - Pacific Grove, CA, 4-7 Nov. 2007. - P. 1529-1533.

C1559. Yimin Zhang. A Novel Approach for Multiple Moving Target Localization Using Dual-Frequency Radars and Time-Frequency Distributions. / Yimin Zhang, Amin M., Ahmad F. // 2007. ACSSC 2007. Conference Record of the Forty-First Asilomar Conference on Signals, Systems and Computers. - Pacific Grove, CA, 4-7 Nov. 2007. - P. 1817-1821.

C1560. Barbaresco F. Radar resources optimization by adaptive serch domains priority assignment based on most threatening trajectories computation. 2007 10th International Conference on Information Fusion. - Quebec, Que., 9-12 July 2007. - P. 1-8.

C1561. Musicki D. Track management and PMHT. / Musicki D., Xuezhi Wang. // 2007 10th International Conference on Information Fusion. - Quebec, Que., 9-12 July 2007. - P. 1-5.

C1562. Danu D. Fusion of over-the-horizon radar and automatic identification systems for overall maritime picture. / Danu D., Sinha A., Kirubarajan T., Farooq M., Brookes D. // 2007 10th International Conference on Information Fusion. - Quebec, Que., 9-12 July 2007. - P. 1-8.

C1563. Willett P. Quickest detection of statistical changes with application to tracking. 2007 10th International Conference on Information Fusion. - Quebec, Que., 9-12 July 2007. - P. 1.

C1564. Tian Jin. Subaperture wiener filter construction for time-varying RFI suppression in UWB SAR. / Tian Jin, Zhimin Zhou, Qian Song. // 2007. APSAR 2007. 1st Asian and Pacific Conference on Synthetic Aperture Radar. - Huangshan, 5-9 Nov. 2007. - P. 71-75.

C1565. Fan Yang. The scheme and key components design of W-band coherent doppler velocity radar front-end. / Fan Yang, Xiao-Hong Tang, Tao Wu. // 2007. ASICON '07. 7th International Conference on ASIC. - Guilin, 22-25 Oct. 2007. - P. 356-359.

C1566. Chen Li. Data association for target tracking by several passive sensors. / Chen Li, Yuzhu Su, Hong Wang, Chongzhao Han, Xiaoning Du. // 2007. ISIC. IEEE International Conference on Systems, Man and Cybernetics. - Montreal, Que., 7-10 Oct. 2007. - P. 3214-3219.

C1567. Ulmke M. Gaussian mixture cardinalized PHD filter for ground moving target tracking. / Ulmke M., Erdinc O., Willett P. // 2007 10th International Conference on Information Fusion. - Quebec, Que., 9-12 July 2007. - P. 1-8.

C1568. de Villers Y. A fusion study of the FAVS sensors suite. 2007 10th International Conference on Information Fusion. - Quebec, Que., 9-12 July 2007. - P. 1-6.

C1569. Carthel C. Multisensor tracking and fusion for maritime surveillance. / Carthel C., Coraluppi S., Grignan P. // 2007 10th International Conference on Information Fusion. - Quebec, Que., 9-12 July 2007. - P. 1-6.

C1570. Ramdaras U. Sensor selection: the modified riccati equation approach compared with other selection schemes. / Ramdaras U., Absil F. // 2007 10th International Conference on Information Fusion. - Quebec, Que., 9-12 July 2007. - P. 1-6.

C1571. Ray P. A novel framework for the network-wide distributed detection problem. / Ray P., Varshney P.K., Ruixin Niu. // 2007 10th International Conference on Information Fusion. - Quebec, Que., 9-12 July 2007. - P. 1-8.

C1572. Takruri M. Drift aware wireless sensor networks. / Takruri M., Challa S. // 2007 10th International Conference on Information Fusion. - Quebec, Que., 9-12 July 2007. - P. 1-7.

C1573. Hanselmann T. Multiple target tracking with asynchronous bearings-only-measurements. / Hanselmann T., Morelande M. // 2007 10th International Conference on Information Fusion. - Quebec, Que., 9-12 July 2007. - P. 1-8.

C1574. Duflos E. Time allocation of a set of radars in a multitarget environment. / Duflos E., de Vilmorin M., Vanheeghe P. // 2007 10th International Conference on Information Fusion. - Quebec, Que., 9-12 July 2007. - P. 1-8.

C1575. Yu Jing. An effective SAR-GMTI technique based on eigen-decomposition of the covariance matrix. / Yu Jing, Liao Guisheng. // 2007. APSAR 2007. 1st Asian and Pacific Conference on Synthetic Aperture Radar. - Huangshan, 5-9 Nov. 2007. - P. 302-305.

C1576. Ting Shu. Moving target detection in airborne SAR by a combined wigner-STFT transform. / Ting Shu, Xingzhao Liu. // 2007. APSAR 2007. 1st Asian and Pacific Conference on Synthetic Aperture Radar. - Huangshan, 5-9 Nov. 2007. - P. 298-301.

C1577. Jia Xu. Moving target location of VSAR based on maximum likelihood method. / Jia Xu, Gang Li, Ying-Ning Peng, Xiang-Gen Xia, Yong-liang Wang. // 2007. APSAR 2007. 1st Asian and Pacific Conference on Synthetic Aperture Radar. - Huangshan, 5-9 Nov. 2007. - P. 293-297.

C1578. Qiu Chaoyang. Ground slow-moving target adaptive processing for Airborne Radar. / Qiu Chaoyang, Hao Zhimei. // 2007. APSAR 2007. 1st Asian and Pacific Conference on Synthetic Aperture Radar. - Huangshan, 5-9 Nov. 2007. - P. 310-313.

C1579. Ying Luo. Motion compensation for SISAR based on contrast maximization. / Ying Luo, Dong-liang Hu, Bin-feng Luo, Qun Zhang. // 2007. APSAR 2007. 1st Asian and Pacific Conference on Synthetic Aperture Radar. - Huangshan, 5-9 Nov. 2007. - P. 431-434.

C1580. Guolong Cui. A new wall compensation algorithm for through-the-wall radar imaging. / Guolong Cui, Lingjiang Kong, Jianyu Yang, Xiaochun Wang. // 2007. APSAR 2007. 1st Asian and Pacific Conference on Synthetic Aperture Radar. - Huangshan, 5-9 Nov. 2007. - P. 393-396.

C1581. Yan Zhang. An airborne GMTI radar simulator based on space-time adaptive processing. / Yan Zhang, Yunhua Zhang, Xiangkun Zhang. // 2007. APSAR 2007. 1st Asian and Pacific Conference on Synthetic Aperture Radar. - Huangshan, 5-9 Nov. 2007. - P. 314-317.

C1582. Xu Wei. SAR detection of moving targets based on matched fourier transform. / Xu Wei, Wang Shengli. // 2007. APSAR 2007. 1st Asian and Pacific Conference on Synthetic Aperture Radar. - Huangshan, 5-9 Nov. 2007. - P. 289-292.

C1583. Xinzheng Zhang. Data fusion of multiple polarimetric SAR images based on combined curvelet and wavelet transform. / Xinzheng Zhang, Peikang Huang, Ping Zhou. // 2007. APSAR 2007. 1st Asian and Pacific Conference on Synthetic Aperture Radar. - Huangshan, 5-9 Nov. 2007. - P. 225-228.

C1584. Liu Zhong-xun. Optimal polarimetric interferometry coherence analysis in detection and location of moving target with SAR. / Liu Zhong-xun, Dai Da-hai, Li Dun, Wang Xue-song, Xiao Shun-ping. // 2007. APSAR 2007. 1st Asian and Pacific Conference on Synthetic Aperture Radar. - Huangshan, 5-9 Nov. 2007. - P. 164-169.

C1585. Zhang Xu-jin. Channels equalizing and calibration technology of moving target detection for multi-phase centers receive system. / Zhang Xu-jin, Zhang Chang-yao, Deng Hai-tao. // 2007. APSAR 2007. 1st Asian and Pacific Conference on Synthetic Aperture Radar. - Huangshan, 5-9 Nov. 2007. - P. 154-158.

C1586. Zhou Hong. Single-channel UWB SAR ground moving targets detection method using change detection based on single-pass sub-aperture images. / Zhou Hong, Huang Xiaotao, Chang Yulin, Zhou Zhimin. //

2007. APSAR 2007. 1st Asian and Pacific Conference on Synthetic Aperture Radar. - Huangshan, 5-9 Nov. 2007. - P. 266-270.

C1587. Lifeng Zhang. A novel approach to three-channel SAR-GMTI channel equalization and moving target detection and location based on real data. / Lifeng Zhang, Tong Wang, Mengdao Xing, Zheng Bao. // 2007. APSAR 2007. 1st Asian and Pacific Conference on Synthetic Aperture Radar. - Huangshan, 5-9 Nov. 2007. - P. 284-288.

C1588. Shi Gong-tao. A novel ground moving target detector in dual-channel SAR images based on the covariance matrix. / Shi Gong-tao, Gao Gui, Kuang gang-yao. // 2007. APSAR 2007. 1st Asian and Pacific Conference on Synthetic Aperture Radar. - Huangshan, 5-9 Nov. 2007. - P. 279-283.

C1589. Zhou Wei. Change detection of concealed targets using repeat-pass SAR images. / Zhou Wei, Guan Jian, Wang Jie. // 2007. APSAR 2007. 1st Asian and Pacific Conference on Synthetic Aperture Radar. - Huangshan, 5-9 Nov. 2007. - P. 275-278.

C1590. Sirui Tian. A wavelet based targets detection method for high resolution airborne SAR data. / Sirui Tian, Chao Wang, Hong Zhang, Bo Zhang, Fan Wu. // 2007. IGARSS 2007. IEEE International Geoscience and Remote Sensing Symposium. - Barcelona, 23-28 July 2007. - P. 2071-2073.

C1591. Poncos V. Point target interferometry for natural and artificial scatterers. / Poncos V., Mei S., Singhroy V. // 2007. IGARSS 2007. IEEE International Geoscience and Remote Sensing Symposium. - Barcelona, 23-28 July 2007. - P. 2106-2109.

C1592. Fois F. Comparison between MARSIS & SHARAD results. / Fois F., Mecozzi R., Iorio M., Calabrese D., Bombaci O., Catallo C., Croce A., Croci R., Guelfi M., Zampolini E., Ravasi D., Molteni M., Ruggeri P., Ranieri A., Ottavianelli M., Flamini E., Picardi G., Seu R., Biccari D., Orosei R., Cartacci M., Cicchetti A., Masdea A., Giacomoni E., Cutigni M., Provenziani M., Fuga O., Alberti G., Mattei S., Papa C., Marras P., Tattarletti B., Vicari D., Bonaventura F., Paterno T., Di Placido A., Morlupi A. // 2007. IGARSS 2007. IEEE International Geoscience and Remote Sensing Symposium. - Barcelona, 23-28 July 2007. - P. 2134-2139.

C1593. Haiyan Li. Ship detection with the fuzzy c-mean clustering algorithm using fully polarimetric SAR. / Haiyan Li, Yijun He, Hui Shen. // 2007. IGARSS 2007. IEEE International Geoscience and Remote Sensing Symposium. - Barcelona, 23-28 July 2007. - P. 1151-1154.

C1594. Morgenthaler A. Semi-Analytic Mode Matching (SAMM) algorithm for efficient computation of nearfield scattering in lossy ground from borehole sources. / Morgenthaler A., He Zhan, Rappaport C. // 2007. IGARSS 2007. IEEE International Geoscience and Remote Sensing Symposium. - Barcelona, 23-28 July 2007. - P. 754-757.

C1595. Zhang Yafei. Distributed target detection in SAR images using improved chaos-based method. / Zhang Yafei, Zhu Minhui, Chong Jinsong. // 2007. IGARSS 2007. IEEE International Geoscience and Remote Sensing Symposium. - Barcelona, 23-28 July 2007. - P. 929-932.

C1596. Cantalloube H. POLINSAR for FOPEN using flashlight mode images along circular trajectories. / Cantalloube H., Colin E.K. // 2007. IGARSS 2007. IEEE International Geoscience and Remote Sensing Symposium. - Barcelona, 23-28 July 2007. - P. 1139-1142.

C1597. Ince T. Preliminary quantitative analysis of S-band FNCW radar data from atmospheric observation. 2007. IGARSS 2007. IEEE International Geoscience and Remote Sensing Symposium. - Barcelona, 23-28 July 2007. - P. 2280-2283.

C1598. Crisp D.J. Polarimetric analysis of maritime SAR data collected with the DSTO ingara X-Band radar. / Crisp D.J., Stacy N.J.S., Hudson D.A., Pincus P.B., Goh A.S. // 2007. IGARSS 2007. IEEE International Geoscience and Remote Sensing Symposium. - Barcelona, 23-28 July 2007. - P. 3870-3873.

C1599. Suchandt S. First results of ground moving target analysis in TerraSAR-X data. / Suchandt S., Runge H., Eineder M., Breit H., Kotenkov A., Balss U. // 2007. IGARSS 2007. IEEE International Geoscience and Remote Sensing Symposium. - Barcelona, 23-28 July 2007. - P. 3943.

C1600. Redadaa S. Focusing problems of subsurface imaging by a low-frequency SAR. / Redadaa S., Le Caillec J.-M., Solaiman B., Benslama M. // 2007. IGARSS 2007. IEEE International Geoscience and Remote

Sensing Symposium. - Barcelona, 23-28 July 2007. - P. 4101-4104.

C1601. Dupuis X. Very high resolution interferogram acquisition campaign and processing. / Dupuis X., Angelliaume S., Oriot H., Dubois-Fernandez P., Cantalloube H., Coulombeix C., du Plessis O., Fromage P., Bonin G., Heuze D. // 2007. IGARSS 2007. IEEE International Geoscience and Remote Sensing Symposium. - Barcelona, 23-28 July 2007. - P. 3866-3869.

C1602. Songxin Tan. Detection of foliage-obscured vehicle using a multiwavelength polarimetric lidar. / Songxin Tan, Stoker J., Greenlee S. // 2007. IGARSS 2007. IEEE International Geoscience and Remote Sensing Symposium. - Barcelona, 23-28 July 2007. - P. 2503-2506.

C1603. Nonaka T. A comparison of the methods for the urban land cover change detection by high-resolution SAR data. / Nonaka T., Shibayama T., Umakawa H., Uratsuka S. // 2007. IGARSS 2007. IEEE International Geoscience and Remote Sensing Symposium. - Barcelona, 23-28 July 2007. - P. 3470-3473.

C1604. Cerutti-Maori D. Wide area traffic monitoring with the PAMIR system. / Cerutti-Maori D., Klare J., Burger W., Brenner A.R., Ender J.H.G. // 2007. IGARSS 2007. IEEE International Geoscience and Remote Sensing Symposium. - Barcelona, 23-28 July 2007. - P. 3567-3570.

C1605. Nakasako N. On distance measurement using band-limited noise. / Nakasako N., Uebo T., Ohmata N., Mori A. // 2007 Annual Conference SICE. - Takamatsu, 17-20 Sept. 2007. - P. 151-156.

C1606. Won-Yong Choi. Modeling of local search for track updates in phased array radar tracking. / Won-Yong Choi, Sun-Mog Hong, Seung-Min Song. // 2007 Annual Conference SICE. - Takamatsu, 17-20 Sept. 2007. - P. 2540-2545.

C1607. Xiu-Qin Pan. A kind of trading off algorithm of object classification based on intelligent data fusion. / Xiu-Qin Pan, Yong Lu, Yue Zhao, Yong-Cun Cao, Yuan Shun. // 2007. ICWAPR '07. International Conference on Wavelet Analysis and Pattern Recognition. - Beijing, 2-4 Nov. 2007. - Vol. 3. - P. 990-993.

C1608. Haijian Zhang. Automatic extraction of power transmission tower series from PolSAR imagery based on MRF model. / Haijian Zhang, Wen Yang, Tongyuan Zhou, Hong Sun. // 2007. APSAR 2007. 1st Asian and Pacific Conference on Synthetic Aperture Radar. - Huangshan, 5-9 Nov. 2007. - P. 788-792.

C1609. Tang Shiyue. The detection of multi moving targets for the airborne SAR. / Tang Shiyue, Gao Xincheng. // 2007. APSAR 2007. 1st Asian and Pacific Conference on Synthetic Aperture Radar. - Huangshan, 5-9 Nov. 2007. - P. 691-694.

C1610. Zhang Hui. A SAR image registration algorithm based on target detection. / Zhang Hui, Wang Jianguo. // 2007. APSAR 2007. 1st Asian and Pacific Conference on Synthetic Aperture Radar. - Huangshan, 5-9 Nov. 2007. - P. 695-698.

C1611. Zhang Yanfei. Adaptive CFAR detection of range-spread targets based on SAR raw data. / Zhang Yanfei, Guan Jian, Li Xiuyou, Huang Yong. // 2007. APSAR 2007. 1st Asian and Pacific Conference on Synthetic Aperture Radar. - Huangshan, 5-9 Nov. 2007. - P. 699-703.

C1612. Kovalenko V. Polarimetric feature fusion in GPR for landmine detection. / Kovalenko V., Yarovoy A., Ligthart L.P. // 2007. IGARSS 2007. IEEE International Geoscience and Remote Sensing Symposium. - Barcelona, 23-28 July 2007. - P. 30-33.

C1613. Aboutanios E. Evaluation of the single and two data set STAP detection algorithms using measured data. / Aboutanios E., Mulgrew B. // 2007. IGARSS 2007. IEEE International Geoscience and Remote Sensing Symposium. - Barcelona, 23-28 July 2007. - P. 494-498.

C1614. Hwee Siang Tan. ISAR imaging of targets with moving parts using micro-doppler detection on the range profile image. / Hwee Siang Tan, Changzheng Ma, Tat Soon Yeo, Qun Zhang, Chun Sum Ng, Bin Zou. // 2007. IGARSS 2007. IEEE International Geoscience and Remote Sensing Symposium. - Barcelona, 23-28 July 2007. - P. 499-502.

C1615. Xu Feng. Region feature extraction based on improved regularization method in SAR image. / Xu Feng, Wang Chao, Zhang Hong. // 2007. IGARSS 2007. IEEE International Geoscience and Remote Sensing Symposium. - Barcelona, 23-28 July 2007. - P. 571-573.

C1616. Uschkerat U. Application of 3D-SAR nearfield imaging algorithms to GPR data. 2007. IGARSS 2007. IEEE International Geoscience and Remote Sensing Symposium. - Barcelona, 23-28 July 2007. - P. 452-455.

C1617. Ender J.H.G. Space-based moving target positioning using radar with a switched aperture antenna. / Ender J.H.G., Gierull C.H., Cerutti-Maori D. // 2007. IGARSS 2007. IEEE International Geoscience and Remote Sensing Symposium. - Barcelona, 23-28 July 2007. - P. 101-106.

C1618. Fois F. Performance results of the SHARAD instrument. / Fois F., Croci R., Seu R., Picardi G., Flamini E. // 2007. IGARSS 2007. IEEE International Geoscience and Remote Sensing Symposium. - Barcelona, 23-28 July 2007. - P. 119-124.

C1619. Martorella M. Polarimetric phase gradient autofocus. / Martorella M., Preiss M., Haywood B., Bates B. // 2007. IGARSS 2007. IEEE International Geoscience and Remote Sensing Symposium. - Barcelona, 23-28 July 2007. - P. 133-136.

C1620. Rudy P.T. Developing High Brightness Semiconductor Lasers for Homeland Security and Defense Applications. / Rudy P.T., Osowski M.L., Lammert R.M., Oh S.W., Ocochlain C., Panja C., Stakelon T., Ungar J.E. // 2007. CLEO 2007. Conference on Lasers and Electro-Optics. - Baltimore, MD, 6-11 May 2007. - P. 1-2.

C1621. {no data available}. Copyright. 2007. RADAR 2007. The Institution of Engineering and Technology International Conference on Radar Systems. - Edinburgh, 15-18 Oct. 2007. - P. i-ii.

C1622. Zheng Yahong Rosa. A normalized Fractionally lower-order moment algorithm for Space-Time Adaptive Processing. / Zheng Yahong Rosa, Chen Genshe, Blasch Erik. // 2007. MILCOM 2007. IEEE Military Communications Conference. - Orlando, FL, USA, 29-31 Oct. 2007. - P. 1-6.

C1623. Wiegert R. Demonstration of a Novel Man-Portable Magnetic STAR Technology for Real Time Localization of Unexploded Ordnance. / Wiegert R., Oeschger J., Tuovila E. // OCEANS 2007. - Vancouver, BC, Sept. 29 2007-Oct. 4 2007. - P. 1-7.

C1624. Huilin Zhou. Wrapper approach for feature subset selection using GA. / Huilin Zhou, Jianbin Wu, Yuhao Wang, Mao Tian. // 2007. ISPACS 2007. International Symposium on Intelligent Signal Processing and Communication Systems. - Xiamen, Nov. 28 2007-Dec. 1 2007. - P. 188-191.

C1625. Fang Qianxue. The arm detection based on Rao test method. / Fang Qianxue, Wang Yongliang, Wang Shouyong. // 2007. ISPACS 2007. International Symposium on Intelligent Signal Processing and Communication Systems. - Xiamen, Nov. 28 2007-Dec. 1 2007. - P. 842-845.

C1626. Hu Wuming. Airborne SAR passive radar imaging algorithm based on external illuminator. / Hu Wuming, Wang Jun. // 2007. APSAR 2007. 1st Asian and Pacific Conference on Synthetic Aperture Radar. - Huangshan, 5-9 Nov. 2007. - P. 642-645.

C1627. Ly Hung D. Collaborative Multi-Target Detection in Radar Sensor Networks. / Ly Hung D., Liang Qilian. // 2007. MILCOM 2007. IEEE Military Communications Conference. - Orlando, FL, USA, 29-31 Oct. 2007. - P. 1-7.

C1628. Cheeseman B. Comparison of Shape Imaging between Pulse Integration, Correlation and Adaptive Filter. / Cheeseman B., Huang Y. // 2007. EuCAP 2007. The Second European Conference on Antennas and Propagation. - Edinburgh, 11-16 Nov. 2007. - P. 1-6.

C1629. Mikhnev V.A. A Clutter Reduction Technique for Microwave Reconstruction of Shallow Underground Targets. / Mikhnev V.A., Vainikainen P. // 2007. EuCAP 2007. The Second European Conference on Antennas and Propagation. - Edinburgh, 11-16 Nov. 2007. - P. 1-4.

C1630. Meng Yao. Target of Imaging Observation Based on The Wavelet Transform and GPR. / Meng Yao, Huabin Wang, Cui Wang. // 2007. IECON 2007. 33rd Annual Conference of the IEEE Industrial Electronics Society. - Taipei, 5-8 Nov. 2007. - P. 2470-2473.

C1631. Soliman M. Design, Simulation and Implementation of UWB Antenna Array and it's Application in GPR Systems. / Soliman M., Wu Z. // 2007. EuCAP 2007. The Second European Conference on Antennas and Propagation. - Edinburgh, 11-16 Nov. 2007. - P. 1-5.

C1632. Kim Yeejung. Detection Probability of WCDMA Based Cellular Radar System. / Kim Yeejung, Kim Seungmo, Han Youngnam, Bae Kyung Bin, Jeong Myung Deuk. // 2007. MILCOM 2007. IEEE Military Communications Conference. - Orlando, FL, USA, 29-31 Oct. 2007. - P. 1-5.

C1633. Xun Dai. Vehicle centroid estimation based on radar multiple detections. / Xun Dai, Kummert A., Su Birm Park, Iurgel U. // 2007. ICVES. IEEE International Conference on Vehicular Electronics and Safety. - Beijing, 13-15 Dec. 2007. - P. 1-5.

C1634. Pierucci L. Improvements of radar clutter classification in air traffic control environment. / Pierucci L., Bocchi L. // 2007 IEEE International Symposium on Signal Processing and Information Technology. - Giza, 15-18 Dec. 2007. - P. 721-724.

C1635. Vasile G. Coherent-stable scatterers detection in SAR multi-interferograms: Feature fuzzy fusion in Alpine glacier geophysical context. / Vasile G., Trouve E., Valet L., Nicolas J.-M., Bombrun L., Gay M., Petillot I., Bolon P., Buzuloiu V. // 2007. IGARSS 2007. IEEE International Geoscience and Remote Sensing Symposium. - Barcelona, 23-28 July 2007. - P. 4862-4865.

C1636. Gonzalez-Huici M.A. Numerical simulation of electromagnetic-wave propagation for land mine detection using GPR. / Gonzalez-Huici M.A., Uschkerat U., Hoerdt A. // 2007. IGARSS 2007. IEEE International Geoscience and Remote Sensing Symposium. - Barcelona, 23-28 July 2007. - P. 4957-4960.

C1637. Mengmeng Zhu. An improved time-frequency phase adjustment technique for ISAR. / Mengmeng Zhu, Junfeng Wang, Xingzhao Liu. // 2007. IGARSS 2007. IEEE International Geoscience and Remote Sensing Symposium. - Barcelona, 23-28 July 2007. - P. 5170-5173.

C1638. Weihing D. Detecting moving targets in dual-channel high resolution spaceborne SAR images with a compound detection scheme. / Weihing D., Hinz S., Meyer F., Suchandt S., Bamler R. // 2007. IGARSS 2007. IEEE International Geoscience and Remote Sensing Symposium. - Barcelona, 23-28 July 2007. - P. 4818-4821.

C1639. Villard L. Bistatic foliage penetration modelling. / Villard L., Borderies P. // 2007. IGARSS 2007. IEEE International Geoscience and Remote Sensing Symposium. - Barcelona, 23-28 July 2007. - P. 4109-4112.

C1640. Zheng-Shu Zhou. Development of a baseband signal ATI-SAR simulator for ground moving target indication. / Zheng-Shu Zhou, Bates B.D., Yunhan Dong. // 2007. IGARSS 2007. IEEE International Geoscience and Remote Sensing Symposium. - Barcelona, 23-28 July 2007. - P. 4505-4508.

C1641. Lidicky L. A new method for moving target indication and detection in multi-channel SAR data. 2007. IGARSS 2007. IEEE International Geoscience and Remote Sensing Symposium. - Barcelona, 23-28 July 2007. - P. 4802-4805.

C1642. Kazansky O.V. Radiation, scattering and receiving of pulse signals for subsurface object identification. 2007 6th International Conference on Antenna Theory and Techniques. - Sevastopol, 17-21 Sept. 2007. - P. 363-364.

C1643. Chen lei. A time-domain beamformer for UWB through-wall imaging. / Chen lei, Shan ouyang. // TENCON 2007-2007 IEEE Region 10 Conference. - Taipei, Oct. 30 2007-Nov. 2 2007. - P. 1-4.

C1644. Rudy P.T. Developing high brightness semiconductor lasers for homeland security and defense applications. / Rudy P.T., Osowski M.L., Lammert R.M., Oh S.W., Ocochlain C, Panja C., Stakelon T., Ungar J.E. // 2007. QELS '07 Quantum Electronics and Laser Science Conference. - Baltimore, MD, USA, 6-11 May 2007. - P. 1-2.

C1645. Lellouch G. On the Capability of a Radar Network to Support Communications. / Lellouch G., Nikookar H. // 2007 14th IEEE Symposium on Communications and Vehicular Technology in the Benelux. - Delft, 15-15 Nov. 2007. - P. 1-5.

C1646. Dend-Jyi Juang. Extended neural network solution of radar tracking problems. / Dend-Jyi Juang, Kuo-Chang Hu, Mang-Liang Lee, Chih-Yung Wang, Yi-Nung Chung. // TENCON 2007-2007 IEEE Region 10 Conference. - Taipei, Oct. 30 2007-Nov. 2 2007. - P. 1-4.

C1647. Manikandan M.S. Wavelet-Based ECG and PCG Signals Compression Technique for Mobile

Telemedicine. / Manikandan M.S., Dandapat S. // 2007. ADCOM 2007. International Conference on Advanced Computing and Communications. - Guwahati, Assam, 18-21 Dec. 2007. - P. 164-169.

C1648. Manikandan J. Evaluation of Edge Detection Techniques towards Implementation of Automatic Target Recognition. / Manikandan J., Venkataramani B., Jayachandran M. // 2007. International Conference on Conference on Computational Intelligence and Multimedia Applications. - Sivakasi, Tamil Nadu, 13-15 Dec. 2007. - Vol. 2. - P. 441-445.

C1649. Hou Yuguan. Reconstruction of Super-resolution Spectra for the Beamformed Data in HF Skywave Radar. / Hou Yuguan, Shen Yiying, Liu Yongtan. // 2007. ICICIC '07. Second International Conference on Innovative Computing, Information and Control. - Kumamoto, 5-7 Sept. 2007. - P. 500.

C1650. Panzhi Liu. Adaptive censored cell-averaging CFAR detection in distributed sensor networks. / Panzhi Liu, Chongzhao Han, Ming Lei, Zengguo Sun. // 2007 10th International Conference on Information Fusion. - Quebec, Que., 9-12 July 2007. - P. 1-8.

C1651. Fan Yang. The Scheme and Key Components Design of W-band Coherent Doppler Velocity Radar Front-end. / Fan Yang, Xiao-Hong Tang, Tao Wu. // 2007 International Symposium on Microwave, Antenna, Propagation and EMC Technologies for Wireless Communications. - Hangzhou, 16-17 Aug. 2007. - P. 467-470.

C1652. Chen Jiong. Super-Resolution of Polarimetric SAR Images for Ship Detection. / Chen Jiong, Yang Jian. // 2007 International Symposium on Microwave, Antenna, Propagation and EMC Technologies for Wireless Communications. - Hangzhou, 16-17 Aug. 2007. - P. 1499-1502.

C1653. Jung-Hong Cho. Optimal Acoustic Search Path Planning Based on Genetic Algorithm in Continuous Path System. / Jung-Hong Cho, Jea Soo Kim, Jun-Seok Lim, Seongil Kim, Young-Sun Kim. // OCEANS 2006-Asia Pacific. - Singapore, 16-19 May 2007. - P. 1-5.

C1654. Pramudita A.A. Footprint Adjustment On SFCW-GPR With Modified Dipole Array. / Pramudita A.A., Kurniavvan A., Suksmono A.B., Lestari A.A. // 2007 International Symposium on Microwave, Antenna, Propagation and EMC Technologies for Wireless Communications. - Hangzhou, 16-17 Aug. 2007. - P. 639-643.

C1655. Song Lizhong. Target Detection Method of the LFM Radar Signal with Multiple Polarization Agility. / Song Lizhong, Wu Qun, Mu Yinan. // 2007 International Symposium on Microwave, Antenna, Propagation and EMC Technologies for Wireless Communications. - Hangzhou, 16-17 Aug. 2007. - P. 1186-1190.

C1656. Jas A. The Region-Exhaustive Fault Model. / Jas A., Natarajan S., Patil S. // 2007. ATS 07. 16th Asian Test Symposium. - Beijing, 8-11 Oct. 2007. - P. 13-18.

C1657. Baum C.E. Identification of Hidden Mines. 2007. ICEAA 2007. International Conference on Electromagnetics in Advanced Applications. - Torino, 17-21 Sept. 2007. - P. 692-695.

C1658. Hatano H. Automotive Ultrasonic Array Emitter for Short-range Targets Detection. / Hatano H., Yamazato T., Katayama M. // 2007. ISWCS 2007. 4th International Symposium on Wireless Communication Systems. - Trondheim, 17-19 Oct. 2007. - P. 355-359.

C1659. Nath B. A Geometrical Feature Based Sensor Fusion Model of GPR and IR for the Detection and Classification of Anti-Personnel Mines. / Nath B., Bhuiyan A. // 2007. ISDA 2007. Seventh International Conference on Intelligent Systems Design and Applications. - Rio de Janeiro, 20-24 Oct. 2007. - P. 849-856.

C1660. Iskander M.F. On the feasibility of using GPR technology for the UXO detection and discrimination in the volcanic soil of Hawaii. / Iskander M.F., Zhengqing Yun, Hyoung-sun Youn, Kim W., Celik N. // 2007 IEEE Antennas and Propagation Society International Symposium. - Honolulu, HI, 9-15 June 2007. - P. 4949-4952.

C1661. Jeongwoo Han. A multi-band UWB radar for sensing objects. / Jeongwoo Han, Cam Nguyen. // 2007 IEEE Antennas and Propagation Society International Symposium. - Honolulu, HI, 9-15 June 2007. - P. 4917-4920.

C1662. Wee Chang Khor. An Experimental and Theoretical Investigation into Capabilities of a UWB Microwave Imaging Radar System to Detect Breast Cancer. / Wee Chang Khor, Hua Wang, Bialkowski M.E., Abbosh A., Seman N. // 2007. The International Conference on " EUROCONComputer as a Tool". - Warsaw, 9-12 Sept.

2007. - P. 771-776.

C1663. Huaping Liu. Vehicle tracking using stochastic fusion-based particle filter. / Huaping Liu, Fuchun Sun, Liping Yu, Kezhong He. // 2007. IROS 2007. IEEE/RSJ International Conference on Intelligent Robots and Systems. - San Diego, CA, Oct. 29 2007-Nov. 2 2007. - P. 2735-2740.

C1664. Xiande Wang. Electromagnetic scattering from complex targets located in a four-layer medium model of a densely forested environment. / Xiande Wang, Werner D.H., Le-Wei Li, Yeow-Beng Gan. // 2007 IEEE Antennas and Propagation Society International Symposium. - Honolulu, HI, 9-15 June 2007. - P. 4829-4832.

C1665. Hoi-Shun Lui. Performance analysis on subsurface target depth detection using the E-Pulse Technique. / Hoi-Shun Lui, Shuley N.V. // 2007 IEEE Antennas and Propagation Society International Symposium. - Honolulu, HI, 9-15 June 2007. - P. 1781-1784.

C1666. Kidera S. A high-resolution imaging algorithm without derivatives based on waveform estimation for UWB pulse radars. / Kidera S., Sakamoto T., Sato T. // 2007 IEEE Antennas and Propagation Society International Symposium. - Honolulu, HI, 9-15 June 2007. - P. 1481-1484.

C1667. Yi Jiang. Polarization Sensitive time reversal SAR imaging in an environment filled with trees. / Yi Jiang, Jian-Gang Zhu, Stancil D.D., Chabalko M.J. // 2007 IEEE Antennas and Propagation Society International Symposium. - Honolulu, HI, 9-15 June 2007. - P. 4000-4003.

C1668. Wee Chang Khor. Investigations into an uwb microwave radar system for breast cancer detection. / Wee Chang Khor, Bialkowski M.E. // 2007 IEEE Antennas and Propagation Society International Symposium. - Honolulu, HI, 9-15 June 2007. - P. 2160-2163.

C1669. Giuli D. Ad hoc receive sensors aimed at enhancing multistatic radar operation for surveillance of limited critical areas. / Giuli D., Cuccoli F., Gentili G.B., Erricolo D. // 2007. ICEAA 2007. International Conference on Electromagnetics in Advanced Applications. - Torino, 17-21 Sept. 2007. - P. 476-479.

C1670. Kidder C.C. Design Considerations For An Atmospheric Imaging Radar. / Kidder C.C., Yeary M.B., Palmer R.D. // 2007 IEEE Region 5 Technical Conference. - Fayetteville, AR, 20-22 April 2007. - P. 97-101.

C1671. Ibarra C. Radar Polarimetry for Target Discrimination. / Ibarra C., Kegege O., Junfei Li, Foltz H. // 2007 IEEE Region 5 Technical Conference. - Fayetteville, AR, 20-22 April 2007. - P. 86-92.

C1672. Hirose A. UWB measurement, complex-amplitude texture, and Walled-LTSA array in plastic landmine visualization. / Hirose A., Masuyama S. // 2007. ICUWB 2007. IEEE International Conference on Ultra-Wideband. - Singapore, 24-26 Sept. 2007. - P. 46-49.

C1673. Koshelev V.I. Detection and recognition of radar objects at sounding by high-power ultrawideband pulses. 2007. ICUWB 2007. IEEE International Conference on Ultra-Wideband. - Singapore, 24-26 Sept. 2007. - P. 31-36.

C1674. Qadir S.G. Digital Implementation of Pulse Compression Technique for X-band Radar. / Qadir S.G., Kayani J.K., Malik S. // 2007. IBCAST 2007. International Bhurban Conference on Applied Sciences & Technology. - Islamabad, 8-11 Jan. 2007. - P. 35-39.

C1675. Yuan Quan. A Fuzzy Adaptive Fusion Algorithm for Radar/Infrared Based on Wavelet Analysis. / Yuan Quan, Dong Chaoyang, Wang Qing. // 2007. ICCA 2007. IEEE International Conference on Control and Automation. - Guangzhou, May 30 2007-June 1 2007. - P. 1344-1348.

C1676. Torres J. Radar Detection Through Wavelet Transform. / Torres J., Marcano A., Andina D. // 2007. ISIE 2007. IEEE International Symposium on Industrial Electronics. - Vigo, 4-7 June 2007. - P. 3420-3423.

C1677. Liu Hang. Research on Data Association in Three Passive Sensors Network. / Liu Hang, Dou Li-hua, Pan Feng, Dong Ling-xun. // 2007. ICCA 2007. IEEE International Conference on Control and Automation. - Guangzhou, May 30 2007-June 1 2007. - P. 3235-3238.

C1678. Yang Jim Peng. Application of neural network in Infrared-Radar Dual-mode Guidance System. / Yang Jim Peng, Zhu Xiao Ping. // 2007. ICCA 2007. IEEE International Conference on Control and Automation. - Guangzhou, May 30 2007-June 1 2007. - P. 1765-1768.

C1679. Goodman N.A. Closed-Loop Radar with Adaptively Matched Waveforms. 2007. ICEAA 2007. International Conference on Electromagnetics in Advanced Applications. - Torino, 17-21 Sept. 2007. - P. 468-471.

C1680. Greco M. Cross-Channel Interference in Multi-User Radar Systems. / Greco M., Gini F. // 2007. ICEAA 2007. International Conference on Electromagnetics in Advanced Applications. - Torino, 17-21 Sept. 2007. - P. 450-453.

C1681. Sarkar T.K. Applying the Fourier-Modified Mellin Transform (FMMT) to Doppler Distorted Waveforms. / Sarkar T.K., Yang J. // 2007. ICEAA 2007. International Conference on Electromagnetics in Advanced Applications. - Torino, 17-21 Sept. 2007. - P. 472-475.

C1682. Abdullah R.S.A.R. Target prediction in Forward Scattering Radar. / Abdullah R.S.A.R., Rasid M.F.A., Azis M.W., Khalafalla M. // 2007. APACE 2007. Asia-Pacific Conference on Applied Electromagnetics. - Melaka, 4-6 Dec. 2007. - P. 1-5.

C1683. Pramudita A.A. Footprint Adjustment On SFCW-GPR With Modified Dipole Array. / Pramudita A.A., Lestari A.A., Kurniawan A., Suksmono A.B. // 2007. ICUWB 2007. IEEE International Conference on Ultra-Wideband. - Singapore, 24-26 Sept. 2007. - P. 784-788.

C1684. Nezirovic A. Experimental Verification of Human Being Detection Dependency on Operational UWB Frequency Band. / Nezirovic A., Yarovoy A.G., Ligthart L.P. // 2007. ICUWB 2007. IEEE International Conference on Ultra-Wideband. - Singapore, 24-26 Sept. 2007. - P. 305-310.

C1685. Nezirovic A. Narrowband Interference Suppression in UWB Impulse Radar for Human Being Detection. / Nezirovic A., Damen I.J.P., Yarovoy A.G. // 2007. ICUWB 2007. IEEE International Conference on Ultra-Wideband. - Singapore, 24-26 Sept. 2007. - P. 56-61.

C1686. Hantscher S. A Wave Front Extraction Algorithm for High-Resolution Pulse Based Radar Systems. / Hantscher S., Etzlinger B., Reisenzahn A., Diskus C.G. // 2007. ICUWB 2007. IEEE International Conference on Ultra-Wideband. - Singapore, 24-26 Sept. 2007. - P. 590-595.

C1687. Ghahramani M. A Double Stage IPCP Detector for UWB Radars. / Ghahramani M., Mohseni R., Sheikhi A. // 2007. ICUWB 2007. IEEE International Conference on Ultra-Wideband. - Singapore, 24-26 Sept. 2007. - P. 345-348.

C1688. Yarovoy A. Ultra-wideband radars for high-resolution imaging and target classification. 2007. EuRAD 2007. European Radar Conference. - Munich, 10-12 Oct. 2007. - P. 1-4.

C1689. Alamdari M. An improved CFAR detector using wavelet shrinkage in multiple target environments. / Alamdari M., Modarres-Hashemi M. // 2007. ISSPA 2007. 9th International Symposium on Signal Processing and Its Applications. - Sharjah, 12-15 Feb. 2007. - P. 1-4.

C1690. Rasshofer R.H. Functional requirements of future automotive radar systems. 2007. EuRAD 2007. European Radar Conference. - Munich, 10-12 Oct. 2007. - P. 259-262.

C1691. Laroussi T. Adaptive ML-CFAR detection for correlated chi-square targets of all fluctuation models in correlated clutter and multiple target situations. / Laroussi T., Barkat M. // 2007. ISSPA 2007. 9th International Symposium on Signal Processing and Its Applications. - Sharjah, 12-15 Feb. 2007. - P. 1-4.

C1692. Setlur P. Urban target classifications using time-frequency micro-Doppler signatures. / Setlur P., Amin M., Ahmad F. // 2007. ISSPA 2007. 9th International Symposium on Signal Processing and Its Applications. - Sharjah, 12-15 Feb. 2007. - P. 1-4.

C1693. Doyuran U.C. Multi-range and multi-pulse radar detection in correlated non-Gaussian clutter. / Doyuran U.C., Tanik Y. // 2007. EuRAD 2007. European Radar Conference. - Munich, 10-12 Oct. 2007. - P. 190-193.

C1694. Farnoosh N. A hybrid MOMFD-FDTD ground penetrating radar modeling technique to detect multiple buried objects. / Farnoosh N., Shoory A., Moini R., Sadeghi S. // 2007. ISSPA 2007. 9th International Symposium on Signal Processing and Its Applications. - Sharjah, 12-15 Feb. 2007. - P. 1-4.

C1695. Almarshad M.N. A Monte Carlo simulation for two novel automatic censoring techniques of radar interfering targets in log-normal clutter. / Almarshad M.N., Barkat M., Alshebeili S.A. // 2007. ISSPA 2007. 9th International Symposium on Signal Processing and Its Applications. - Sharjah, 12-15 Feb. 2007. - P. 1-4.

C1696. Winkler V. Range Doppler detection for automotive FMCW radars. 2007. European Microwave Conference. - Munich, 9-12 Oct. 2007. - P. 1445-1448.

C1697. Shen Chiu. Performance analysis of RADARSAT-2 multi-channel MODEX modes. 2007. European Microwave Conference. - Munich, 9-12 Oct. 2007. - P. 1449-1452.

C1698. Kulpa K. A simple robust detection of weak target in noise radars. / Kulpa K., Misiurewicz J., Gajo Z., Malanowski M. // 2007. EuRAD 2007. European Radar Conference. - Munich, 10-12 Oct. 2007. - P. 275-278.

C1699. Chauveau J. Modification of resonance poles of a conducting target by a dielectric coating. / Chauveau J., de Beaucoudrey N., Saillard J. // 2007. EuRAD 2007. European Radar Conference. - Munich, 10-12 Oct. 2007. - P. 440-443.

C1700. Prokopenko I.G. Adaptive algorithm for moving target detection and velocity estimation. / Prokopenko I.G., Yanovsky F.J., Prokopenko K.I. // 2007. EuRAD 2007. European Radar Conference. - Munich, 10-12 Oct. 2007. - P. 452-455.

C1701. Moldovan E. W-band substrate integrated waveguide radar sensor based on multi-port technology. / Moldovan E., Tatu S.O., Affes S., Bosisio R.G., Ke Wu. // 2007. EuRAD 2007. European Radar Conference. - Munich, 10-12 Oct. 2007. - P. 174-177.

C1702. Chauveau J. Modification of resonance poles of a conducting target by a dielectric coating. / Chauveau J., de Beaucoudrey N., Saillard J. // 2007. European Microwave Conference. - Munich, 9-12 Oct. 2007. - P. 1719-1722.

C1703. Prokopenko I.G. Adaptive algorithm for moving target detection and velocity estimation. / Prokopenko I.G., Yanovsky F.J., Prokopenko K.I. // 2007. European Microwave Conference. - Munich, 9-12 Oct. 2007. - P. 1731-1734.

C1704. Shanwen Zhang. A Detection Method of Radar Signal by Wavelet Transforms. / Shanwen Zhang, Jianbo Fan, Lidan Shou, Jinxiang Dong. // 2007. FSKD 2007. Fourth International Conference on Fuzzy Systems and Knowledge Discovery. - Haikou, 24-27 Aug. 2007. - Vol. 2. - P. 710-714.

C1705. Doyuran U.C. Multi-range and multi-pulse radar detection in correlated non-Gaussian clutter. / Doyuran U.C., Tanik Y. // 2007. European Microwave Conference. - Munich, 9-12 Oct. 2007. - P. 1469-1472.

C1706. Rasshofer R.H. Functional requirements of future automotive radar systems. 2007. European Microwave Conference. - Munich, 9-12 Oct. 2007. - P. 1538-1541.

C1707. Kulpa K. A simple robust detection of weak target in noise radars. / Kulpa K., Misiurewicz J., Gajo Z., Malanowski M. // 2007. European Microwave Conference. - Munich, 9-12 Oct. 2007. - P. 1554-1557.

C1708. Luo Zhiyong. ML Estimation of true Height in 2-D Radar Network. / Luo Zhiyong, He Jia-Zhou. // 2007 10th International Conference on Information Fusion. - Quebec, Que., 9-12 July 2007. - P. 1-7.

C1709. Brown K. A distributed stand-in EW hunter-killer system. / Brown K., Drake S., Mason K., Piotrowski A., Swierkowski L. // 2007 10th International Conference on Information Fusion. - Quebec, Que., 9-12 July 2007. - P. 1-8.

C1710. Panzhi Liu. Distributed adaptive CCAWCA CFAR detector. / Panzhi Liu, Chongzhao Han, Yi Yang, Ming Lei. // 2007 10th International Conference on Information Fusion. - Quebec, Que., 9-12 July 2007. - P. 1-8.

C1711. Shen Chiu. Performance analysis of RADARSAT-2 multi-channel MODEX modes. 2007. EuRAD 2007. European Radar Conference. - Munich, 10-12 Oct. 2007. - P. 170-173.

C1712. Winkler V. Range Doppler detection for automotive FMCW radars. 2007. EuRAD 2007. European Radar Conference. - Munich, 10-12 Oct. 2007. - P. 166-169.

C1713. Chauveau J. Determination of resonance poles of radar targets in narrow frequency bands. / Chauveau J., de Beaucoudrey N., Saillard J. // 2007. EuRAD 2007. European Radar Conference. - Munich, 10-12 Oct. 2007. - P. 122-125.

C1714. Cheniakov M. UWB FSR for air targets detection: Preliminary analysis. / Cheniakov M., Cheng Hu, Gashinova M. // 2007. EuRAD 2007. European Radar Conference. - Munich, 10-12 Oct. 2007. - P. 103-106.

C1715. Seungmo Kim. Detection Probability of WCDMA Based Cellular Radar System. / Seungmo Kim, Yeejung Kim, Youngnam Han, Kyung Bin Bae, Myung Deuk Jeong. // 2007. APMC 2007. Asia-Pacific Microwave Conference. - Bangkok, 11-14 Dec. 2007. - P. 1-4.

C1716. Pettersson M.I. Four-dimensional discretization for detection of moving objects in Wide Band SAR. 2007. EuRAD 2007. European Radar Conference. - Munich, 10-12 Oct. 2007. - P. 79-82.

C1717. van Kleef J. Multiple-Hypothesis Trilateration and Tracking with Distributed Radars. / van Kleef J., Bergmans J., Kester L., Groen F. // 2006 9th International Conference on Information Fusion. - Florence, 10-13 July 2006. - P. 1-7.

C1718. V.N. Chernyshov. The GPR Response of a Subsurface Objects and its Use for Target Detection. / V. N. Chernyshov, S. G. Kataev, V. V. Zagoskin, V. N. Iljushenko, L. P. Ligthart, A. G. Yarovoy. // The Third International Conference Ultrawideband and Ultrashort Impulse Signals. - Sevastopol, Sept. 2006. - P. 106-108.

C1719. G.V. Yermakov. Estimation of the Target Detection Radar Noise Stability at the Ultrawideband Jamming Influence. / G. V. Yermakov, D. S. Kalugin, D. M. Litovchenko, O. N. Stavisky. // The Third International Conference Ultrawideband and Ultrashort Impulse Signals. - Sevastopol, Sept. 2006. - P. 130-132.

C1720. Hanselmann T. Adaptive Target Tracking in Slowly Changing Clutter. / Hanselmann T., Musicki D., Palaniswami M. // 2006 9th International Conference on Information Fusion. - Florence, 10-13 July 2006. - P. 1-8.

C1721. Ren J. Detecting Small Slow-moving Sonar Targets Using Bottom Reverberation Coherence. / Ren J., Bird J.S. // OCEANS 2006. - Boston, MA, 18-21 Sept. 2006. - P. 1-6.

C1722. Li Zhou. Study on Algorithms of Sensor mode Management. / Li Zhou, Xiuzhen Yang, Chuanwen Ju, Jinyong Yu. // 2006 IEEE International Conference on Information Acquisition. - Shandong, 20-23 Aug. 2006. - P. 1369-1373.

C1723. A.G. Yarovoy. UWB Radars for Chalenging Applications. / A. G. Yarovoy, L. P. Ligthart. // The Third International Conference Ultrawideband and Ultrashort Impulse Signals. - Sevastopol, Sept. 2006. - P. 50-55.

C1724. Lucifredi I. Integrated Marine Mammal Monitoring and Protection System (IMAPS): Gray Whale Target Strength Measurements and the Analysis of the Back-Scattered Response. / Lucifredi I., Stein P.J. // OCEANS 2006. - Boston, MA, 18-21 Sept. 2006. - P. 1-6.

C1725. S. Hantscher. 2D Imaging Algorithm for the Evaluation of UWB B-Scans. / S. Hantscher, B. Praher, A. Reisenzahn, C. G. Diskus. // The Third International Conference Ultrawideband and Ultrashort Impulse Signals. - Sevastopol, Sept. 2006. - P. 139-141.

C1726. Yassin Elhillali. Enhancement and implementation of a localization and communication system dedicated to guided transports. / Yassin Elhillali, Charles Tatkeu, Atika Rivenq, J. M Rouvaen. // 2006 6th International Conference on ITS Telecommunications Proceedings. - Chengdu, June 2006. - P. 596-599.

C1727. Liu Bo. Receiving Signal Processing of MIMO Radar Based On Transmitting Diversity. / Liu Bo, He zishu, Zeng jiankui. // 2006 6th International Conference on ITS Telecommunications Proceedings. - Chengdu, June 2006. - P. 1224-1227.

C1728. A. Chernenko. Pulse-Doppler UWB Radar. / A. Chernenko, E. Ziganshin. // The Third International Conference Ultrawideband and Ultrashort Impulse Signals. - Sevastopol, Sept. 2006. - P. 145-147.

C1729. Qilian Liang. KUPS: Knowledge-based Ubiquitous and Persistent Sensor networks for Threat Assessment. 2006. MILCOM 2006. IEEE Military Communications Conference. - Washington, DC, 23-25 Oct. 2006. - P. 1-7.

C1730. Yang Ying. The Research of Collision Avoiding System Based on Millimeter Wave and Image Processing Technique. / Yang Ying, Wei Ximing. // 2006 International Conference on Computational Intelligence and Security. - Guangzhou, 3-6 Nov. 2006. - Vol. 2. - P. 1789-1792.

C1731. Loza A. Structural Similarity-Based Object Tracking in Video Sequences. / Loza A., Mihaylova L., Canagarajah N., Bull D. // 2006 9th International Conference on Information Fusion. - Florence, 10-13 July 2006. - P. 1-6.

C1732. M. Emadi. Parameter Optimization for Bistatic PCL Radar. / M. Emadi, A. Jafargholi, M. Mousavi, S. Bayat, M.M. Nayebi. // 2006 6th International Conference on ITS Telecommunications Proceedings. - Chengdu, June 2006. - P. 1256-1258.

C1733. A. Jafargholi. Fast and High Resolution Statistical Based Algorithm for PCL Radar Detection in Noisy Environment. / A. Jafargholi, M. Emadi, M. Mousavi, A. Granpayeh, M.M. Nayebi. // 2006 6th International Conference on ITS Telecommunications Proceedings. - Chengdu, June 2006. - P. 1259-1262.

C1734. Zhang Hong-lei. Road Recognition in High Resolution SAR Image Based on Genetic Algorithm. / Zhang Hong-lei, Li Zhu-lin, Wang Yan, Zhang Xian-wei. // 2006 IEEE International Conference on Information Acquisition. - Shandong, 20-23 Aug. 2006. - P. 649-654.

C1735. Musicki D. Track Score and Target Existence. 2006 9th International Conference on Information Fusion. - Florence, 10-13 July 2006. - P. 1-7.

C1736. Pawlak R.J. Combined Unscented Kalman and Particle Filtering for Tracking Closely Spaced Objects. 2006 9th International Conference on Information Fusion. - Florence, 10-13 July 2006. - P. 1-6.

C1737. Chen Li. Data Association for Infrared Search and Track System. / Chen Li, Chongzhao Han, Hongyan Zhu. // 2006 9th International Conference on Information Fusion. - Florence, 10-13 July 2006. - P. 1-6.

C1738. Boers Y. A Track Before Detect Approach for Extended Objects. / Boers Y., Driessen J.N. // 2006 9th International Conference on Information Fusion. - Florence, 10-13 July 2006. - P. 1-7.

C1739. Kiran Chittella. Bias Estimation of Multiple Radars by Quasi-Recursive Filtering. / Kiran Chittella, Tanushree Garai, Siddhartha Mukhopadhyay. // 2006 Annual IEEE India Conference. - New Delhi, Sept. 2006. - P. 1-6.

C1740. Surender S.C. Covert Netted Wireless Noise Radar Sensor: OFDMA-Based Communication Architecture. / Surender S.C., Narayanan R.M. // 2006. MILCOM 2006. IEEE Military Communications Conference. - Washington, DC, 23-25 Oct. 2006. - P. 1-7.

C1741. Clark D.E. The GM-PHD Filter Multiple Target Tracker. / Clark D.E., Panta K., Vo B.-N. // 2006 9th International Conference on Information Fusion. - Florence, 10-13 July 2006. - P. 1-8.

C1742. Blanding W. Tracking Through Jamming Using Negative Information. / Blanding W., Koch W., Nickel U. // 2006 9th International Conference on Information Fusion. - Florence, 10-13 July 2006. - P. 1-8.

C1743. Xin Kang. Automatic SAR Image Registration by Using Element Triangle Invariants. / Xin Kang, Chongzhao Han, Yi Yang. // 2006 9th International Conference on Information Fusion. - Florence, 10-13 July 2006. - P. 1-7.

C1744. Allard Y. Interpretation of high-resolution optical imagery with evidential fusion of spectral information and object attributes. / Allard Y., Jouan A. // 2006 9th International Conference on Information Fusion. - Florence, 10-13 July 2006. - P. 1-7.

C1745. Jing Liang. Orthogonal Waveform Design and Performance Analysis in Radar Sensor Networks. / Jing Liang, Qilian Liang. // 2006. MILCOM 2006. IEEE Military Communications Conference. - Washington, DC, 23-25 Oct. 2006. - P. 1-6.

C1746. Maehlisch M. Multisensor Vehicle Tracking with the Probability Hypothesis Density Filter. / Maehlisch M., Schweiger R., Ritter W., Dietmayer K. // 2006 9th International Conference on Information Fusion. - Florence, 10-13 July 2006. - P. 1-8.

C1747. Rhodes B.J. SeeCoast: Automated Port Scene Understanding Facilitated by Normalcy Learning. / Rhodes B.J., Bomberger N.A., Seibert M., Waxman A.M. // 2006. MILCOM 2006. IEEE Military Communications Conference. - Washington, DC, 23-25 Oct. 2006. - P. 1-7.

C1748. Coraluppi S. Benchmark Evaluation of Multistatic Trackers. / Coraluppi S., Grimmett D., de Theije P. // 2006 9th International Conference on Information Fusion. - Florence, 10-13 July 2006. - P. 1-7.

C1749. Grimmett D. Contact-Level Multistatic Sonar Data Simulator for Tracker Performance Assessment. / Grimmett D., Coraluppi S. // 2006 9th International Conference on Information Fusion. - Florence, 10-13 July 2006. - P. 1-7.

C1750. Witkoskie J. Random Set Tracker Experiment on a Road Constrained Network with Resource Management. / Witkoskie J., Kuklinski W., Theophanis S., Otero M. // 2006 9th International Conference on Information Fusion. - Florence, 10-13 July 2006. - P. 1-7.

C1751. Hung D. Ly. Spatial-Temporal-Frequency Diversity in Radar Sensor Networks. / Hung D. Ly, Qilian Liang. // 2006. MILCOM 2006. IEEE Military Communications Conference. - Washington, DC, 23-25 Oct. 2006. - P. 1-7.

C1752. Santos Lopez-Estrada. Decision Tree Based FPGA-Architecture for Texture Sea State Classification. / Santos Lopez-Estrada, Rene Cumplido. // 2006. ReConFig 2006. IEEE International Conference on Reconfigurable Computing and FPGA's. - San Luis Potosi, Sept. 2006. - P. 1-7.

C1753. Zhixi Li. Data Level Fusion of Multilook Inverse Synthetic Aperture Radar (ISAR) Images. / Zhixi Li, Narayanan R.M. // 2006. AIPR 2006. 35th IEEE Applied Imagery and Pattern Recognition Workshop. - Washington, DC, 11-13 Oct. 2006. - P. 2.

C1754. Zakeri B. Pure Target Detection Based on Eigenvector Decomposition Using H-α Method in Radar Polarimetry. / Zakeri B., Ghorbani A., Galletti M. // 2006. RFM 2006. International RF and Microwave Conference. - Putra Jaya, 12-14 Sept. 2006. - P. 101-105.

C1755. Ziade Y. Medeling of propagation of electromagnetic waves in forest media Application to detection and localization of targets. / Ziade Y., Nguyen H., Roussel H., Tabbara W. // 2006. ICTTA '06. 2nd Information and Communication Technologies. - Damascus, 2006. - Vol. 2. - P. 2140-2145.

C1756. Idler C. Realtime Vision Based Multi-Target-Tracking with Particle Filters in Automotive Applications. / Idler C., Schweiger R., Paulus D., Mahlisch M., Ritter W. // 2006 IEEE Intelligent Vehicles Symposium. - Tokyo, 2006. - P. 188-193.

C1757. Abdallah A. A New Method for Indoor Tracking and Tracing System. 2006. ICTTA '06. 2nd Information and Communication Technologies. - Damascus, 2006. - Vol. 2. - P. 2429-2433.

C1758. Zhang W. A Design Method of Parameters for Airborne Conical Scan Pulsed Doppler Radar Seeker. / Zhang W., Sun H., Lv X. // 2006 8th International Conference on Signal Processing. 16-20 2006. - Vol. 4. - {no data available}.

C1759. Gao F. Approaches of Single Channel SAR Combining ATI for GMTI. / Gao F., Mao S., Yuan Y., Yu Z., Liu S. // 2006 8th International Conference on Signal Processing. 16-20 2006. - Vol. 4. - {no data available}.

C1760. Xu X. An Improved Target Detection Method on Wavelet-Based Fractal Scaling Analysis. / Xu X., Liu X., Suo J. // 2006 8th International Conference on Signal Processing. 16-20 2006. - Vol. 4. - {no data available}.

C1761. Haiqing Jiang. Design and Implementation of the Pulse Tracker Based on FPGA. / Haiqing Jiang, Meiguo Gao, Yunjie Li. // 2006 8th International Conference on Signal Processing. 16-20 2006. - Vol. 4. - {no data available}.

C1762. Xianli Wu. Research on Applications of Chaff. / Xianli Wu, Zizhong Qi, Teng Long. // 2006 8th International Conference on Signal Processing. 16-20 2006. - Vol. 4. - {no data available}.

C1763. Le Beux S. FPGA Implementation of Embedded Cruise Control and Anti-Collision Radar. / Le Beux S., Marquet P., Labbani O., Dekeyser J.-L. // 2006. DSD 2006. 9th EUROMICRO Conference on Digital System

Design: Architectures, Methods and Tools. - Dubrovnik, 2006. - P. 280-287.

C1764. Li Qiang. Sea Clutter Suppression Based on Radon Transform at High Grazing Angles. / Li Qiang, Zhang Shou-hong, Zhang Huan-ying, Cao Yun-he. // 2006. CIE '06. International Conference on Radar. - Shanghai, 16-19 Oct. 2006. - P. 1-4.

C1765. Zhang Y. A Method to Remove Rebound Jamming against Bistatic Synthetic Aperture Radar. / Zhang Y., Wang J.G. // 2006. CIE '06. International Conference on Radar. - Shanghai, 16-19 Oct. 2006. - P. 1-4.

C1766. Huixia Liu. A Multipath Viterbi Data Association Algorithm for OTUR. / Huixia Liu, Yan Liang, Quan Pan, Yongmei Cheng. // 2006. CIE '06. International Conference on Radar. - Shanghai, 16-19 Oct. 2006. - P. 1-4.

C1767. Yong Wu. Analysis on Rank of Channel Matrix for Monostatic MIMO Radar System. / Yong Wu, Jun Tang, Yingning Peng. // 2006. CIE '06. International Conference on Radar. - Shanghai, 16-19 Oct. 2006. - P. 1-4.

C1768. Yang Li. Range Migration Compensation and Doppler Ambiguity Resolution by Keystone Transform. / Yang Li, Tao Zeng, Teng Long, Zheng Wang. // 2006. CIE '06. International Conference on Radar. - Shanghai, 16-19 Oct. 2006. - P. 1-4.

C1769. Sargazi Moghadam M.H. Bistatic Ambiguity Function and DOA Estimation for PCL Radar. / Sargazi Moghadam M.H., Jafargholi A., Emadi M., Nayebi M.M. // 2006. APCCAS 2006. IEEE Asia Pacific Conference on Circuits and Systems. - Singapore, 4-7 Dec. 2006. - P. 840-843.

C1770. Chen Xiaowei. Performance Analysis of Track Initiation Algorithm. / Chen Xiaowei, Lin Jiajun, Zhang Jie. // 2006. WCICA 2006. The Sixth World Congress on Intelligent Control and Automation. - Dalian, 2006. - Vol. 1. - P. 4239-4243.

C1771. Chin-Heng Lim. Reduced-Dimension Single Data Set Detection Algorithms. 2006. APCCAS 2006. IEEE Asia Pacific Conference on Circuits and Systems. - Singapore, 4-7 Dec. 2006. - P. 2016-2019.

C1772. Chen Juan. Bistatic Radar DPCA Technique. / Chen Juan, Chen Jianjun, Wang Shengli. // 2006. CIE '06. International Conference on Radar. - Shanghai, 16-19 Oct. 2006. - P. 1-4.

C1773. Chen Jian-jun. Detection of Ultra-High Speed Moving Target Based on Matched Fourier Transform. / Chen Jian-jun, Chen Juan, Wang Sheng-li. // 2006. CIE '06. International Conference on Radar. - Shanghai, 16-19 Oct. 2006. - P. 1-4.

C1774. Chen Y. A New Method of Integration and Detection for Continuous Range Profiles. / Chen Y., Zhao H., Fu Q. // 2006 8th International Conference on Signal Processing. 16-20 2006. - Vol. 4. - {no data available}.

C1775. Ward Keith. High Resolution Radar Imaging of the Sea Surface. / Ward Keith, Tough Robert. // 2006. The Institution of Engineering and Technology Seminar on High Resolution Imaging and Target Classification. - London, 21-21 Nov. 2006. - P. 39-52.

C1776. Baker Christopher. Passive Radar Tracking. / Baker Christopher, O'Hagan D. W., Baker C. J., Griffiths H. D., Inggs M., Lord R., Morrison N. // 2006. The Institution of Engineering and Technology Seminar on The Future of Civil Radar. - London, 15-15 June 2006. - P. 57-67.

C1777. Bell J.M. Target Recognition in Synthetic Aperture and High Resolution Sidescan Sonar. / Bell J.M., Petillot Y.R., Lebart K., Reed S., Coiras E., Mignotte P.Y., Rohou H. // 2006. The Institution of Engineering and Technology Seminar on High Resolution Imaging and Target Classification. - London, 21-21 Nov. 2006. - P. 99-106.

C1778. {no data available}. The IEEE Seminar on Target Tracking: Algorithms and Applications. 2006. The IEE Seminar on (Ref. No. 2006/11359) Target Tracking: Algorithms and Applications. - Birmingham, 7-8 March 2006. - P. 0_1.

C1779. Tasdelen A.S. Range Resolution Improvement in Passive Coherent Location Radar Systems Using Multiple FM Radio Channels. / Tasdelen A.S., Koymen H. // 2006. The Institution of Engineering and Technology Forum on Waveform Diversity and Design in Communications, Radar and Sonar. - London, 22-22 Nov. 2006. -

P. 23-31.

C1780. Felip R.L. Discerning Objects from Ground and Target Pose Estimation in ladar Data using Robust Statistics. / Felip R.L., Binefa X., Diaz-Caro J. // 2006 IEEE International Conference on Image Processing. - Atlanta, GA, 8-11 Oct. 2006. - P. 2109-2112.

C1781. David S. Mazel. Mobile Ravin: Intrusion Detection and Tracking with Organic Airport Radar and Video Systems. / David S. Mazel, Ann Barry. // Proceedings 2006 40th Annual IEEE International Carnahan Conferences Security Technology. - Lexington, KY, Oct. 2006. - P. 30-33.

C1782. Elhillali Y. A Novel Multiplexing Method for High Data Rate Communication Systems. / Elhillali Y., Tatkeu C., Rivenq A., Rouvaen J.M. // 2006. VTC-2006 Fall. 2006 IEEE 64th Vehicular Technology Conference. - Montreal, Que., 25-28 Sept. 2006. - P. 1-4.

C1783. Chen Li. A New Data Association Algorithm for Multiple Passive Sensors. / Chen Li, Chongzhao Han, Hongyan Zhu. // 2006. CASE '06. IEEE International Conference on Automation Science and Engineering. - Shanghai, 8-10 Oct. 2006. - P. 594-599.

C1784. Baptiste P. On Scheduling a Single Machine to Minimize a Function of Distances Between Pairs of Tasks: Scheduling a Multifunction Radar. / Baptiste P., Winter E. // 2006 International Conference on Service Systems and Service Management. - Troyes, 25-27 Oct. 2006. - Vol. 2. - P. 1132-1137.

C1785. Blanding W.R. ML-PDA track validation thresholds. / Blanding W.R., Willett P.K., Bar-Shalom Y. // 2006 IEEE Aerospace Conference. - Big Sky, MT, 2006. - P. 11

C1786. Jinping Zhang. Compounding segmentation method for SAR images. / Jinping Zhang, Wei Zhao, Gong Cheng, Shiyi Mao. // 2006 8th International Conference on Signal Processing. 16-20 Nov. 2006. - Vol. 4. - {no data available}.

C1787. Shujuan Hou. Multi-targets miss distance measurement based on a sequence of image processing techniques. / Shujuan Hou, Siliang Wu. // 2006 8th International Conference on Signal Processing. 16-20 2006. - Vol. 2. - {no data available}.

C1788. Xia G. Detection of Laser Radar Target Based on Wavelet Decomposition. / Xia G., Zhao B. // 2006 8th International Conference on Signal Processing. 16-20 2006. - Vol. 4. - {no data available}.

C1789. Gang Li. Detection, Location and Imaging of Fast Moving Targets Using Non-uniform Linear Antenna Array SAR. / Gang Li, Jia Xu, Ying-Ning Peng, Xiang-Gen Xia. // 2006 8th International Conference on Signal Processing. 16-20 2006. - Vol. 4. - {no data available}.

C1790. Shang Haiyan. Detection of unknown nonlinear fm signals by time-frequency morphological filtering. / Shang Haiyan, Shui Penglang, Zhang Shouhong. // 2006 8th International Conference on Signal Processing. 16-20 Nov. 2006. - Vol. 4. - {no data available}.

C1791. Jahangir Mohammed. Utilising signal absence in SAR imagery for moving target detection. / Jahangir Mohammed, Moate Christopher P. // 2006. The Institution of Engineering and Technology Forum on Waveform Diversity and Design in Communications, Radar and Sonar. - London, 22-22 Nov. 2006. - P. 41-46.

C1792. Cheng-Chih Chu. Development of advanced entry, descent, and landing technologies for future Mars missions. 2006 IEEE Aerospace Conference. - Big Sky, MT, 2006. - P. 8

C1793. Vujovic I. Wavelet Quasi-Superresolution in Marine Applications. / Vujovic I., Kuzmanic I. // 48th International Symposium ELMAR-2006 focused on Multimedia Signal Processing and Communications. - Zadar, June 2006. - P. 65-68.

C1794. Hoi-Shun Lui. Hip Prosthesis Detection based on Complex Natural Resonances. / Hoi-Shun Lui, Shuley N., Crozier S. // 2005. IEEE-EMBS 2005. 27th Annual International Conference of the Engineering in Medicine and Biology Society. - Shanghai, 17-18 Jan. 2006. - P. 1571-1574.

C1795. Laroussi T. A performance comparison of two time diversity systems using OS-CFAR detection for partially correlated chi-square targets and multiple target situations. / Laroussi T., Barkat M. // 2006 IEEE GCC Conference (GCC). - Manama, 20-22 March 2006. - P. 1-6.

C1796. Zhang Chun-cheng. An Effective Method for the Suppression of Mirror Doppler Frequency Components in Airborne Pulsed Doppler Radar. / Zhang Chun-cheng, Huang Zheng-ying, Tan Jian-mei, Ge Jian-jun. // 2006 International Conference on Communications, Circuits and Systems Proceedings. - Guilin, 25-28 June 2006. - Vol. 1. - P. 633-635.

C1797. Ogle W.C. An application of advanced spectrum estimation to multi-channel radar detection and location. / Ogle W.C., Mendelson H., Zulch P.A. // 2006 IEEE Aerospace Conference. - Big Sky, MT, 2006. - P. 7

C1798. Willett P. Comparison of soft and hard assignment ML trackers on multistatic data. / Willett P., Coraluppi S., Blanding W. // 2006 IEEE Aerospace Conference. - Big Sky, MT, 2006. - P. 12

C1799. Bonneau R.J. A rate distortion method for waveform design in RF target detection. 2006 IEEE Aerospace Conference. - Big Sky, MT, 2006. - P. 12

C1800. Cheng-Ming Huang. Visual tracking with probabilistic data association filter based on the circular hough transform. / Cheng-Ming Huang, Chuan-Wen Lai, Li-Chen Fu. // 2006. ICRA 2006. Proceedings 2006 IEEE International Conference on Robotics and Automation. - Orlando, FL, 15-19 May 2006. - P. 4094-4099.

C1801. Amo A.D. Fuzzy Logic Applications to Fire Control Systems. 2006 IEEE International Conference on Fuzzy Systems. - Vancouver, BC, 2006. - P. 1298-1304.

C1802. Foreman T.L. Reinterpreting the CLEAN algorithm as an optimum detector. 2006 IEEE Conference on Radar. 24-27 April 2006. - P. 8

C1803. Schoenig G.N. Adaptive processor convergence improvement using reiterative projection statistics. / Schoenig G.N., Picciolo M.L., Mili L., Gerlach K. // 2006 IEEE Conference on Radar. 24-27 April 2006. - P. 6

C1804. Portela J.N. Surveillance area as a multiplicatively weighted Voronoi diagram. / Portela J.N., Alencar M.S. // 2006 IEEE Conference on Radar. 24-27 April 2006. - P. 4

C1805. Vouras P. Detection of targets in bandlimited and spatially correlated clutter. 2006 IEEE Conference on Radar. 24-27 April 2006. - P. 8

C1806. Xiangyang Liu. Robust distributed detection fusion scheme under unknown time-variant signal-to-clutter ratio conditions. / Xiangyang Liu, Yingning Peng. // 2006 IEEE Conference on Radar. 24-27 April 2006. - P. 4

C1807. Wenqin Wang. An approach for multiple moving targets detection and velocity estimation. 2006 IEEE Conference on Radar. 24-27 April 2006. - P. 8

C1808. Walker T.O. Pulse transmission scheduling for a distributed system of cooperative radars. / Walker T.O., Tummala M., Michael J.B. // 2006 IEEE/SMC International Conference on System of Systems Engineering. - Los Angeles, CA, 24-26 April 2006. - P. 6

C1809. Gang Shi. Cramer-Rao Bound Analysis on Multiple Scattering in Multistatic Point Scatterer Estimation. / Gang Shi, Nehorai A. // 2006. ICASSP 2006 Proceedings. 2006 IEEE International Conference on Acoustics, Speech and Signal Processing. - Toulouse, 14-19 May 2006. - Vol. 4. - P. IV.

C1810. Fabrizio G.A. Stap for Clutter and Interference Cancellation in a Hf Radar System. / Fabrizio G.A., Frazer G.J., Turley M.D. // 2006. ICASSP 2006 Proceedings. 2006 IEEE International Conference on Acoustics, Speech and Signal Processing. - Toulouse, 14-19 May 2006. - Vol. 4. - P. IV.

C1811. Wenchong Xie. DDD Method Based on Joint Target Cancellation for Circular Array Antennas. / Wenchong Xie, Yongliang Wang. // 2006. ICICIC '06. First International Conference on Innovative Computing, Information and Control. - Beijing, Aug. 30 2006-Sept. 1 2006. - Vol. 2. - P. 279-281.

C1812. Sakai M. Human and Object Detection in Smoke-filled Space using Millimeter-wave radar based Measurement System. / Sakai M., Aoki Y. // 2006. ICPR 2006. 18th International Conference on Pattern Recognition. 20-24 Aug. 2006. - Vol. 3. - P. 750.

C1813. Weizhou Zhao. Study on the Detection Algorithm of Bridge over Water in SAR Image Based on Fuzzy

Theory. / Weizhou Zhao, Jianshe Song, Jie Zhang. // 2006. ICICIC '06. First International Conference on Innovative Computing, Information and Control. - Beijing, Aug. 30 2006-Sept. 1 2006. - Vol. 3. - P. 641-644.

C1814. Borkar M. A Monte-Carlo Method for Initializing Distributed Tracking Algorithms. / Borkar M., Cevher V., McClellan J.H. // 2006. ICASSP 2006 Proceedings. 2006 IEEE International Conference on Acoustics, Speech and Signal Processing. - Toulouse, 14-19 May 2006. - Vol. 4. - P. IV.

C1815. Gurbuz A.C. Locating Subsurface Targets Using Minimal GPR Measurements. / Gurbuz A.C., McClellan J.H., Scott W.R. // 2006 IEEE 14th Signal Processing and Communications Applications. - Antalya, 17-19 April 2006. - P. 1-4.

C1816. Sonmez T. Splitting Algorithm for Cases with Single Detection from Sonar Data for Two Tracks. 2006 IEEE 14th Signal Processing and Communications Applications. - Antalya, 17-19 April 2006. - P. 1-4.

C1817. Ramakrishnan D. Target Detection in Abruptly Non-Stationary Doppler-Spread Clutter. / Ramakrishnan D., Krolik J. // 2006. ICASSP 2006 Proceedings. 2006 IEEE International Conference on Acoustics, Speech and Signal Processing. - Toulouse, 14-19 May 2006. - Vol. 3. - P. III.

C1818. Abeysekera S.S. Efficient Wideband Spreading Function Estimation Using Arbitrary Shaped LFM Signals via Hermite Decompositions. / Abeysekera S.S., Sharif R. // 2006. ICASSP 2006 Proceedings. 2006 IEEE International Conference on Acoustics, Speech and Signal Processing. - Toulouse, 14-19 May 2006. - Vol. 3. - P. III.

C1819. Greco A.S. Adaptive Radar Detection of Distributed Targets in Partially-Homogeneous Noise Plus Subspace Interference. / Greco A.S., Bandiera F., De Maio A., Ricci G. // 2006. ICASSP 2006 Proceedings. 2006 IEEE International Conference on Acoustics, Speech and Signal Processing. - Toulouse, 14-19 May 2006. - Vol. 3. - P. III.

C1820. Zhijian Chen. Design of test software for Over-The-Horizon Radar system. / Zhijian Chen, Chengang Yu, Xiaodong Yang, Kun Lu. // 2006. IRST 2006. 10th IET International Conference on Ionospheric Radio Systems and Techniques. - London, UK, 18-21 July 2006. - P. 230-234.

C1821. Ghosh D. Extraction of the signature of a buried object using GPR. / Ghosh D., Sarkar T.K. // 2006 IEEE Conference on Radar. 24-27 April 2006. - P. 6

C1822. Cheng Q. A novel approach for distributed maneuver detection. / Cheng Q., Varshney P.K. // 2006 IEEE Conference on Radar. 24-27 April 2006. - P. 7

C1823. Mangiat S. Effect of terrain modeling and internal clutter motion on space based radar performance. / Mangiat S., Li K.Y., Unnikrishna Pillai S., Himed B. // 2006 IEEE Conference on Radar. 24-27 April 2006. - P. 8

C1824. Hu J. Modeling sea clutter as a nonstationary and nonextensive random process. / Hu J., Tung W., Gao J. // 2006 IEEE Conference on Radar. 24-27 April 2006. - P. 5

C1825. Colone F. Cancellation of clutter and multipath in passive radar using a sequential approach. / Colone F., Cardinali R., Lombardo P. // 2006 IEEE Conference on Radar. 24-27 April 2006. - P. 7

C1826. Lin A. Two-dimensional human tracking using a three-element Doppler and direction-of-arrival (DDOA) radar. / Lin A., Ling H. // 2006 IEEE Conference on Radar. 24-27 April 2006. - P. 4

C1827. Sadjadi F. Classifying dielectric mine-like objects using the Huynen-Fork polarization parameters. / Sadjadi F., Chun C.C.S., Sullivan A., Gaunaurd G.C. // 2006 IEEE Conference on Radar. 24-27 April 2006. - P. 4

C1828. Corbeil A. Data mining of GMTI radar databases. / Corbeil A., Van Patten G., Spoldi L., O'Hern B., Alford M. // 2006 IEEE Conference on Radar. 24-27 April 2006. - P. 8

C1829. Madany Y.M. The analysis of wideband conformal microstrip array antenna with cosecant-squared beam shaping. 2006 IEEE Conference on Radar. 24-27 April 2006. - P. 7

C1830. Yang Z. A STAP approach to estimate drift angle and aircraft velocity. 2006 IEEE Conference on Radar. 24-27 April 2006. - P. 5

C1831. Heng L.C. Linear prediction of range-dependent inverse covariance matrix. / Heng L.C., Aboutanios E., Mulgrew B. // 2006 IEEE Conference on Radar. 24-27 April 2006. - P. 5

C1832. Kubica M. Optimum target detection using illuminators of opportunity. / Kubica M., Kubica V., Neyt X., Raout J., Roques S., Acheroy M. // 2006 IEEE Conference on Radar. 24-27 April 2006. - P. 8

C1833. Ahmad F. A noncoherent approach to radar localization through unknown walls. / Ahmad F., Amin M.G. // 2006 IEEE Conference on Radar. 24-27 April 2006. - P. 7

C1834. Stiles J. Space-time transmit signal construction for multi-mode radar. / Stiles J., Vishal Sinha, Ambika Prasad Nanda. // 2006 IEEE Conference on Radar. 24-27 April 2006. - P. 7

C1835. Luley R. End-to-end modeling and simulation of GMTI target detection from space. / Luley R., Maher J., Hancock R., Davis M.E. // 2006 IEEE Conference on Radar. 24-27 April 2006. - P. 8

C1836. Bergin J.S. Evaluation of antenna architectures for angle estimation of endo-clutter targets in airborne adaptive radars. / Bergin J.S., Techau P.M. // 2006 IEEE Conference on Radar. 24-27 April 2006. - P. 7

C1837. Ranney K. Borehole radar performance characteristics and applications for underground change detection. / Ranney K., Stanton B., Nguyen L., Sullivan A., Smith G., Wong D., Ressler M., Tran C., Costanza J., Kirose G., Kappra K., Sichina J. // 2006 IEEE Conference on Radar. 24-27 April 2006. - P. 7

C1838. Shackelford A.K. Performance enhancement of the FRACTA algorithm via dimensionality reduction: results from KASSPER I. / Shackelford A.K., Gerlach K., Blunt S.D. // 2006 IEEE Conference on Radar. 24-27 April 2006. - P. 8

C1839. Kapfer R. SBR sparse array performance with subarray orientation and timing errors. / Kapfer R., Krumme M., Davis M.E. // 2006 IEEE Conference on Radar. 24-27 April 2006. - P. 8

C1840. Veeramachaneni K. Multiple sectors, multi function, multi radar dwell time management using particle swarm optimization (M3RTM). / Veeramachaneni K., Osadciw L.A. // 2006 IEEE Conference on Radar. 24-27 April 2006. - P. 7

C1841. Uinnikrishna Pillai S. Cramer-Rao bounds for target Doppler and power in space based radar. / Uinnikrishna Pillai S., Li K.Y., Himed B. // 2006 IEEE Conference on Radar. 24-27 April 2006. - P. 7

C1842. Yeste-Ojeda O.A. Atomic decomposition for ISAR imaging. / Yeste-Ojeda O.A., Grajal J. // 2006 IEEE Conference on Radar. 24-27 April 2006. - P. 6

C1843. Sanyal P.K. Detecting moving targets in SAR via keystoning and multiple phase center interferometry. / Sanyal P.K., Zasada D.M., Perry R.P. // 2006 IEEE Conference on Radar. 24-27 April 2006. - P. 6

C1844. Mallahzadeh A.R. A New Algorithm for Scattering Calculation of Absorber Coated Objects. / Mallahzadeh A.R., Rashed-Mohassel J., Soleimani M., Zeidaabadi Nezhad A. // 2006 IEEE International Conference on Electro/information Technology. - East Lansing, MI, 7-10 May 2006. - P. 603-607.

C1845. Van Caekenberghe K. Monopulse-Doppler Radar Front-End Concept for Automotive Applications Based on RF MEMS Technology. / Van Caekenberghe K., Sarabandi K. // 2006 IEEE International Conference on Electro/information Technology. - East Lansing, MI, 7-10 May 2006. - P. 1-5.

C1846. Cao Furong. Edge Diffraction Computing Based on SCTE. / Cao Furong, Yang Helin, He ChangHui. // The 2006 4th Asia-Pacific Conference on Environmental Electromagnetics. - Dalian, 1-4 Aug. 2006. - P. 847-850.

C1847. Mirko Mahlisch. Heterogeneous Fusion of Video, LIDAR and ESP Data for Automotive ACC Vehicle Tracking. / Mirko Mahlisch, Rudiger Hering, Werner Ritter, Klaus Dietmayer. // 2006 IEEE International Conference on Multisensor Fusion and Integration for Intelligent Systems. - Heidelberg, Sept. 2006. - P. 139-144.

C1848. Wolfgang Koch. On Bayesian Tracking of Extended Objects. 2006 IEEE International Conference on Multisensor Fusion and Integration for Intelligent Systems. - Heidelberg, Sept. 2006. - P. 209-216.

C1849. Zhu Jiabing. A Direct Path Interference Cancellation Approach to Passive Radar Based on FM Radio transmitter. / Zhu Jiabing, Tao Liang, Hong Yi. // 2006 IEEE International Conference on Electro/information Technology. - East Lansing, MI, 7-10 May 2006. - P. 55-59.

C1850. Ouarzeddine M. Target Detection and Characterization using H/alpha Decomposition and Polarimetric Signatures. / Ouarzeddine M., Souissi B., Belhadj-Aissa A. // 2006. ICTTA '06. 2nd Information and Communication Technologies. - Damascus, 2006. - Vol. 1. - P. 395-400.

C1851. El-Ocla H. Radar Cross-Section of Targets using Beam wave incidence for Horizontal Polarization. IEEE Antennas and Propagation Society International Symposium 2006. - Albuquerque, NM, 9-14 July 2006. - P. 3267-3270.

C1852. Brown E.B. Analysis of an X-Band Retrodirective Noise Correlating Radar for Large-Caliber Bullet and Projectile Detection. / Brown E.B., Brown E.R. // 2006. IEEE MTT-S International Microwave Symposium Digest. - San Francisco, CA, 11-16 June 2006. - P. 102-105.

C1853. Hantscher S. UWB Radar Calibration Using Wiener Filters for Spike Reduction. / Hantscher S., Etzlinger B., Reisenzahn A., Diskus C.G. // 2006. IEEE MTT-S International Microwave Symposium Digest. - San Francisco, CA, 11-16 June 2006. - P. 1995-1998.

C1854. Rappaport C.M. Soil Moisture and Surface Roughness Effects in Ground Penetrating Radar Detection of Land Mines. 2006. IEEE MTT-S International Microwave Symposium Digest. - San Francisco, CA, 11-16 June 2006. - P. 280-283.

C1855. Jost Koller. Data Fusion for Ground Moving Target Tracking. / Jost Koller, Martin Ulmke. // 2006 IEEE International Conference on Multisensor Fusion and Integration for Intelligent Systems. - Heidelberg, Sept. 2006. - P. 217-224.

C1856. Masri I. Short range detector of static or mobile targets in the ISM band 2.45 GHz. / Masri I., Huyart B., Cousin J.-C., Boudet T., Guillot A. // 2006. EuRAD 2006. 3rd European Radar Conference. - Manchester, 13-15 Sept. 2006. - P. 285-287.

C1857. Xiang Shi. Stealth Consideration for Passive Millimetre-wave Detection and Guidance. / Xiang Shi, Guowei Lou, Xingguo Li. // 2006. EuRAD 2006. 3rd European Radar Conference. - Manchester, 13-15 Sept. 2006. - P. 213-216.

C1858. Kuroki F. Range Finding by Using NRD Guide Pulse Radar Front-End at 60 GHz. / Kuroki F., Yamaoka K., Murata Y., Ishikawa S., Masaki K., Yoneyama T. // 2006. EuRAD 2006. 3rd European Radar Conference. - Manchester, 13-15 Sept. 2006. - P. 292-295.

C1859. Liu Hui-xia. A Multipath Viterbi Data Association Algorithm with uncertain ionospheric state. / Liu Hui-xia, Liang Yan, Pan Quan, Cheng Yong-mei. // 2006. CCC 2006. Chinese Control Conference. - Harbin, 7-11 Aug. 2006. - P. 450-454.

C1860. Zamyatina A.A. Radar as a Tool for Antiterrorism. / Zamyatina A.A., Zamyatin A.J., Zamyatin V.J., Zavirukha V.K., Baygutlina I.A. // 2006. EuRAD 2006. 3rd European Radar Conference. - Manchester, 13-15 Sept. 2006. - P. 299-302.

C1861. Messali Z. Distributed Pre-Processed CA-CFAR Detection Structure For Non Gaussian Clutter Reduction. / Messali Z., Soltani F., Sahmoudi M. // 2006. EuRAD 2006. 3rd European Radar Conference. - Manchester, 13-15 Sept. 2006. - P. 209-212.

C1862. Malboubi M. The Intelligent Identification of Air and Sea Targets in Coastal Radars. / Malboubi M., Akhlaghi J., Saraf M.-R.A., Sadeghi H.M.M. // 2006. EuRAD 2006. 3rd European Radar Conference. - Manchester, 13-15 Sept. 2006. - P. 17-20.

C1863. Doughty S. Characterisation of a Multistatic Radar System. / Doughty S., Woodbridge K., Baker C. // 2006. EuRAD 2006. 3rd European Radar Conference. - Manchester, 13-15 Sept. 2006. - P. 5-8.

C1864. Mousavi M.R. Fast and Accurate Method for PCL Radar Detection in Noisy Environment. / Mousavi M.R., Jafargholi A., Nayebi M.M. // 2006. EuRAD 2006. 3rd European Radar Conference. - Manchester, 13-15 Sept. 2006. - P. 33-36.

C1865. Inomata K. 2-Dimensional Measuring Method Using a Wide-area Surveillance Sensor with Leaky Coaxial Cables. / Inomata K., Hirai T., Yamada H., Yamaguchi Y. // 2006. EuRAD 2006. 3rd European Radar Conference. - Manchester, 13-15 Sept. 2006. - P. 202-205.

C1866. Papadopoulos S. Monostatic Radar Signatures of Significant Classes of Ground Targets, in the Time and Frequency-Domain. / Papadopoulos S., Mishra A.K., Mulgrew B. // 2006. EuRAD 2006. 3rd European Radar Conference. - Manchester, 13-15 Sept. 2006. - P. 96-99.

C1867. Hoi-Shun Lui. Detection of Small Changes in a Hip Prosthesis using the E-Pulse Technique. / Hoi-Shun Lui, Shuley N., Crozier S. // IEEE Antennas and Propagation Society International Symposium 2006. - Albuquerque, NM, 9-14 July 2006. - P. 2195-2198.

C1868. Linnehan R. Evaluation and Tuning of a SAR Detector using Sparse-Array Spotlight Mode Simulations. / Linnehan R., Schindler J., Brady D. // 2006. Fourth IEEE Workshop on Sensor Array and Multichannel Processing. - Waltham, MA, 12-14 July 2006. - P. 315-319.

C1869. Tabrikian J. Barankin Bounds for Target Localization by MIMO Radars. 2006. Fourth IEEE Workshop on Sensor Array and Multichannel Processing. - Waltham, MA, 12-14 July 2006. - P. 278-281.

C1870. Bastami B.A. A New Radar Detector in Unknown Signal and Clutter Environment. / Bastami B.A., Amindavar H. // 2006. Fourth IEEE Workshop on Sensor Array and Multichannel Processing. - Waltham, MA, 12-14 July 2006. - P. 354-357.

C1871. Amin M. Moving Target Localization for Indoor Imaging using Dual Frequency CW Radars. / Amin M., Zemany P., Setlur P., Ahmad F. // 2006. Fourth IEEE Workshop on Sensor Array and Multichannel Processing. - Waltham, MA, 12-14 July 2006. - P. 367-371.

C1872. Ahmad F. Analyses of Autofocusing Schemes for Indoor Imaging with Unknown Walls. / Ahmad F., Amin M.G. // 2006. Fourth IEEE Workshop on Sensor Array and Multichannel Processing. - Waltham, MA, 12-14 July 2006. - P. 358-362.

C1873. Bonneau R.J. A waveform strategy for detection of targets in multiplicative clutter. 2006 IEEE Conference on Radar. 24-27 April 2006. - P. 10

C1874. Dickson K. Programmable Processor Design for Givens Rotations based Applications. / Dickson K., Liu Z., McCanny J.V. // 2006. Fourth IEEE Workshop on Sensor Array and Multichannel Processing. - Waltham, MA, 12-14 July 2006. - P. 84-87.

C1875. Kazanci O.R. Single-Snapshot Beamformer Performance using Large Arrays with Faulty Sensors. / Kazanci O.R., Krolik J.L. // 2006. Fourth IEEE Workshop on Sensor Array and Multichannel Processing. - Waltham, MA, 12-14 July 2006. - P. 6-10.

C1876. Huaijin Gu. Optimal Adaptive Array and Angle Tracking for Multiple Targets-A Re-examination of Optimal Array Processing. 2006. Fourth IEEE Workshop on Sensor Array and Multichannel Processing. - Waltham, MA, 12-14 July 2006. - P. 171-175.

C1877. Blunt S.D. Doppler-compensated adaptive pulse compression. / Blunt S.D., Smith K.J., Gerlach K. // 2006 IEEE Conference on Radar. 24-27 April 2006. - P. 6

C1878. Yang Yang. Radar Waveform Design using Minimum Mean-Square Error and Mutual Information. / Yang Yang, Blum R.S. // 2006. Fourth IEEE Workshop on Sensor Array and Multichannel Processing. - Waltham, MA, 12-14 July 2006. - P. 234-238.

C1879. Jian Li. Signal Waveform's Optimal Under Restriction Design for Active Sensing. / Jian Li, Guerci J.R., Luzhou Xu. // 2006. Fourth IEEE Workshop on Sensor Array and Multichannel Processing. - Waltham, MA, 12-14 July 2006. - P. 382-386.

C1880. Cepni A.G. Experimental results on single antenna target detection using time-reversal techniques. / Cepni A.G., Stancil D.D., Henty B., Yi Jiang, Yuanwei Jin, Moura J.M.F., Jian-Gang Zhu. // IEEE Antennas and Propagation Society International Symposium 2006. - Albuquerque, NM, 9-14 July 2006. - P. 703-706.

C1881. Bin Gao. Vehicle identification and GPS error detection from a LIDAR equipped probe vehicle. / Bin

Gao, Coifman B. // 2006. ITSC '06. IEEE Intelligent Transportation Systems Conference. - Toronto, Ont., 17-20 Sept. 2006. - P. 1537-1542.

C1882. Padhi S.K. Resonance behavior of a dielectric target in a half-space using the CNR (complex natural resonance) method. / Padhi S.K., Shuley N.V., Hoi-Shun Lui. // IEEE Antennas and Propagation Society International Symposium 2006. - Albuquerque, NM, 9-14 July 2006. - P. 715-718.

C1883. Hughes E.J. Improved Target Detection and Tracking in Littoral Environments Using a Self-organising Spatio temporal CFAR. / Hughes E.J., Lewis M.B. // 2006. The IEE Seminar on (Ref. No. 2006/11359) Target Tracking: Algorithms and Applications. - Birmingham, 7-8 March 2006. - P. 69-76.

C1884. Krolik J.L. Exploiting multipath propagation for GMTI in urban environments. / Krolik J.L., Farrell J., Steinhardt A. // 2006 IEEE Conference on Radar. 24-27 April 2006. - P. 4

C1885. Lemeret Y. An association algorithm for tracking multiple moving objects. / Lemeret Y., Lefevre E., Jolly D. // 2006. ITSC '06. IEEE Intelligent Transportation Systems Conference. - Toronto, Ont., 17-20 Sept. 2006. - P. 1334-1339.

C1886. Neyt X. Range-dependence Issues in Multistatic STAP-based Radar. / Neyt X., Acheroy M., Verly J.G. // 2006. Fourth IEEE Workshop on Sensor Array and Multichannel Processing. - Waltham, MA, 12-14 July 2006. - P. 594-598.

C1887. Deming R. Concurrent Detection and Tracking using Multiple, Flying, Sensors. / Deming R., Perlovsky L. // 2006. Fourth IEEE Workshop on Sensor Array and Multichannel Processing. - Waltham, MA, 12-14 July 2006. - P. 505-509.

C1888. Haykin S. Cognitive Radar Networks. 2006. Fourth IEEE Workshop on Sensor Array and Multichannel Processing. - Waltham, MA, 12-14 July 2006. - P. 1-24.

C1889. Yiguang Xuan. Lane Change Maneuver Detection from Probe Vehicle DGPS Data. / Yiguang Xuan, Coifman B. // 2006. ITSC '06. IEEE Intelligent Transportation Systems Conference. - Toronto, Ont., 17-20 Sept. 2006. - P. 624-629.

C1890. Withopf D. Learning Algorithm for Real-Time Vehicle Tracking. / Withopf D., Jahne B. // 2006. ITSC '06. IEEE Intelligent Transportation Systems Conference. - Toronto, Ont., 17-20 Sept. 2006. - P. 516-521.

C1891. Xiangyang Liu. A Distributed Detection Scheme for Multiple Monostatic Radars. / Xiangyang Liu, Jun Yan, Yingning Peng. // 2006. CIE '06. International Conference on Radar. - Shanghai, 16-19 Oct. 2006. - P. 1-4.

C1892. Kuroki F. Digital signal processing of multi-reflection for short range detection using NRD guide pulse radar front- end at 60 GHz. / Kuroki F., Izuho T., Yoneyama T. // 2006. APMC 2006. Asia-Pacific Microwave Conference. - Yokohama, 12-15 Dec. 2006. - P. 1697-1700.

C1893. Yilong Lu. An experimental GSM based passive radar. / Yilong Lu, Tan D., Hongbo Sun. // 2006. APMC 2006. Asia-Pacific Microwave Conference. - Yokohama, 12-15 Dec. 2006. - P. 1626-1632.

C1894. Picardi G. Subsurface Investigations by MARSIS in Mars Express Mission. / Picardi G., Biccaria D., Cartacci M., Cicchetti A., Iorio M., Seu R., Masdea A., Plaut J., Jordan R.L., Huff R., Safaenili A., Orosei R., Bombaci O., Calabrese D., Zampolini E., Melacci P.T. // 2006. IRS 2006. International Radar Symposium. - Krakow, 24-26 May 2006. - P. 1-15.

C1895. Kalenichenko S.P. The Joint Radar Targets Detecting and Communication System. / Kalenichenko S.P., Mikhailov V.N. // 2006. IRS 2006. International Radar Symposium. - Krakow, Poland, 24-26 May 2006. - P. 1-4.

C1896. Sheikhi Abbas. Adaptive Target Detection in Clutter Using MIMO Radar. / Sheikhi Abbas, Zamani Ali. // 2006. IRS 2006. International Radar Symposium. - Krakow, Poland, 24-26 May 2006. - P. 1-4.

C1897. Sira S.P. A Subspace-Based Approach to Sea Clutter Suppression for Improved Target Detection. / Sira S.P., Cochran D., Papandreou-Suppappola A., Morrell D., Moran W., Howard S. // 2006. ACSSC 06. Fortieth Asilomar Conference on Signals, Systems and Computers. - Pacific Grove, CA, Oct. 29 2006-Nov. 1 2006. - P. 752-756.

C1898. Jian Wang. Sequential Detection for a Target in Compound-Gaussian Clutter. / Jian Wang, Nehorai A. // 2006. ACSSC 06. Fortieth Asilomar Conference on Signals, Systems and Computers. - Pacific Grove, CA, Oct. 29 2006-Nov. 1 2006. - P. 745-751.

C1899. Mori S. Tracking Separating Targets with Possibly Merged Measurements Using Generalized Janossy Measure Concept. / Mori S., Chee-Yee Chong. // 2006. ACSSC 06. Fortieth Asilomar Conference on Signals, Systems and Computers. - Pacific Grove, CA, Oct. 29 2006-Nov. 1 2006. - P. 2024-2028.

C1900. Choeychuen K. An Efficient Implementation of the Nearest Neighbor Based Visual Objects Tracking. / Choeychuen K., Kumhom P., Chamnongthai K. // 2006. ISPACS '06. International Symposium on Intelligent Signal Processing and Communications. - Yonago, 12-15 Dec. 2006. - P. 574-577.

C1901. Bilich Carlos G. Bio-Medical Sensing using Ultra Wideband Communications and Radar Technology: A Feasibility Study. 2006 Pervasive Health Conference and Workshops. - Innsbruck, Nov. 29 2006-Dec. 1 2006. - P. 1-9.

C1902. Shrivastava A.K. Application of STAP For Detection of Target In The Presence of Ground Clutter. / Shrivastava A.K., Sarkar B.K. // 2006. IRS 2006. International Radar Symposium. - Krakow, Poland, 24-26 May 2006. - P. 1-4.

C1903. Hocking W. K. Detection of Targets in Sea Clutter Using Adaptively Truncated Interleaved Spectral-Temporal Interferometry. / Hocking W. K., Thayaparan T., Hocking A. // 2006. IRS 2006. International Radar Symposium. - Krakow, Poland, 24-26 May 2006. - P. 1-4.

C1904. Thayaparan T. 3D motion model and detection method for ISAR imaging. / Thayaparan T., Brinkman W. // 2006. IRS 2006. International Radar Symposium. - Krakow, Poland, 24-26 May 2006. - P. 1-4.

C1905. Wawruch Ryszard. Radar Detection of Small Sailing Yachts. / Wawruch Ryszard, Stupak Tadeusz. // 2006. IRS 2006. International Radar Symposium. - Krakow, Poland, 24-26 May 2006. - P. 1-4.

C1906. Hamadouche M. Performance Analysis of a Novel Adaptive SLB/CFAR System. / Hamadouche M., Bencheikh M.L., Magaz B., Belouchrani A. // 2006. IRS 2006. International Radar Symposium. - Krakow, Poland, 24-26 May 2006. - P. 1-4.

C1907. Sanz-Gonzalez J.L. Performance Analysis of Permutation and Rank Tests under K-Distributed Clutter in Radar Detection. / Sanz-Gonzalez J.L., Alvarez-Vaquero F., Gonzalez-Garcia J.E. // 2006. IRS 2006. International Radar Symposium. - Krakow, 24-26 May 2006. - P. 1-4.

C1908. Asgari Fateme. Resource Management of a Multifunction Array Radar. / Asgari Fateme, Kamarei Mahmood, Mofrad Reza Fatemi. // 2006. IRS 2006. International Radar Symposium. - Krakow, Poland, 24-26 May 2006. - P. 1-4.

C1909. Kawalec Adam. Estimation Of Target Movement Parameters In Synthetic Aperture Radar. / Kawalec Adam, Serafin Piotr. // 2006. IRS 2006. International Radar Symposium. - Krakow, Poland, 24-26 May 2006. - P. 1-4.

C1910. Bayat S. Sensitivity Analysis of Configuration in Bistatic Radars. / Bayat S., Emadi M., Mousavi M. R., Jafargholi A., Nayebi M. M. // 2006. IRS 2006. International Radar Symposium. - Krakow, Poland, 24-26 May 2006. - P. 1-4.

C1911. Xu Shan. Multi-target Detection in FMCW Radar based on Six-Port Technology. / Xu Shan, Liu Fa-Lin. // 2006. IRMMW-THz 2006. Joint 31st International Conference on Infrared Millimeter Waves and 14th International Conference on Teraherz Electronics. - Shanghai, 18-22 Sept. 2006. - P. 308.

C1912. Jian Feng Zhang. Subtle Detection of Target Profiles Using Submillimeter Waves. / Jian Feng Zhang, Tie Jun Cui. // 2006. IRMMW-THz 2006. Joint 31st International Conference on Infrared Millimeter Waves and 14th International Conference on Teraherz Electronics. - Shanghai, 18-22 Sept. 2006. - P. 16.

C1913. Friedlander B. Adaptive Waveform Design for a Multi-Antenna Radar System. 2006. ACSSC 06. Fortieth Asilomar Conference on Signals, Systems and Computers. - Pacific Grove, CA, Oct. 29 2006-Nov. 1 2006. - P. 735-739.

C1914. Kulpa K.S. Stretch Processing for Long Integration Time Passive Covert Radar. / Kulpa K.S., Misiurewicz J. // 2006. CIE '06. International Conference on Radar. - Shanghai, 16-19 Oct. 2006. - P. 1-4.

C1915. Ren Li-xiang. Study on HPRF Pulsed Doppler Stepped Frequency Radar System. / Ren Li-xiang, Mao Er-ke. // 2006. CIE '06. International Conference on Radar. - Shanghai, 16-19 Oct. 2006. - P. 1-4.

C1916. Klemm R. Adaptive monopluse with STAP. / Klemm R., Nickel U. // 2006. CIE '06. International Conference on Radar. - Shanghai, 16-19 Oct. 2006. - P. 1-4.

C1917. Mullane J. Evidential versus Bayesian Estimation for Radar Map Building. / Mullane J., Adams M.D., Wijesoma W.S. // 2006. ICARCV '06. 9th International Conference on Control, Automation, Robotics and Vision. - Singapore, 5-8 Dec. 2006. - P. 1-8.

C1918. Xu Kaiyu. Target Detection Based on The Artificial Neural Network Technology. / Xu Kaiyu, Hu Wenhua, Zhou Weina, Zheng Huayao. // 2006. ICARCV '06. 9th International Conference on Control, Automation, Robotics and Vision. - Singapore, 5-8 Dec. 2006. - P. 1-5.

C1919. Tao Haihong. Novel Filter Design for detecting weak targets of slow speed out of multi-mode clutters. / Tao Haihong, Li Nintao, Liao Guisheng. // 2006. CIE '06. International Conference on Radar. - Shanghai, 16-19 Oct. 2006. - P. 1-4.

C1920. Chen Jianwen. Analysis of STAP on MDV for Spaceborne SAR-GMTI Applications. / Chen Jianwen, Ren lei. // 2006. CIE '06. International Conference on Radar. - Shanghai, 16-19 Oct. 2006. - P. 1-3.

C1921. Wang Zhihong. Research on Target Auto-tracking Initiation Based on Plot Fusion Processing of Multi-radar. / Wang Zhihong, Mei Xiaochun. // 2006. CIE '06. International Conference on Radar. - Shanghai, 16-19 Oct. 2006. - P. 1-4.

C1922. Gashinova M. UWB signature analysis for detection of body-worn weapons. / Gashinova M., Cherniakov M., Vasalos A. // 2006. CIE '06. International Conference on Radar. - Shanghai, 16-19 Oct. 2006. - P. 1-4.

C1923. Qianxue Fang. Application of Adaptive Stochastic Resonance in Noise Restrain. / Qianxue Fang, Yongliang Wang, Shouyong Wang, Wenlin Hu. // 2006. CIE '06. International Conference on Radar. - Shanghai, 16-19 Oct. 2006. - P. 1-3.

C1924. Viola F. 2B-5 Ultrasound Imaging with Beamforming Adapted to Target. / Viola F., Ellis M.A., Walker W.F. // 2006. IEEE Ultrasonics Symposium. - Vancouver, BC, 2-6 Oct. 2006. - P. 128-131.

C1925. Wenshuai Zhai. SAR Imaging Simulation for Subsurface Target Detection. / Wenshuai Zhai, Yunhua Zhang, Xiangkun Zhang. // 2006. ISAPE '06. 7th International Symposium on Antennas, Propagation & EM Theory. - Guilin, 26-29 Oct. 2006. - P. 1-5.

C1926. WeiHua Yu. A Processing Detection Project Research of Weak Targets in the Complex Ground Clutter. / WeiHua Yu, HouJun Sun, HuaiZhi Yang, Wei Zhang. // 2006. ISAPE '06. 7th International Symposium on Antennas, Propagation & EM Theory. - Guilin, 26-29 Oct. 2006. - P. 1-4.

C1927. Lehmann N.H. High Resolution Capabilities of MIMO Radar. / Lehmann N.H., Haimovich A.M., Blum R.S., Cimini L. // 2006. ACSSC 06. Fortieth Asilomar Conference on Signals, Systems and Computers. - Pacific Grove, CA, Oct. 29 2006-Nov. 1 2006. - P. 25-30.

C1928. Marple S.L. New Non-Stationary Target Feature Detection Techniques. / Marple S.L., Corbell P.M., Rangaswamy M. // 2006. ACSSC 06. Fortieth Asilomar Conference on Signals, Systems and Computers. - Pacific Grove, CA, Oct. 29 2006-Nov. 1 2006. - P. 550-553.

C1929. Sorenson L. Chirplet Transform Signal Decomposition for Echo Detection and Estimation. / Sorenson L., Yufeng Lu, Martinez-Vallina F., Saniie J. // 2006. ACSSC 06. Fortieth Asilomar Conference on Signals, Systems and Computers. - Pacific Grove, CA, Oct. 29 2006-Nov. 1 2006. - P. 509-512.

C1930. Zhang Peng. An Imaging Simulation Method of SAR for Three-dimensional Targets. / Zhang Peng, Yang Fang, Guo Chen Jiang, Xu Jia Dong. // 2006. ISAPE '06. 7th International Symposium on Antennas, Propagation & EM Theory. - Guilin, 26-29 Oct. 2006. - P. 1-4.

C1931. Alioua C.B. Combined Membership Functions in Fuzzy Signal Detection. / Alioua C.B., Soltani F. // 2006 1ST IEEE International Conference on E-Learning in Industrial Electronics. - Hammamet, 18-20 Dec. 2006. - P. 1-5.

C1932. El-Ocla H. Laser Radar Cross-Section of Conducting Targets Using Horizontal Polarization. 2006. ISAPE '06. 7th International Symposium on Antennas, Propagation & EM Theory. - Guilin, 26-29 Oct. 2006. - P. 1-4.

C1933. Qu Wei. A Study Of Air Target Detection Base On Signal Disturbance. / Qu Wei, Jia Xin, Wu Yan-hong. // 2006. ISAPE '06. 7th International Symposium on Antennas, Propagation & EM Theory. - Guilin, 26-29 Oct. 2006. - P. 1-4.

C1934. Jun-Lin Wang. Target Detection with Non-Cooperative Illuminators. / Jun-Lin Wang, Jian-Yun Zhang. // 2006. ISAPE '06. 7th International Symposium on Antennas, Propagation & EM Theory. - Guilin, 26-29 Oct. 2006. - P. 1-5.

C1935. Bencheikh M. L. Analysis and Real Time Implementation of a Clutter Map CFAR Detector with Noncoherent Integration. / Bencheikh M. L., Magaz B., Hamadouche M., Belouchrani A. // 2006. IRS 2006. International Radar Symposium. - Krakow, Poland, 24-26 May 2006. - P. 1-4.

C1936. Mikhnev V. Estimation of Efficiency of Modified Method of Detecting and Recognizing Shallowly Buried Objects. / Mikhnev V., Maksimovitch Ye., Vainikainen P. // 2006. IRS 2006. International Radar Symposium. - Krakow, Poland, 24-26 May 2006. - P. 1-4.

C1937. Garvanov Ivan. Radar Detection and Track Determination with a Transform Analogous to the Hough Transform. / Garvanov Ivan, Kabakchiev Christo. // 2006. IRS 2006. International Radar Symposium. - Krakow, Poland, 24-26 May 2006. - P. 1-4.

C1938. Praskovskaya E. Spatial-Temporal Differential Analysis for GMTD with Airborne Radars, Part 2: First Experimental Results. / Praskovskaya E., Praskovsky A., Himed B. // 2006. IRS 2006. International Radar Symposium. - Krakow, 24-26 May 2006. - P. 1-6.

C1939. Ries P. Knowledge-aided Heterogeneity-compensation Algorithm for STAP Applicable to Bistatic Configurations and Conformal Antenna Arrays. / Ries P., de Greve S., Lapierre F.D., Verly J.G. // 2006. IRS 2006. International Radar Symposium. - Krakow, 24-26 May 2006. - P. 1-4.

C1940. Praskovsky A. Spatial-Temporal Differential Analysis for GMTD with Airborne Radars, Part 1: Theoretical Background. / Praskovsky A., Praskovskaya E., Himed B. // 2006. IRS 2006. International Radar Symposium. - Krakow, 24-26 May 2006. - P. 1-6.

C1941. Bertacca Massimo. Homomorphic Inverse-FEXP filtering for target detection in sea SAR images. / Bertacca Massimo, Berizzi Fabrizio, Mese Enzo Dalle. // 2006. IRS 2006. International Radar Symposium. - Krakow, Poland, 24-26 May 2006. - P. 1-4.

C1942. Zaikov Egor. The GPOF-based Ground Return Deembedding in Stepped Frequency Ground Penetrating Radar. 2006. IRS 2006. International Radar Symposium. - Krakow, Poland, 24-26 May 2006. - P. 1-4.

C1943. Gonzalez-Garcia Jose E. Permutation Detectors under Nonhomogeneous K-Distributed Clutter in Radar Applications. / Gonzalez-Garcia Jose E., Sanz-Gonzalez Jose L., Alvarez-Vaquero Francisco. // 2006. IRS 2006. International Radar Symposium. - Krakow, Poland, 24-26 May 2006. - P. 1-4.

C1944. Prokopenko I. Nonparametric Algorithm for Radar Detection of Moving Target. / Prokopenko I., Prokopenko K. // 2006. IRS 2006. International Radar Symposium. - Krakow, Poland, 24-26 May 2006. - P. 1-4.

C1945. van Genderen Piet. A Case Study on the design of a cluttermap based plot classification mechanism. 2006. IRS 2006. International Radar Symposium. - Krakow, Poland, 24-26 May 2006. - P. 1-4.

C1946. Dzvonkovskaya A.L. CFAR Target Detection Based on Gumbel Distribution for HF Radar. / Dzvonkovskaya A.L., Rohling H. // 2006. IRS 2006. International Radar Symposium. - Krakow, 24-26 May 2006. - P. 1-4.

C1947. Venkataramani R. Optimal Equalizers and Targets for Detection in ISI Channels. / Venkataramani R., Erden F. // 2006. INTERMAG 2006. IEEE International Magnetics Conference. - San Diego, CA, 8-12 May 2006. - P. 796.

C1948. Okamoto Y. A study on application of partial response maximum likelihood channel to magnetic recording system using patterned media. / Okamoto Y., Sugai H., Osawa H., Nakamura Y., Aoi H., Muraoka H. // 2006. INTERMAG 2006. IEEE International Magnetics Conference. - San Diego, CA, 8-12 May 2006. - P. 788.

C1949. Wang Yang. Utilization of chirp-z transform to improve the performance of target number detection of low resolution radar. / Wang Yang, Jin Lin, Liu Zhong. // IMACS Multiconference on Computational Engineering in Systems Applications. - Beijing, 4-6 Oct. 2006. - Vol. 1. - P. 403-407.

C1950. Murai K. Basic Study of Navigator's Recognition of Radar Target Direction. / Murai K., Hayashi Y., Stone L.C., Inokuchi S. // 2006. SMC '06. IEEE International Conference on Systems, Man and Cybernetics. - Taipei, 8-11 Oct. 2006. - Vol. 1. - P. 796-801.

C1951. Zainud-Deen S.H. Microstrip Antenna For Detecting Buried Land Mines. / Zainud-Deen S.H., Badr M.E., Awadalla K.H., Sharshar H.A. // 2006. NRSC 2006. Proceedings of the Twenty Third National Radio Science Conference. - Menoufiya, 14-16 March 2006. - Vol. 0. - P. 1-6.

C1952. Chauveau Janic. Resonances of complex shape scattering objects: Modelling by resonant circuits. / Chauveau Janic, de Beaucoudrey Nicole, Saillard Joseph. // 2006. EuCAP 2006. First European Conference on Antennas and Propagation. - Nice, 6-10 Nov. 2006. - P. 1-6.

C1953. Gabele M. Study of System Design Parameters for Space-Based Traffic Monitoring. / Gabele M., Baumgartner S., Krieger G., Bethke K.-H. // 2006. IRS 2006. International Radar Symposium. - Krakow, 24-26 May 2006. - P. 1-4.

C1954. Isoda K. An effective orbit estimation algorithm for a space debris radar using the quasi-periodicity of the evaluation function. / Isoda K., Sakamoto T., Sato T. // 2006. EuCAP 2006. First European Conference on Antennas and Propagation. - Nice, 6-10 Nov. 2006. - P. 1-6.

C1955. Stepanov M.A. A Simplified Equation for Estimation of Detection Characteristics of Radar Wits Selector of Moving Targets in Case of High Correlation of Fluctuation of Speed Wind Vector. 2006. APEIE '06. 8th International Conference on Actual Problems of Electronic Instrument Engineering. - Novosibirsk, Russia, 26-28 Sept. 2006. - P. 276.

C1956. Migliaccio C. Fresnel reflector antennas for mm-Wave helicopter obstacle detection radar. / Migliaccio C., Nguyen B.D., Pichot Ch., Yamamoto K., Yonemoto N., Yamada K. // 2006. EuCAP 2006. First European Conference on Antennas and Propagation. - Nice, 6-10 Nov. 2006. - P. 1-5.

C1957. Folster Florian. Observation of lateral moving traffic with an automotive radar. / Folster Florian, Rohling Hermann. // 2006. IRS 2006. International Radar Symposium. - Krakow, Poland, 24-26 May 2006. - P. 1-4.

C1958. Nechval N.A. Detection and Recognition of Target Signals in Radar Clutter via Adaptive CFAR Tests. / Nechval N.A., Nechval K.N., Berzinsh G., Purgailis M. // 2006. ICIT 2006. IEEE International Conference on Industrial Technology. - Mumbai, 15-17 Dec. 2006. - P. 710-715.

C1959. Kutuzov V.M. LPI Radar Systems with Spatial Feedback. / Kutuzov V.M., Kalenichenko S.P. // 2006. IRS 2006. International Radar Symposium. - Krakow, Poland, 24-26 May 2006. - P. 1-4.

C1960. Robson M. Evaluation of eCognition for Assisted Target Detection and Recognition in SAR Imagery. / Robson M., Vachon P.W., Seeker J. // 2006. IGARSS 2006. IEEE International Conference on Geoscience and Remote Sensing Symposium. - Denver, CO, July 31 2006-Aug. 4 2006. - P. 145-148.

C1961. Hambaryan A. A Complex of Multi-Frequency at 3GHz, 5.6GHz, 20GHz and 37GHz, Polarimetric, Combined, Short Pulse, Short Range Action Radar- Radiometers for Soil and Snow Remote Sensing and Surveillance. / Hambaryan A., Arakelyan A.K., Manukyan M.R., Karyan V.V., Hovhannisyan G.G., Darbinyan S. // 2006. IGARSS 2006. IEEE International Conference on Geoscience and Remote Sensing Symposium. - Denver, CO, July 31 2006-Aug. 4 2006. - P. 698-701.

C1962. Durand R. Man Made Target Detection in a Forest with a Subspace Detector SAR Processor. / Durand R., Thirion L., Ginolhac G., Forster P. // 2006. IGARSS 2006. IEEE International Conference on Geoscience and Remote Sensing Symposium. - Denver, CO, July 31 2006-Aug. 4 2006. - P. 149-152.

C1963. Cantini L. Target Feature Extraction in Fully Polarimetric High Range Resolution Radar. / Cantini L., Berizzi F., Martorella M., Calugi D. // 2006. IRS 2006. International Radar Symposium. - Krakow, Poland, 24-26 May 2006. - P. 1-4.

C1964. Bayat S. Optimized FM PCL Radar Waveform. / Bayat S., Emadi M., Mousavi M. R., Jafargholi A., Nayebi M. M. // 2006. IRS 2006. International Radar Symposium. - Krakow, Poland, 24-26 May 2006. - P. 1-5.

C1965. Muller Stephan. Pre-Crash Application for Multiple Target Situations. / Muller Stephan, Ritter Henning, Rohling Hermann. // 2006. IRS 2006. International Radar Symposium. - Krakow, Poland, 24-26 May 2006. - P. 1-4.

C1966. Janczak D. Joint Adaptive Detection-Estimation Algorithm for Maneuvering Target Tracking. / Janczak D., Grishin Yu.P. // 2006. IRS 2006. International Radar Symposium. - Krakow, 24-26 May 2006. - P. 1-4.

C1967. Sedehi Matteo. A modified M/N logic for track initiation of low observable targets using amplitude information. / Sedehi Matteo, Lombardo Pierfrancesco, Farina Alfonso. // 2006. IRS 2006. International Radar Symposium. - Krakow, Poland, 24-26 May 2006. - P. 1-4.

C1968. Arakelyan A.K. S-Band, Polarimetric, Combined, Short Range Action Scatterometer-Radiometer for Platform and Vessel Application. / Arakelyan A.K., Hambaryan A.K., Karyan V.V., Hovhannisyan G.G., Pogosyan N.G., Manukyan M.R., Arakelyan A.A., Hambaryan V.K., Grigoryan M.L., Hakobyan I.K., Darbinyan S. // 2006. IGARSS 2006. IEEE International Conference on Geoscience and Remote Sensing Symposium. - Denver, CO, July 31 2006-Aug. 4 2006. - P. 1266-1269.

C1969. Brenner Tadeusz. Multiband Radar Modelling. / Brenner Tadeusz, Kuschel Heiner, Olsen Karl Erik. // 2006. IRS 2006. International Radar Symposium. - Krakow, Poland, 24-26 May 2006. - P. 1-7.

C1970. Axelsson Sune R.J. Acoustic Random Noise Radar Using Ultra Wide Band Waveforms. 2006. IRS 2006. International Radar Symposium. - Krakow, Poland, 24-26 May 2006. - P. 1-4.

C1971. Khlopov Grigory. Informative characters in spectral-polarization images of backscattering from surface objects. / Khlopov Grigory, Lutsenko Vladislav, Popov Igor. // 2006. IRS 2006. International Radar Symposium. - Krakow, Poland, 24-26 May 2006. - P. 1-4.

C1972. Glende M. PCL-Signal-Processing for Sidelobe Reduction in Case of Periodical Illuminator Signals. 2006. IRS 2006. International Radar Symposium. - Krakow, 24-26 May 2006. - P. 1-4.

C1973. Bayat S. Fast and High-Resolution PCL Radar Detection in Noisy Environment. / Bayat S., Emadi M., Mousavi M. R., Jafargholi A., Nayebi M. M. // 2006. IRS 2006. International Radar Symposium. - Krakow, Poland, 24-26 May 2006. - P. 1-5.

C1974. Breit H. TerraSAR-X Products and Product Performance Update. / Breit H., Eineder M., Fritz T., Schattler B., Huber M., Mittermayer J. // 2006. IGARSS 2006. IEEE International Conference on Geoscience and Remote Sensing Symposium. - Denver, CO, July 31 2006-Aug. 4 2006. - P. 1921.

C1975. Churchill S. Data Fusion: Cumulative Effects of Discrete Fusion on Target Detection Probability. / Churchill S., Randell C., Gill E. // 2006. IGARSS 2006. IEEE International Conference on Geoscience and Remote Sensing Symposium. - Denver, CO, July 31 2006-Aug. 4 2006. - P. 1800-1803.

C1976. Li G. Detection, Location and Imaging of Fast Moving Targets Using Non-uniform Linear Antenna Array SAR. / Li G., Xu J., Peng Y.-N., Xia X.-G. // 2006. IGARSS 2006. IEEE International Conference on Geoscience and Remote Sensing Symposium. - Denver, CO, USA, July 31 2006-Aug. 4 2006. - P. 3173-3176.

C1977. Dupuis X. Change Detection using Multi-PASS and Multi- DATE Data at P and L bands. / Dupuis X., Dreuillet P., Ulander L., Gustavsson A. // 2006. IGARSS 2006. IEEE International Conference on Geoscience and Remote Sensing Symposium. - Denver, CO, USA, July 31 2006-Aug. 4 2006. - P. 4044-4047.

C1978. Zhang W. Moving Target Detection based on Sub-aperture Image. / Zhang W., Peng Y., Li W. // 2006. IGARSS 2006. IEEE International Conference on Geoscience and Remote Sensing Symposium. - Denver, CO, USA, July 31 2006-Aug. 4 2006. - P. 3325-3328.

C1979. Yingjun Li. A method for automatic spotting using water column. / Yingjun Li, Xiushe Zhang, Xiaoquan Hu. // 2006. CIE '06. International Conference on Radar. - Shanghai, 16-19 Oct. 2006. - P. 1-4.

C1980. Ramdaras U.D. Networks of Maritime Radar Systems: Sensor Selection Algorithm for PD 1 Based on the Modified Riccati Equation. / Ramdaras U.D., Absil F.G.J. // 2006 IEEE Nonlinear Statistical Signal Processing Workshop. - Cambridge, UK, 13-15 Sept. 2006. - P. 152-155.

C1981. Shirong Yin. Lidar signal denoising based on wavelet domain spatial filtering. / Shirong Yin, Weiran Wang. // 2006. CIE '06. International Conference on Radar. - Shanghai, 16-19 Oct. 2006. - P. 1-3.

C1982. Zhigang Li. Study on Reducing False Targets for Anti-collision Radar in Intelligence Transportation System. / Zhigang Li, Lina Fan, Zhonghai He. // 2006. WCICA 2006. The Sixth World Congress on Intelligent Control and Automation. - Dalian, 2006. - Vol. 2. - P. 8572-8576.

C1983. Balajti I. RCS Aspects of Multi-Band Radar Systems Composed of "VHF," L" and "X" Band Radars. 2006. MIKON 2006. International Conference on Microwaves, Radar & Wireless Communications. - Krakow, 22-24 May 2006. - P. 1149-1155.

C1984. Plata S. FMCW Radar Transmitter Based on DDS Synthesis. 2006. MIKON 2006. International Conference on Microwaves, Radar & Wireless Communications. - Krakow, 22-24 May 2006. - P. 1179-1183.

C1985. Jafargholi A. High Accurate Multiple Target Detection in PCL Radar Systems. / Jafargholi A., Mousavi M.R., Nayebi M.M. // 2006. CIE '06. International Conference on Radar. - Shanghai, 16-19 Oct. 2006. - P. 1-4.

C1986. Fang Qin. A method of hybrid ATI and DPCA technique to detect moving target. / Fang Qin, Xiaoling Zhang, Min Dong. // 2006. CIE '06. International Conference on Radar. - Shanghai, 16-19 Oct. 2006. - P. 1-4.

C1987. Song Jie. Adaptive Radar Clutter Suppression Based on Real Data. / Song Jie, He You, Tang Xiao-ming. // 2006. CIE '06. International Conference on Radar. - Shanghai, 16-19 Oct. 2006. - P. 1-4.

C1988. Jian-hong Zhao. Frequency diversity to low-angle detecting using a highly deterministic multipath signal model. / Jian-hong Zhao, Jian-yu Yang. // 2006. CIE '06. International Conference on Radar. - Shanghai, 16-19 Oct. 2006. - P. 1-5.

C1989. Guan Xin. A New Radar Emitter Recognition Method Based on Variable Precision Rough Set Model. / Guan Xin, Yi Xiao, Sun Yingfeng, He You. // 2006. CIE '06. International Conference on Radar. - Shanghai, 16-19 Oct. 2006. - P. 1-4.

C1990. Hua Wang. FDTD Study of an UWB Radar Technique for Breast Tumor Detection. / Hua Wang, Bialkowski M.E., Feng Liu, Crozier S. // 2006. MIKON 2006. International Conference on Microwaves, Radar & Wireless Communications. - Krakow, 22-24 May 2006. - P. 1033-1036.

C1991. Mousavi M.R. Null Function as a Fast and Accurate Algorithm for Noisy Environment Target Detection in PCL Radars. / Mousavi M.R., Jafargholi A., Nayebi M.M. // 2006. CIE '06. International Conference on Radar. - Shanghai, 16-19 Oct. 2006. - P. 903-906.

C1992. Bing Deng. Novel Long-Term Coherent Integration Method For Moving-Target-Detection. / Bing Deng, Ran Tao, Lu Ma. // 2006. CIE '06. International Conference on Radar. - Shanghai, 16-19 Oct. 2006. - P. 1266-1268.

C1993. Gupta R. A Monopulse Based Correlation Technique for De-Garble Processing of SSR Replies. / Gupta R., Valarmathi J., Rajesh R., Sharma R., Balakrishnan T. // 2006. CIE '06. International Conference on Radar. - Shanghai, 16-19 Oct. 2006. - P. 1501-1505.

C1994. Heng L.C. Averaging of Sorted Bigenvalues for STAP. / Heng L.C., Aboutanios E., Mulgrew B. // 2006. CIE '06. International Conference on Radar. - Shanghai, 16-19 Oct. 2006. - P. 1-4.

C1995. Qu Zhi-guo. A CFAR Based on Statistics of Cell Under Test. / Qu Zhi-guo, Tan Xian-si, Wang Hong,

He Gang. // 2006. CIE '06. International Conference on Radar. - Shanghai, 16-19 Oct. 2006. - P. 1-4.

C1996. Rytel-Andrianik R. On the Ambiguity Function for Accelerating Target in FMCW Radar. 2006. MIKON 2006. International Conference on Microwaves, Radar & Wireless Communications. - Krakow, 22-24 May 2006. - P. 207-210.

C1997. Celuch M. Socot Project (scatterometry for integrated circuits defectoscopy). 2006. MIKON 2006. International Conference on Microwaves, Radar & Wireless Communications. - Krakow, 22-24 May 2006. - P. 217.

C1998. Gorski T. Space-Time Adaptive Processing analysis for the moving target on the sea surface indication purpose. / Gorski T., Le Caillec J.-M., Lecornu L., Kawalec A., Czarnecki W., Pietrasinski J., Solaiman B. // 2006. MIKON 2006. International Conference on Microwaves, Radar & Wireless Communications. - Krakow, 22-24 May 2006. - P. 199-202.

C1999. Tkac J. Radar Range Modelling in Noise Jamming Conditions. 2006. AE 2006. International Conference on Applied Electronics. - Pilsen, 6-7 Sept. 2006. - P. 217-219.

C2000. Petrov Z. Comparison of several algorithms for suppression of foliage clutter. 2006. MIKON 2006. International Conference on Microwaves, Radar & Wireless Communications. - Krakow, 22-24 May 2006. - P. 133-137.

C2001. Liu Li-hua. Precession Period Extraction of Ballistic Missile Based on Radar Measurement. / Liu Li-hua, Wang Zhuang, Hu Wei-dong. // 2006. CIE '06. International Conference on Radar. - Shanghai, 16-19 Oct. 2006. - P. 1-4.

C2002. Huang Yong. Radar Track-Before-Detect Algorithm of Multitarget Based on the Dynamic Programming. / Huang Yong, Jiang Guo-feng, Qiu Kai-lan, Qu Chang-wen. // 2006. CIE '06. International Conference on Radar. - Shanghai, 16-19 Oct. 2006. - P. 1-4.

C2003. Hua Li. Effects of geometry on clutter characteristics of hybrid bistatic space based radar. / Hua Li, Jun Tang, Yingning Peng. // 2006. CIE '06. International Conference on Radar. - Shanghai, 16-19 Oct. 2006. - P. 1-4.

C2004. Vespe M. Outline Structural Representation for Radar Target Classification Based on Non-Radar Templates. / Vespe M., Baker C.J., Griffiths H.D. // 2006. CIE '06. International Conference on Radar. - Shanghai, 16-19 Oct. 2006. - P. 1-4.

C2005. Xiao Hui. Multi-cycle Integration of Weak Target Signals in LFMCW Radar. / Xiao Hui, Hu Weidong, Yu Wenxian. // 2006. CIE '06. International Conference on Radar. - Shanghai, 16-19 Oct. 2006. - P. 1-5.

C2006. Lin Li. Radar Targets Detection in Formation Based on Time-Varying AR Model. / Lin Li, Hong-bing Ji. // 2006. CIE '06. International Conference on Radar. - Shanghai, 16-19 Oct. 2006. - P. 1-4.

C2007. Yin Jian-feng. Detection and Imaging of Aerial Moving Targets Based on Spaceborne SAR. / Yin Jian-feng, Li Dao-jing, Tang Li-bo, Wu Yi-rong. // 2006. CIE '06. International Conference on Radar. - Shanghai, 16-19 Oct. 2006. - P. 1-5.

C2008. Anitori L. Importance sampling for NMF class of STAP detectors. / Anitori L., Srinivasan R., Rangaswamy M. // 2006. CIE '06. International Conference on Radar. - Shanghai, 16-19 Oct. 2006. - P. 1-4.

C2009. Fan Hongqi. Frame-overlapped Zoom-FFT Optimization in PD Radar Application. / Fan Hongqi, Wang Sheng, Chen Fubin, Zhu Yilong. // 2006. CIE '06. International Conference on Radar. - Shanghai, 16-19 Oct. 2006. - P. 1-5.

C2010. Gang Li. Detection, Velocity Estimation and Imaging of Fast Moving Targets Using Single Antenna SAR. / Gang Li, Jia Xu, Ying-Ning Peng, Xiang-Gen Xia. // 2006. CIE '06. International Conference on Radar. - Shanghai, 16-19 Oct. 2006. - P. 1-4.

C2011. Ning Xin. A synthetical pose estimation of SAR imagery using Hough transform and 2-D continuous wavelet transform. / Ning Xin, Guo-hong Wang, Jing Zhang. // 2006. CIE '06. International Conference on Radar. - Shanghai, 16-19 Oct. 2006. - P. 1-4.

C2012. Pettersson M.I. Relative Speed Step Size in SAR processing for Moving Target Detection. 2006. CIE '06. International Conference on Radar. - Shanghai, 16-19 Oct. 2006. - P. 1-5.

C2013. Yinghui Hou. Performance Analysis of A Long-Term Integration Algorithm for Space-borne Radar Based on Segment Processing. / Yinghui Hou, Yinsheng Wei, Wei Bian, Rongqing Xu. // 2006. CIE '06. International Conference on Radar. - Shanghai, 16-19 Oct. 2006. - P. 1-4.

C2014. Liu Tao. Fractal Features and Detection of Meteor Interference in OTHR. / Liu Tao, Gong Yaohuan, Wei Min, Li Jun. // 2006. CIE '06. International Conference on Radar. - Shanghai, 16-19 Oct. 2006. - P. 1-5.

C2015. Guo Ruiting. Analysis of Doppler Features of Spiral Maneuver of Reentry Missile with Time-Frequency Transform. / Guo Ruiting, Liu Zheng, Zhang Shouhong. // 2006. CIE '06. International Conference on Radar. - Shanghai, 16-19 Oct. 2006. - P. 1-4.

C2016. Zaimbashi A. Order Statistic and Algebraic Product CFAR Detector for Weibull Clutter. / Zaimbashi A., Taban M.R., Nayebi M.M. // 2006. CIE '06. International Conference on Radar. - Shanghai, 16-19 Oct. 2006. - P. 1-4.

C2017. Shuling Jin. Two-Hierarchical Hough Transform for Sky-wave Over-the-Horizon Radar Track Initiation. / Shuling Jin, Yan Liang, Peng He, Lizhen Wang, Quan Pan. // 2006. CIE '06. International Conference on Radar. - Shanghai, 16-19 Oct. 2006. - P. 1-4.

C2018. Luping Xu. Multiresolutional Maneuvering Target Tracking with Average Interpolation and Parallel Implementation. / Luping Xu, Dajun Feng. // 2006. CIE '06. International Conference on Radar. - Shanghai, 16-19 Oct. 2006. - P. 1-4.

C2019. Praveen R. Comparison and Simulation of Linear/LOG CFAR Algorithms. / Praveen R., Dinesh Kumar T., Prabhu Kiran D.V.N. // 2006. CIE '06. International Conference on Radar. - Shanghai, 16-19 Oct. 2006. - P. 1-4.

C2020. Su Xiaohong. Prediction of Sea Clutter Based on Chaos Theory with RBF and K-mean Clustering. / Su Xiaohong, Suo Jidong. // 2006. CIE '06. International Conference on Radar. - Shanghai, 16-19 Oct. 2006. - P. 1-4.

C2021. Li Bo. Geometric Analysis on Moving Targets and First-order Sea Clutters in Bistatic Shipborne SWR. / Li Bo, Xu Bin, Yuan Yeshu. // 2006. CIE '06. International Conference on Radar. - Shanghai, 16-19 Oct. 2006. - P. 1-4.

C2022. Bo Liu. Receiving Signal Processing of Wideband MIMO Radar Based On Transmitting Diversity. / Bo Liu, Chunlin Han, Benyong Liu. // 2006. CIE '06. International Conference on Radar. - Shanghai, 16-19 Oct. 2006. - P. 1-4.

C2023. Young-Kil Kwag. An Adaptive Compensation of Moving Clutter Doppler Shift for Helicopter MTD Radar. / Young-Kil Kwag, Min-Su Choi, Chul-Ho Jung. // 2006. CIE '06. International Conference on Radar. - Shanghai, 16-19 Oct. 2006. - P. 1-4.

C2024. Chen Baixiao. Detection and Recognition of High-speed Anti-Radiation Missiles with Simple Multi-antenna VHF Radar. / Chen Baixiao, Wang Yongtian, Zhang Shouhong. // 2006. CIE '06. International Conference on Radar. - Shanghai, 16-19 Oct. 2006. - P. 1-4.

C2025. Mingxin Nie. A Novel Fusion and Target Detection Method of Airborne SAR Images and Optical Images. / Mingxin Nie, Ling Lu, Wei Xu. // 2006. CIE '06. International Conference on Radar. - Shanghai, 16-19 Oct. 2006. - P. 1-4.

C2026. Colone F. A Pre-Doppler Approach for Reduced Loss Bistatic STAP. / Colone F., Labriola M., Poli F., Lombardo P. // 2006. CIE '06. International Conference on Radar. - Shanghai, 16-19 Oct. 2006. - P. 1-4.

C2027. Xinwei Wu. A New Method of Resolving Velocity Ambiguities in Multi-Channel Interferometric SAR/GMTI. / Xinwei Wu, Changyao Zhang. // 2006. CIE '06. International Conference on Radar. - Shanghai, 16-19 Oct. 2006. - P. 1-4.

C2028. Song Hu. A Study on the Technologies of Ultrahigh-speed Data Acquisition and Signal Processing of

Ultrawide-band Radar. / Song Hu, Chen Jian-jun. // 2006. CIE '06. International Conference on Radar. - Shanghai, 16-19 Oct. 2006. - P. 1-4.

C2029. Sheikhi A. Model-based Adaptive Target Detection in Clutter Using MIMO Radar. / Sheikhi A., Zamani A., Norouzi Y. // 2006. CIE '06. International Conference on Radar. - Shanghai, 16-19 Oct. 2006. - P. 1-4.

C2030. He You. A method for MTD detectability improvement using FFT/WFFT-DWT. / He You, Jian Tao, Su Feng, Qu ChangWen. // 2006. CIE '06. International Conference on Radar. - Shanghai, 16-19 Oct. 2006. - P. 1-4.

C2031. Jiaxue Liu. Novel Ground Bounce Removal Algorithms Based on Non-homogeneous Detector. / Jiaxue Liu, Renbiao Wu, Tang Li, Bei Zhang. // 2006. CIE '06. International Conference on Radar. - Shanghai, 16-19 Oct. 2006. - P. 1-5.

C2032. Zhao YiNan. A Practical Method Against Passive Centroid Jamming in Monopulse Radar. / Zhao YiNan, Jin Ming, Wang Jun, Qiao Xiao Lin. // 2006. CIE '06. International Conference on Radar. - Shanghai, 16-19 Oct. 2006. - P. 1-3.

C2033. Winter E. On Scheduling the Dwells of a Multifunction Radar. / Winter E., Lupinski L. // 2006. CIE '06. International Conference on Radar. - Shanghai, 16-19 Oct. 2006. - P. 1-4.

C2034. Gao Fuxiang. Analysis and Simulation of Air Traffic Control Conflict. / Gao Fuxiang, Li Fengyun, Bao Shengfei, Tian Hong. // 2006. CIE '06. International Conference on Radar. - Shanghai, 16-19 Oct. 2006. - P. 1-4.

C2035. Sun Long-xiang. Analogue TV Signal-Based Passive Radar onboard Single Air-Platform. / Sun Long-xiang, Liu jian, Chen Si-xing. // 2006. CIE '06. International Conference on Radar. - Shanghai, 16-19 Oct. 2006. - P. 1-4.

C2036. Wenlin Hu. A Robust CFAR Detector Based on Ordered Statistic. / Wenlin Hu, Yongliang Wang, Shouyong Wang, Qianxue Fang. // 2006. CIE '06. International Conference on Radar. - Shanghai, 16-19 Oct. 2006. - P. 1-4.

C2037. Ma Xiaoyan. Detection Performance Analysis of Distributed OSCA CFAR with Nonconherent Integration. / Ma Xiaoyan, Yang Jun, Xiang Jiabin. // 2006. CIE '06. International Conference on Radar. - Shanghai, 16-19 Oct. 2006. - P. 1-4.

C2038. Cao Yunhe. Wideband Phased Subarray Jammer Nulling Technique. / Cao Yunhe, Liu Zheng, Zhang Shouhong, Li Qiang. // 2006. CIE '06. International Conference on Radar. - Shanghai, 16-19 Oct. 2006. - P. 1-4.

C2039. Fan Mingyi. Side-Lobe Blanking In Doppler-Domain For An Airborne Side-Looking Phased Array PD Radar. / Fan Mingyi, Ge Jianjun, Qiu Wei, Wu Manqing. // 2006. CIE '06. International Conference on Radar. - Shanghai, 16-19 Oct. 2006. - P. 1-4.

C2040. Haiyan Shang. Target Detection in Long Duration Energy Integration by Time-Frequency Distribution and Morphological Filtering. / Haiyan Shang, Penglang Shui, Shouhong Zhang. // 2006. CIE '06. International Conference on Radar. - Shanghai, 16-19 Oct. 2006. - P. 1-4.

C2041. Folster F. Lateral velocity estimation based on automotive radar sensors. / Folster F., Rohling H. // 2006. CIE '06. International Conference on Radar. - Shanghai, 16-19 Oct. 2006. - P. 1-4.

C2042. Dzvonkovskaya A.L. Target Detection with Adaptive Power Regression Thresholding for HF Radar. / Dzvonkovskaya A.L., Rohling H. // 2006. CIE '06. International Conference on Radar. - Shanghai, 16-19 Oct. 2006. - P. 1-4.

C2043. Longmei Xi. A Kind of Dual-Channel GMTI Real-Time Processing Method Based on Frequency DPCA. / Longmei Xi, Changyao Zhang. // 2006. CIE '06. International Conference on Radar. - Shanghai, 16-19 Oct. 2006. - P. 1-4.

C2044. Wang Gan. A Wavelet-Based Algorithm to Compensate Fast-Moving One-Dimension Target's Range Profile. / Wang Gan, Xing Lie, Wang Jianming, Wu Daoqing. // 2006. CIE '06. International Conference on Radar. - Shanghai, 16-19 Oct. 2006. - P. 1-3.

C2045. Zhu Jiabing. Adaptive Beamforming Passive Radar Based on FM Radio Transmitter. / Zhu Jiabing, Hong Yi, Tao Liang. // 2006. CIE '06. International Conference on Radar. - Shanghai, 16-19 Oct. 2006. - P. 1-4.

C2046. Zhang Yanfei. AR Model-based Rapid Detection of SAR Phase History Data with Wald Tests. / Zhang Yanfei, Guan Jian, Wang Jie. // 2006. CIE '06. International Conference on Radar. - Shanghai, 16-19 Oct. 2006. - P. 1-4.

C2047. Xi-Zeng Dai. A new method of improving the weak target detection performance based on the MIMO radar. / Xi-Zeng Dai, Jia Xu, Ying-Ning Peng, Xiang-Gen Xia. // 2006. CIE '06. International Conference on Radar. - Shanghai, 16-19 Oct. 2006. - P. 1-4.

C2048. Qian Gao. A Novel KICA Method for Ground Bounce Removal with GPR. / Qian Gao, Tang Li, Renbiao Wu. // 2006. CIE '06. International Conference on Radar. - Shanghai, 16-19 Oct. 2006. - P. 1-4.

C2049. Yonglun Wan. Ultra-wideband Radar Signals Generated with Two-channel. / Yonglun Wan, Qiang Si, Youxin Lu, Xuegang Wang. // 2006. CIE '06. International Conference on Radar. - Shanghai, 16-19 Oct. 2006. - P. 1-4.

C2050. Chen Li. The Detection of Deception Jamming against SAR Based on Dual-Aperture Antenna Cross-Track Interferometry. / Chen Li, Daiyin Zhu. // 2006. CIE '06. International Conference on Radar. - Shanghai, 16-19 Oct. 2006. - P. 1-4.

C2051. Fengsen Deng. Coherent Integration Detection Algorithm Research of Space Debris. / Fengsen Deng, Xuegang Wang. // 2006. CIE '06. International Conference on Radar. - Shanghai, 16-19 Oct. 2006. - P. 1-4.

C2052. Xiaoming Tang. Detection and Parameter Estimiation of LPI Signals in Passive Radar. / Xiaoming Tang, Benqing Jiang, Caisheng Zhang, You He. // 2006. CIE '06. International Conference on Radar. - Shanghai, 16-19 Oct. 2006. - P. 1-4.

C2053. Mingyang Wang. An IMF-product detector for the UWB radar signal. / Mingyang Wang, Wei Pan, Yiyu Zhou, Wenli Jiang. // 2006. CIE '06. International Conference on Radar. - Shanghai, 16-19 Oct. 2006. - P. 1-4.

C2054. Yunhan Dong. Approximate Invariance of the Inverse of the Covariance Matrix and Its Applications. 2006. CIE '06. International Conference on Radar. - Shanghai, 16-19 Oct. 2006. - P. 1-5.

C2055. Garvanov I. Rank CFAR Detector in Presence of Randomly Arriving Impulse Interference. / Garvanov I., Kabakchiev Chr., Daskalov P., Babalov S. // 2006. CIE '06. International Conference on Radar. - Shanghai, 16-19 Oct. 2006. - P. 1-4.

C2056. Van Cao T.-T. Effects of Multiple Targets on the Mean Level STAP Detector. 2006. CIE '06. International Conference on Radar. - Shanghai, 16-19 Oct. 2006. - P. 1-4.

C2057. Xue Wang. Small Target Detection in Sea Clutter Based on Doppler Spectrum Features. / Xue Wang, Jin Liu, Hongwei Liu. // 2006. CIE '06. International Conference on Radar. - Shanghai, 16-19 Oct. 2006. - P. 1-4.

C2058. Wei Bian. An Improved DPT-based Estimator and its Application to Maneuvering Air Target Detection for 0TH Radar. / Wei Bian, Yinsheng Wei, Rongqing Xu. // 2006. CIE '06. International Conference on Radar. - Shanghai, 16-19 Oct. 2006. - P. 1-4.

C2059. Bon N. GLRT Detection for Range and Doppler Distributed Targets in non-Gaussian Clutter. / Bon N., Khenchaf A., Garello R., Quellec J.-M. // 2006. CIE '06. International Conference on Radar. - Shanghai, 16-19 Oct. 2006. - P. 1-5.

C2060. Chen Shuxuan. Study of location based on T-R and T/R-R mode in Bistatic Radar. / Chen Shuxuan, Chen Baixiao, Zhang Shouhong. // 2006. CIE '06. International Conference on Radar. - Shanghai, 16-19 Oct. 2006. - P. 1-5.

C2061. Liu Yongxiang. Radar Micro-motion Target Resolution. / Liu Yongxiang, Chen Hangyong, Li Xiang, Zhuang Zhaowen. // 2006. CIE '06. International Conference on Radar. - Shanghai, 16-19 Oct. 2006. - P. 1-4.

C2062. Dawber W.N. Integrated Antenna Architecture for High Frequency Multifunction Naval Systems. / Dawber W.N., Pote M.F., Turner S.D., Graddon J.M., Barker D., Evans G., Wood S.G. // 2006. CIE '06. International Conference on Radar. - Shanghai, 16-19 Oct. 2006. - P. 1-5.

C2063. Xue Jing-hong. Adaptive Filtering in Polarization Domain with the Criterion of LCMV. / Xue Jing-hong, Zhou Hong-juan, Qiao Xiao-lin. // 2006. CIE '06. International Conference on Radar. - Shanghai, 16-19 Oct. 2006. - P. 1-4.

C2064. Qiongdan Huang. A method or radar targets position acquisition based on Possibilistic C_means algorithm. / Qiongdan Huang, Luping Xu. // 2006. CIE '06. International Conference on Radar. - Shanghai, 16-19 Oct. 2006. - P. 1-4.

C2065. Yu Zuo. Detection and Location of Fast Moving Targets Using Minimum Redundancy Linear Array SAR. / Yu Zuo, Gang Li, Jia Xu, Ying-Ning Peng, Xiang-Gen Xia. // 2006. CIE '06. International Conference on Radar. - Shanghai, 16-19 Oct. 2006. - P. 1-4.

C2066. Feng Zhou. An Effective Approach to Ground Moving Target Imaging for Single Channel SAR System. / Feng Zhou, Yachao Li, Renbao Ru, Mengdao Xing, Zheng Bao. // 2006. CIE '06. International Conference on Radar. - Shanghai, 16-19 Oct. 2006. - P. 1-4.

© В.И. Карнышев, 2011
Тематический реферативный сборник сгенерирован в атоматическом режиме
с использованием специализированного программного модуля (ПИО ТУСУР)