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

ТЕМАТИЧЕСКИЙ РЕФЕРАТИВНЫЙ СБОРНИК № 14-1

“Small Vessel Detection”
(«Обнаружение малоразмерных судов»)

Журнальные публикации

Источник: *Digital Library IEEEXplore*
Язык: *английский*
Глубина поиска: *1999 – 2011 гг.*
Дата формирования: *март 2011 г.*
Составитель: *В.И. Карнышев*

Томск – 2011

ТЕМАТИЧЕСКИЙ РЕФЕРАТИВНЫЙ СБОРНИК № 14-1

"Small Vessel Detection"

(«Обнаружение малоразмерных судов»)

Журнальные публикации

"Long-Wavelength IR Imaging System to Scuba Diver Detection in Three Dimensions"

Port surveillance and especially the monitoring of small vessels within a port has been an important focus in port security, whereby today video-based systems are the main candidates for the surveillance despite their apparent inherent limitations at night. This paper presents the results in our experiments in the Hudson River Estuary utilizing a long-wavelength IR imaging system for the detection of a submerged SCUBA diver in three dimensions. During the experiments, the SCUBA diver was in different diving conditions as well as at different depths. Further data analysis shows the correlation of the diver's IR signature to the diver's depth, which may be used to develop a model to detect the diver's depth. [J1]

"Objective Selection of High-Frequency Power Doppler Wall Filter Cutoff Velocity for Regions of Interest Containing Multiple Small Vessels"

High-frequency (> 20 MHz) power Doppler ultrasound is frequently used to quantify vascularity in preclinical studies of small animal angiogenic models, but quantitative images can be difficult to obtain in the presence of flow artifacts. To improve flow quantification, color pixel density (CPD) can be plotted as a function of wall filter cutoff velocity to produce a wall-filter selection curve that can be used to estimate actual vascular volume fraction. A mathematical model based on receiver operating characteristic statistics is developed to study the behavior of wall-filter selection curves. The model is compared to experimental data acquired with a 30-MHz transducer and a custom-designed multiple-vessel flow phantom capable of mimicking a range of blood vessel sizes (200-300 ??m), blood flow velocities (1-10 mm/s), and blood vessel orientations. At high flow rates, wall-filter selection curves for multiple-vessel regions include a plateau whose CPD corresponds with the total vascular volume fraction. Conversely, the vascular volume fraction of a subset of vessels is obtained at low flow rates. Detection of the volume fraction of all vessels is ensured when a plateau is > 0.5 mm/s in length and begins at a wall filter cutoff < 2 mm/s. [J2]

"A Novel Hierarchical Method of Ship Detection from Spaceborne Optical Image Based on Shape and Texture Features"

Ship detection from remote sensing imagery is very important, with a wide array of applications in areas such as fishery management, vessel traffic services, and naval warfare. This paper focuses on the issue of ship detection from spaceborne optical images (SDSOI). Although advantages of synthetic-aperture radar (SAR) result in that most of current ship detection approaches are based on SAR images, disadvantages of SAR still exist, such as the limited number of SAR sensors, the relatively long revisit cycle, and the relatively lower resolution. With the increasing number of and the resulting improvement in continuous coverage of the optical sensors, SDSOI can partly overcome the shortcomings of SAR-based approaches and should be investigated to help satisfy the requirements of real-time ship monitoring. In SDSOI, several factors such as clouds, ocean waves, and small islands affect the performance of ship detection. This paper proposes a novel hierarchical complete and operational SDSOI approach based on shape and texture features, which is considered a sequential coarse-to-fine elimination process of false alarms. First, simple shape analysis is adopted to eliminate evident false candidates generated by image segmentation with global and local information and to extract ship candidates with missing alarms as low as possible. Second, a novel semisupervised hierarchical classification approach based on various features is presented to distinguish between ships and nonships to remove most false alarms. Besides a complete and operational SDSOI approach, the other contributions of our approach include the following three aspects: 1) it classifies ship candidates by using their class probability distributions rather than the direct extracted features; 2) the relevant classes are automatically built by the samples' appearances and their feature attribute in a semisupervised mode; and 3) besides commonly used shape and texture features, a new texture operator, i.e., loca--l multiple patterns, is introduced to enhance the representation ability of the feature set in feature extraction. Experimental results of SDSOI on a large image set captured by optical sensors from multiple satellites show that our approach is effective in distinguishing between ships and nonships, and obtains a satisfactory ship detection performance. [J3]

"Statistical Properties of Phase-Decorrelation in Phase-Resolved Doppler Optical Coherence Tomography"

Decorrelation noise limits the ability of phase-resolved Doppler optical coherence tomography systems to detect smaller vessels exhibiting slower flow velocities, which limits the utility of the technique in many clinical and biological settings. An understanding of the statistical properties of decorrelation noise can aid in the optimal design of these systems and guide the development of noise mitigating strategies. In this work, the statistical properties of decorrelation noise are derived from the underlying statistics of the coherent imaging system and validated through comparison with empirical results and Monte Carlo modeling. Expressions for the noise distribution and the noise variance as a function of relevant imaging system parameters are given, and the implications of these results on both system and algorithm design are discussed. [J4]

"W7-X magnetic diagnostics: Rogowski coil performance for very long pulses"

Stellerators can be operated without the need of significant plasma current for generation of poloidal magnetic field components. Wendelstein 7-X (W7-X) is optimized for stiff magnetic configurations by minimizing pressure driven currents, such as bootstrap and Pfirsch-Schluter currents. In Addition to the largely reduced plasma currents, the HELIAS-type device is a low magnetic shear configuration required for magnetic boundary islands. However, the diverting magnetic field structure is already influenced by small net plasma currents. In particular, the W7-AS divertor results revealed a significant sensitivity of the X-point location with respect to favorable edge plasma states. Thus, a precise X-point control for W7-X is envisaged and, although expected net plasma currents range in the order of 10-100kAonly, stabilization by adaptive controllers is foreseen to an accuracy of about 1kA. This stabilization should be reliable even after 2000sof plasma operation. A precondition for achieving this is a reliable current detection. For this purpose, W7-X will be equipped with Rogowski of which the first has now been assembled onto one of the plasma vessel sectors. The integral performance and sensitivity inhomogeneities have been tested by employing the digital integrator of W7-X [A. Werner, Rev. Sci. Instrum. 77, 10E307 (2006)] and a cable energized with 200A, representing the plasma current. [J5]

"UWB short-range radar sensing-The architecture of a baseband, pseudo-noise UWB radar sensor"

The pioneers of radio science made their first trials of wireless information transmission and demonstrated localization of a steel vessel by radio waves more than 100 years ago. Back then, the world of radio frequencies was organized in a very simple way. The researchers could use any frequency band. There was no interference by others and no controlling government bodies. Since then, governmental authorities have established tight regulations that have split up the available frequency band into small partitions for exclusive use. This article discusses the architecture of a baseband, pseudo-noise UWB radar and gives some examples of applications [J6]

"Detection of tissue harmonic motion induced by ultrasonic radiation force using pulse-echo ultrasound and kalman filter"

A method using pulse echo ultrasound and the Kalman filter is developed for detecting submicron harmonic motion induced by ultrasonic radiation force. The method estimates the amplitude and phase of the motion at desired locations within a tissue region with high sensitivity. The harmonic motion generated by the ultrasound radiation force is expressed as extremely small oscillatory Doppler frequency shifts in the fast time (A-line) of ultrasound echoes, which are difficult to estimate. In slow time (repetitive ultrasound echoes) of the echoes, the motion also is presented as oscillatory phase shifts, from which the amplitude and phase of the harmonic motion can be estimated with the least mean squared error by Kalman filter. This technique can be used to estimate the traveling speed of a harmonic shear wave by tracking its phase changes during propagation. The shear wave propagation speed can be used to solve for the elasticity and viscosity of tissue as reported in our earlier study. Validation and in vitro experiments indicate that the method provides excellent estimations for very small (submicron) harmonic vibrations and has potential for noninvasive and quantitative stiffness measurements of tissues such as artery [J7]

"A System for Real-Time Measurement of the Brachial Artery Diameter in B -Mode Ultrasound Images"

The measurement of the brachial artery diameter is frequently used in clinical studies for evaluating the flow-mediated dilation and, in conjunction with the blood pressure value, for assessing arterial stiffness. This paper presents a system for computing the brachial artery diameter in real-time by analyzing B-mode ultrasound images. The method is based on a robust edge detection algorithm which is used to automatically locate the two

walls of the vessel. The measure of the diameter is obtained with subpixel precision and with a temporal resolution of 25 samples/s, so that the small dilations induced by the cardiac cycle can also be retrieved. The algorithm is implemented on a standalone video processing board which acquires the analog video signal from the ultrasound equipment. Results are shown in real-time on a graphical user interface. The system was tested both on synthetic ultrasound images and in clinical studies of flow-mediated dilation. Accuracy, robustness, and intra/inter observer variability of the method were evaluated [J8]

"The Removal of Wall Components in Doppler Ultrasound Signals by Using the Empirical Mode Decomposition Algorithm"

Doppler ultrasound systems, used for the noninvasive detection of the vascular diseases, normally employ a high-pass filter (HPF) to remove the large, low-frequency components from the vessel wall from the blood flow signal. Unfortunately, the filter also removes the low-frequency Doppler signals arising from slow-moving blood. In this paper, we propose to use a novel technique, called the empirical mode decomposition (EMD), to remove the wall components from the mixed signals. The EMD is firstly to decompose a signal into a finite and usually small number of individual components named intrinsic mode functions (IMFs). Then a strategy based on the ratios between two adjacent values of the wall-to-blood signal ratio (WBSR) has been developed to automatically identify and remove the relevant IMFs that contribute to the wall components. This method is applied to process the simulated and clinical Doppler ultrasound signals. Compared with the results based on the traditional high-pass filter, the new approach obtains improved performance for wall components removal from the mixed signals effectively and objectively, and provides us with more accurate low blood flow. [J9]

"Adaptive AR and Neurofuzzy Approaches: Access to Cerebral Particle Signatures"

In recent years, a relationship has been suggested between the occurrence of cerebral embolism and stroke. Ultrasound has therefore become essential in the detection of emboli when monitoring cerebral vascular disorders and forms part of ultrasound brain-imaging techniques. Such detection is based on investigating the middle cerebral artery using a TransCranial Doppler (TCD) system, and analyzing the Doppler signal of the embolism. Most of the emboli detected in practical experiments are large emboli because their signatures are easy to recognize in the TCD signal. However, detection of small emboli remains a challenge. Various approaches have been proposed to solve the problem, ranging from the exclusive use of expert human knowledge to automated collection of signal parameters. Many studies have recently been performed using time-frequency distributions and classical parameter modeling for automatic detection of emboli. It has been shown that autoregressive (AR) modeling associated with an abrupt change detection technique is one of the best methods for detection of microemboli. One alternative to this is a technique based on taking expert knowledge into account. This paper aims to unite these two approaches using AR modeling and expert knowledge through a neurofuzzy approach. The originality of this approach lies in combining these two techniques and then proposing a parameter referred to as score ranging from 0 to 1. Unlike classical techniques, this score is not only a measure of confidence of detection but also a tool enabling the final detection of the presence or absence of microemboli to be performed by the practitioner. Finally, this paper provides performance evaluation and comparison with an automated technique, i.e., AR modeling used in vitro [J10]

"Homodyne reflectometer for neutral beam injection interlock on large helical device"

Neutral beam injection (NBI) into low-density plasmas can cause serious damage to the vacuum vessel wall. It is necessary to stop the NBI when the plasma terminates. This needs a reliable density monitor for NBI interlock. A three-channel homodyne reflectometer, installed on a large helical device was used for an NBI interlock. Microwaves of 28.5, 34.9, and 40.2GHzwere injected with Omode polarization. At present, a simple homodyne detection scheme is used. The reflected signal consists of a dc component due to local and reflected power and an ac component due to fluctuations in the position of the cutoff layer. Since the change in dc signal was very small, the root mean square value of the ac signal was used as the interlock signal. At present the 34.9GHzOmode channel, whose Omode cutoff density is 1.5Ч1019m-3, is used for the interlock. The system has been working since the first NBI experiments on LHD in 1999. [J11]

"On the Use of HF Surface Wave Radar in Congested Waters: Influence of Masking Effect on Detection of Small Ships"

In this paper, we assess the capability of a high-frequency surface wave radar (HFSWR) to detect a small fast boat moving behind a ship, the dimensions of which are comparable to the wavelength. We show that, in the HF-band, the scattered field in the shadow region of the large ship is significant enough to induce strong coupling between the two vessels. This results in fluctuations in the radar cross section (RCS) values of the small boat of about 12 dB at 10 MHz, for instance. We also introduce a complete simulation tool to account for

the environment and, thus, to be able to simulate real scenes. We have validated these results through anechoic chamber measurements, with two different masking vessels and three different masked ships. The measurements have shown both the low-attenuation results and the RCS fluctuations [J12]

"On the adaptive detection of blood vessels in retinal images"

This paper proposes an automated blood vessel detection scheme based on adaptive contrast enhancement, feature extraction, and tracing. Feature extraction of small blood vessels is performed by using the standard deviation of Gabor filter responses. Tracing of vessels is done via forward detection, bifurcation identification, and backward verification. Tests over twenty images show that for normal images, the true positive rate (TPR) ranges from 80% to 91%, and their corresponding false positive rates (FPR) range from 2.8% to 5.5%. For abnormal images, the TPR ranges from 73.8% to 86.5% and the FPR ranges from 2.1% to 5.3%, respectively. In comparison with two published solution schemes that were also based on the STARE database, our scheme has lower FPR for the reported TPR measure. [J13]

"A real-time PCR analyzer compatible with high-throughput automated processing of 2-μL reactions in glass capillaries"

This paper describes the development of a real-time polymerase chain reaction testbed for the analysis of up to 48 1- to 2-μL reactions in glass capillaries. It is suitable for high-throughput experimentation when used as a downstream module for ACAPELLA-5K, an automated, high-precision, fluid-handling system developed in our laboratory over the past five years. The testbed features a laser-induced fluorescence scanner with high-sensitivity photomultiplier tubes for the detection of three spectral wavelengths. The scanner has a detection threshold of 1-nM fluorescein in a 1-μL detection volume. Peltier-effect thermoelectric elements are used to control thermal cycles with a slew rate of 3°C/s, and a set point tracking accuracy of ±0.5°C. Analyzer design and performance are presented. Experimental results show a successful detection of 3 copies/μL of the albumin gene in serial dilutions of human genomic deoxyribonucleic-acid. Detection levels down to 4 copies/μL of the t(14;18) translocation associated with the cancer follicular lymphoma, was demonstrated in RL-7 cells. Note to Practitioners-Real-time polymerase chain reaction is a thermally driven in-vitro replication of specific segments of DNA, with simultaneous monitoring or reaction product by means of fluorescence detection. This process is important in biochemical analysis for the detection and/or estimation of gene concentration in DNA samples. By increasing the concentration of an initially undetectable gene and monitoring the kinetic history of the reaction, an estimate of the initial concentration can be computed. Although there exists a plethora of commercial real-time PCR instruments, none of these instruments are suitable for low-volume (single-digit microliters) reagents and high-throughput processing while preserving a high degree of fidelity to obtain reliable, repeatable results, and versatility (support for different fluorogenic probes, different operating modes, etc.). The A5K-automated fluid handling and sample preparation system addresses the high-throughput reaction preparation in small-volume glass capillaries. The testbed presented here is a downstream processing module for A5K. To address the challenges posed by the use of- low-volume, elongated reaction vessels, we employ a scanning optical system with a novel inline illumination method to address up to 48 capillaries. We empirically demonstrate that the system's performance is comparable to that of existing commercial real-time PCR platforms, and verify its repeatability and versatility. Future work will address the development of a more compact instrument that can be directly integrated with A5K. [J14]

"Leak detection in spacecraft using structure-borne noise with distributed sensors"

We have developed and tested in the laboratory a method for in-orbit detection and location of air leaks in manned spacecraft that uses only a small number of sensors distributed arbitrarily on the inner surface of the spacecraft skin. Then, structure-borne ultrasound in the range of 300-600 kHz is monitored from each of the sensors. When cross correlations between measured sensor waveforms indicate the presence of a leak, these correlations are compared with a large dynamically generated database of simulated correlations to locate the the leak on the pressure vessel. A series of experimental tests were performed and at worst the method identified some false locations, but the true location of the leak always appeared. [J15]

"Study for a portable IR sensor to detect the blood temperature during coronary bypass implantation"

The objective of this research was to investigate the possibility of using an infrared prototype device for the detection of the blood temperature during a surgical operation for coronary bypass implantation. The correlation between the fluid temperature time behavior and the fluid flow rate was demonstrated. Each blood vessel acts like a thermal wave emitter, so the amount of heat is proportional to the blood flow detected by the IR sensor. The idea was to design a low cost portable device with the advantage that it can be placed near the region of

interest. We chose a pyroelectric sensor for its high-quality cost ratio. Because this kind of sensor detects only a variable infrared source, we used an electromechanical chopper for modulating the radiation. It consists of an electronic shutter whose opening speed is controlled by an astable multivibrator. The output signal was analyzed using a dedicated electronic circuit including a bandpass filter and an amplifier; then an acquisition board was employed for capturing and displaying the signal using a PC. Prototype assessment was made with laboratory equipment and in vivo measurements were made during surgical operation on a small pig. [J16]

"Correction for the dislocation of curved surfaces caused by the PSF in 2D and 3D CT images"

Conventional edge-detection methods suffer from the dislocation of curved surfaces due to the PSF. We propose a new method that uses the isophote curvature to circumvent this. It is accurate for objects with locally constant curvature, even for small objects (like blood vessels) and in the presence of noise. [J17]

"An intestinal surgery simulator: real-time collision processing and visualization"

This research work is aimed toward the development of a VR-based trainer for colon cancer removal. It enables the surgeons to interactively view and manipulate the concerned virtual organs as during a real surgery. First, we present a method for animating the small intestine and the mesentery (the tissue that connects it to the main vessels) in real-time, thus enabling user interaction through virtual surgical tools during the simulation. We present a stochastic approach for fast collision detection in highly deformable, self-colliding objects. A simple and efficient response to collisions is also introduced in order to reduce the overall animation complexity. Second, we describe a new method based on generalized cylinders for fast rendering of the intestine. An efficient curvature detection method, along with an adaptive sampling algorithm, is presented. This approach, while providing improved tessellation without the classical self-intersection problem, also allows for high-performance rendering thanks to the new 3D skinning feature available in recent GPUs. The rendering algorithm is also designed to ensure a guaranteed frame rate. Finally, we present the quantitative results of the simulations and describe the qualitative feedback obtained from the surgeons. [J18]

"Adaptive averaging for improved SNR in real-time coronary artery MRI"

A technique has been developed for combining a series of low signal-to-noise ratio (SNR) real-time magnetic resonance (MR) images to produce composite images with high SNR and minimal artifact in the presence of motion. The main challenge is identifying a set of real-time images with sufficiently small systematic differences to avoid introducing significant artifact into the composite image. To accomplish this task, one must: 1) identify images identical within the limits of noise; 2) detect systematic errors within such images with sufficient sensitivity. These steps are achieved by evaluating the correlation coefficient (CC) between regions in prospective images and a template containing the anatomy of interest. Images identical within noise are selected by comparing the measured CC values to the theoretical distribution expected due to noise. Sensitivity for systematic error depends on the SNR of the CC(=SNRCCmax), which in turn depends on the noise, and the template size and structure. By varying the template size, SNRCCmaxmay be altered. Experiments on phantoms and coronary artery images demonstrate that the SNRCCmaxnecessary to avoid introducing significant artifact varies with the target composite SNR. The future potential of this technique is demonstrated on high-resolution (0.9 mm), reduced field-of-view real-time coronary images. [J19]

"Pulse-length-tolerant features and detectors for sector-scan sonar imagery"

This paper presents a neural-network-based system to detect small man-made objects in sequences of sector-scan sonar images created using signals of various pulse lengths. The detection of such objects is considered out to ranges of 150 m by using an experimental sector-scan sonar system mounted on a vessel. The sonar system considered in this investigation has three modes of operation to create images over ranges of 200, 400, and 800 m from the vessel using acoustic pulses of a different duration for each mode. After an initial cleaning operation performed by compensating for the motion of the vessel, the imagery is segmented to extract objects for analysis. A set of 31 features extracted from each object is examined. These features consist of basic object size and contrast features, shape moment-based features, moment invariants, and features extracted from the second-order histogram of each object. Optimal sets of 15 features are then selected for each mode and over all modes using sequential forward selection (SFS) and sequential backward selection (SBS). These features are then used to train neural networks to detect man-made objects in each sonar mode. By the addition of a feature describing the sonar's mode of operation, a neural network is trained to detect man-made objects in any of the three sonar modes. The multimode detector is shown to perform very well when compared with detectors trained specifically for each sonar mode setting. The proposed detector is also shown to perform well when compared to a number of statistical detectors based on the same set of features. The proposed detector achieves a 92.4% probability of detection at a mean false-alarm rate of 10 per image, averaged over all sonar mode settings. [J20]

"Heavy ion beam probe development for the plasma potential measurement on the TUMAN-3M tokamak"

The peculiarities of the heavy ion beam probe implementation on the small aspect ratio tokamak TUMAN-3M are analyzed. The toroidal displacement of beam trajectory due to the high Ipl/Btorratio is taken into account when designing the layout of the diagnostic. Numerical calculation of beam trajectories using realistic configuration of TUMAN-3M magnetic fields and parabolic plasma current profile resulted in proper adjustment of probing and detection parameters (probing ion material, energy, entrance angles, detector location, and orientation). Secondary ion energy analyzer gain functions Gand Fwere measured in situ using neutral hydrogen puffed in the tokamak vessel as a target for secondary ions production. The detector unit featured split-plate design and had additional electrodes for secondary electron emission suppression. As a result, the diagnostic is now capable of plasma potential evolution measurement and is sensitive enough to trace the potential profile evolution at the L-H mode transition. [J21]

"Measurement of the internal magnetic field of plasmas using an alpha particle source"

The internal magnetic fields of plasmas can be measured under certain conditions from the integrated vЧBdeflection of MeV alpha particles emitted by a small radioactive source. The alpha source and large-area alpha particle detector would be located inside the vacuum vessel but outside the plasma. Alphas with a typical energy of 5.5MeV(241Am)can reach the center of almost all laboratory plasmas and magnetic fusion devices, so this method can potentially determine the q(r)profile of tokamaks or spherical toris (STs). Orbit calculations, background evaluations, and conceptual designs for such alpha vЧB(or "AVB") detector are described. [J22]

"A recurrent neural network for detecting objects in sequences of sector-scan sonar images"

This work presents a system for detecting small man-made objects in sequences of sector-scan images formed using a medium-range sector-scan sonar. The detection of such objects is considered out to ranges of 200 m from the vessel and while the vessel is in motion. This paper extends previous work by making use of temporal information present in the data to improve performance. The system begins by cleaning the imagery, which is done by tracking objects on the sea bed in the imagery and using this information to obtain an improved estimate of the motion of the vessel. Once the vessel's motion is accurately known, the imagery is cleaned by temporally averaging the images after motion compensation. The detector consists of two stages. After the first detection stage has identified possible objects of interest, a bank of Kalman filters is used to track objects in the imagery and to supply sequences of feature vectors to the final detection stage. A recurrent neural network is used for the final detection stage. The feedback loops within the recurrent network allow the incorporation of temporal information into the detection process. The performance of the proposed system is shown to exceed the performances of other models for the final detection stage, including nonrecurrent networks that make use of temporal information supplied in the form of temporal feature vectors. The proposed detection system attains a probability of detection of 77.0% at a mean false-alarm rate of 0.4 per image. [J23]

"A registration-based approach to quantify flow-mediated dilation (FMD) of the brachial artery in ultrasound image sequences"

Flow-mediated dilation (FMD) offers a mechanism to characterize endothelial function and, therefore, may play a role in the diagnosis of cardiovascular diseases. Computerized analysis techniques are very desirable to give accuracy and objectivity to the measurements. Virtually all methods proposed up to now to measure FMD rely on accurate edge detection of the arterial wall, and they are not always robust in the presence of poor image quality or image artifacts. A novel method for automatic dilation assessment based on a global image analysis strategy is presented. We model interframe arterial dilation as a superposition of a rigid motion and a scaling factor perpendicular to the artery. Rigid motion can be interpreted as a global compensation for patient and probe movements, an aspect that has not been sufficiently studied before. The scaling factor explains arterial dilation. The ultrasound sequence is analyzed in two phases using image registration to recover both transformation models. Temporal continuity in the registration parameters along the sequence is enforced with a Kalman filter since the dilation process is known to be a gradual physiological phenomenon. Comparing automated and gold standard measurements (average of manual measurements) we found a negligible bias (0.05%FMD) and a small standard deviation (SD) of the differences (1.05%FMD). These values are comparable with those obtained from manual measurements (bias=0.23%FMD, SDintra-obs=1.13%FMD, SDinter-obs=1.20%FMD). The proposed method offers also better reproducibility (CV=0.40%) than the manual measurements (CV=1.04%). [J24]

"Frequency dependence of speckle in continuous-wave ultrasound with implications for blood perfusion measurements"

Speckle in continuous wave (CW) Doppler has previously been found to cause large variations in detected Doppler power in blood perfusion measurements, where a large number of blood vessels are present in the sample volume. This artifact can be suppressed by using a number of simultaneously transmitted frequencies and averaging the detected signals. To optimize the strategy, statistical properties of speckle in CW ultrasound need to be known. This paper presents analysis of the frequency separation necessary to obtain independent values of the received power for CW ultrasound using a simplified mathematical model for insonation of a static, lossless, statistically homogeneous, weakly scattering medium. Specifically, the autocovariance function for received power is derived, which functionally is the square of the (deterministic) autocorrelation function of the effective sample volumes produced by the transducer pair for varying frequencies, at least if a delta correlated medium is assumed. A marginal broadening of the modeled autocovariance functions is expected for insonation of blood. The theory is applicable to any transducer aperture, but has been experimentally verified here with 5-MHz, 6.35-mm circular transducers using an agar phantom containing small, randomly dispersed glass particles. A similar experimental verification of a transducer used in multiple-frequency blood perfusion measurements shows that the model proposed in this paper is plausible for explaining the decorrelation between different channels in such a measurement. [J25]

"Design of bilateral teleoperation controllers for haptic exploration and telemanipulation of soft environments"

In this letter, teleoperation controller design for haptic exploration and telemanipulation of soft environments is studied. First, a new measure for fidelity in teleoperation is introduced which quantifies the teleoperation system's ability to transmit changes in the compliance of the environment. This sensitivity function is appropriate for the application of telesurgery, where the ability to distinguish small changes in tissue compliance is essential for tasks such as detection of embedded vessels. The bilateral teleoperation controller design problem is then formulated in a task-based optimization framework as the optimization of this metric, with constraints on free-space tracking and robust stability of the system under environment and human operator uncertainties. The control design procedure is illustrated with a case study. The analysis is also used to evaluate the effectiveness of using a force sensor in a teleoperation system. [J26]

"A feature-based, robust, hierarchical algorithm for registering pairs of images of the curved human retina"

This paper describes a robust hierarchical algorithm for fully-automatic registration of a pair of images of the curved human retina photographed by a fundus microscope. Accurate registration is essential for mosaic synthesis, change detection, and design of computer-aided instrumentation. Central to the algorithm is a 12-parameter interimage transformation derived by modeling the retina as a rigid quadratic surface with unknown parameters. The parameters are estimated by matching vascular landmarks by recursively tracing the blood vessel structure. The parameter estimation technique, which could be generalized to other applications, is a hierarchy of models and methods, making the algorithm robust to unmatchable image features and mismatches between features caused by large interframe motions. Experiments involving 3,000 image pairs from 16 different healthy eyes were performed. Final registration errors less than a pixel are routinely achieved. The speed, accuracy, and ability to handle small overlaps compare favorably with retinal image registration techniques published in the literature [J27]

"Clutter filters adapted to tissue motion in ultrasound color flow imaging"

The quality of ultrasound color flow images is highly dependent on sufficient attenuation of the clutter signals originating from stationary and slowly moving tissue. Without sufficient clutter rejection, the detection of low velocity blood flow will be poor, and the velocity estimates will have a large bias. In some situations, e.g., when imaging the coronary arteries or when the operator moves the probe in search for small vessels, there is considerable movement of tissue. It has been suggested that clutter rejection can be improved by mixing down the signal with an estimate of the mean frequency prior to high pass filtering. In this paper, we compare this algorithm with several other adaptive clutter filtering algorithms using both experimental data and simulations. We found that realistic accelerations of the tissue have a large effect on the clutter rejection. The best results were obtained by mixing down the signal with non-constant phase increments estimated from the signal. This adapted the filter to a possibly accelerated tissue motion and produced a significant improvement in clutter rejection. [J28]

"Tangential x-ray imaging system for analysis of the small-scale modes in the T-10 tokamak"

A toroidally viewing x-ray imaging system is used in the T-10 tokamak for reconstruction of the small-scale plasma perturbations (high-m modes). The imaging system is based on the matrix array of the silicon surface-barrier diodes with a two-dimensional Soller collimator and an automatic positioning system. An additional hard

x-ray detector and magnetic probe are placed inside the tokamak vessel for measurements of the nonthermal emission and fast magnetic field perturbations. Initial experiments in T-10 indicated improved sensitivity of the system for identification of the small-scale plasma perturbations prior the density limit disruptions. copyright 2001 American Institute of Physics. [J29]

"Collective microwave scattering diagnostic on the H-1 heliac"

A multichannel microwave scattering diagnostic has been developed and installed on the H-1 heliac. The purpose of the new diagnostic is to study small-scale plasma fluctuations in H-1, which are believed to be responsible for the loss of particles and energy from the plasma. The diagnostic is a 132 GHz, four-channel superheterodyne system. The transmitter and receiver antennas (consisting of horns and focusing bispherical mirrors) are located inside the vacuum vessel of H-1. A radial resolution of Delta r/a 0.2is achieved. The scattering volume is positioned in the density gradient region at r/a 0.6.At present, the system is aligned to measure fluctuations in the poloidal wave number range from approximately 10 to 25 cm-1. The use of the heterodyne detection system allows the fluctuation propagation direction to be determined. The low frequency bandwidth of the system is 1 MHz. The instrument sensitivity is about Ps/Pi 10-6.copyright 2001 American Institute of Physics. [J30]

"Detection of photoacoustic transients originating from microstructures in optically diffuse media such as biological tissue"

The generation and detection of broadband photoacoustic (PA) transients may be used for on-axis monitoring or for imaging of optically different structures in the interior of diffuse bodies such as biological tissue. Various piezoelectric sensors are characterized and compared in terms of sensitivity, depth response, and directivity with respect to spherical broadband acoustic pulses. The influence on the sensor output of acoustic interference and refraction of the PA transients at the sample-sensor interface is discussed. Ring detectors are suitable for deep on-axis detection thanks to their strong directional sensitivity, and small disk sensors are most suited for 3-D imaging of microstructures such as the (micro)vascular system. Voltage and charge preamplification schemes are compared in terms of the signal-to-noise ratio (SNR). In all cases, the preamplifier noise turns out to be the limiting factor for the sensitivity. Based on experimental data, for several sensor types and optical wavelengths, the theoretical detectability of PA signals generated by blood-like absorbers in biological tissue is discussed. [J31]

"Gray-scale skeletonization of small vessels in magnetic resonance angiography"

Interpretation of magnetic resonance angiography (MRA) is problematic due to complexities of vascular shape and to artifacts such as the partial volume effect. The authors present new methods to assist in the interpretation of MRA. These include methods for detection of vessel paths and for determination of branching patterns of vascular trees. They are based on the ordered region growing (ORG) algorithm that represents the image as an acyclic graph, which can be reduced to a skeleton by specifying vessel endpoints or by a pruning process. Ambiguities in the vessel branching due to vessel overlap are effectively resolved by heuristic methods that incorporate a priori knowledge of bifurcation spacing. Vessel paths are detected at interactive speeds on a 500-MHz processor using vessel endpoints. These methods apply best to smaller vessels where the image intensity peaks at the center of the lumen which, for the abdominal MRA, includes vessels whose diameter is less than 1 cm. [J32]

"Flat panel detector-based cone-beam volume CT angiography imaging: system evaluation"

Preliminary evaluation of recently developed large-area flat panel detectors (FPDs) indicates that FPDs have some potential advantages: compactness, absence of geometric distortion and veiling glare with the benefits of high resolution, high detective quantum efficiency (DQE), high frame rate and high dynamic range, small image lag ([J33]

"Estimation of the correlation amplitude of RF signals in small cutaneous vessels"

Time domain correlation technique is a widely used method for blood flow velocity measurement. The time shift between a pair of windowed ultrasonic echoes is estimated by searching the temporal position of the maximum of the interpolated normalized correlation function. Between two consecutive echoes, the acoustical footprint of a group of scatterers, which are transported with the flow, moves and is deformed. This implies a decreasing of the amplitude of the normalized correlation coefficient. In the case of microcirculation (low flow rate, low SNR), the amplitude of the correlation peak can be used to detect the presence of blood flow and to discriminate false and true detections (reliability index). We have numerically evaluated the statistical performances of the cross-correlation algorithm used as a correlation peak amplitude estimator in severe conditions (short correlation

window length, low SNR). These theoretical results have been compared with in vitro experimentation on a 100-μm-diameter microcirculatory phantom and with in vivo experimentation on a 180-μm-diameter vessel of a human leg carrying erysipelas. [J34]

"Fiber-optic tactile microsensor for detecting the position of the tip of a fiberscope"

A tactile microsensor employing optical fibers has been developed and evaluated. The sensor is used for touch sensing to detect the position of the tip of a fiberscope inside a small tubule, such as a blood vessel. The sensor consists of bosses as feelers, which are split sections of the end of a polyurethane tube, a metal diaphragm as a mirror and optical fibers transmit light. The sensors are fabricated using silicon micromachining, such as anisotropic etching and excimer laser etching. The sensing principle is based on the detection of changes in optical reflective intensity from a diaphragm located between a boss and an optical fiber. The width and height of the boss are both 200 μm. For the transmitting source and signal light, a multimode optical fiber 50/125 μm (core/clad) in diameter is used. The results show that tactility measurements can be made easily and safely in blood vessels. This paper describes the structure, fabrication processes, and performance of the sensor. We also propose micromeasuring systems combined with the tactile sensor and a fiberscope of contact type [J35]

"Performance analysis of maximum intensity projection algorithm for display of MRA images"

The maximum intensity projection (MIP) is a popularly used algorithm for display of MRA images, but its performance has not been rigorously analyzed before. In this paper, four measures are proposed for the performance of the MIP algorithm and the quality of images projected from three-dimensional (3-D) data, which are vessel voxel projection probability, vessel detection probability, false vessel probability, and vessel-tissue contrast-to-noise ratio (CNR). As side products, vessel-missing probability, vessel receiver operating characteristics (ROC's), and mean number of false vessels are also studied. Based on the assumptions that the intensities of vessel, tissue, and noise along a projection path are independent Gaussian, these measures are derived and obtained all in closed forms. All the measures are functions of explicit parameters: vessel-to-tissue noise ratio (VTNR) and CNR of 3 D data prior to the MIP, vessel diameter, and projection length. It is shown that the MIP algorithm increases the CNR of large vessels whose CNR prior to the MIP is high and whose diameters are large. The increase in CNR increases with projection path length. On the other hand, all the proposed measures indicate that the small vessels that have low CNR prior to the MIP and small diameters suffer from the MIP. The performance gets worse as projection path length increases. All measures demonstrate a better performance when the vessel diameter is larger. Other properties and possible applications of the derived measures are also discussed. [J36]

"CT image enhancement with wavelet analysis for the detection of small airways disease"

Bronchiolar obstruction is commonly manifested in computed tomography (CT) images as areas of decreased attenuation relative to adjacent normal lung parenchyma. The certain identification of such areas is difficult in practice, particularly if they are poorly marginated. This paper presents a novel approach to the enhancement of feature differences between normal and diseased lung parenchyma so that reliable visual assessment can be made. The method relies on a hybrid structural filtering technique which removes pulmonary vessels appearing in the CT cross-sectional images without affecting intrinsic subtle intensity details of the lung parenchyma. In order to restore possible structural distortions introduced by the hybrid filter, a feature localization process based on wavelet reconstruction of feature extrema is used. After contrast enhancement the resultant images are used to delineate region borders of the diseased areas and quantification is made with regard to the extent of the disease. [J37]

"Adaptive approach to accurate analysis of small-diameter vessels in cineangiograms"

In coronary vessels smaller than 1 mm in diameter, it is difficult to accurately identify lumen borders using existing border detection techniques. Computer-detected diameters of small coronary vessels are often severely overestimated due to the influence of the imaging system point spread function and the use of an edge operator designed for a broad range of diameter vessel sizes. Computer-detected diameters may be corrected if a calibration curve for the X-ray system is available. Unfortunately, the performance of this postprocessing diameter correction approach is severely limited by the presence of image noise. The authors report here a new approach that uses a two-stage adaption of edge operator parameters to optimally match the edge operator to the local lumen diameter. In the first stage, approximate lumen diameters are detected using a single edge operator in a half-resolution image. Depending on the approximate lumen size, one of three edge operators is selected for the second full-resolution stage in which left and right coronary borders are simultaneously identified. The method was tested in a set of 72 segments of nine angiographic phantom vessels with diameters ranging from 0.46 to 4.14 mm and in 82 clinical coronary angiograms. Performance of the adaptive simultaneous

border detection method was compared to that of a conventional border detection method and to that of a postprocessing diameter correction border detection method. Adaptive border detection yielded significantly improved accuracy in small phantom vessels and across all vessel sizes in comparison to the conventional and postprocessing diameter correction methods (p [J38]

"Precise magnetization measurements under high pressures in the diamond-anvil cell"

A precise magnetization measurement system for extremely small samples in the diamond-anvil cell has been developed. The system is based on position differentiating detection (PDD) combined with the use of a SQUID magnetometer. The PDD is a kind of vibrating coil magnetometer and is suitable for the case where high sensitivity detection is required for a sample around which there is little space for the detection coil. The present system enables one to make magnetization measurements at pressures up to about 12 GPa in the temperature range from 1.4 to 30 K. The sensitivity is about 10-9-10-10emu. Three piezoelectric actuators of a bimorph type are used at liquid-helium temperature for stable vibration of the detection coil with an amplitude of 90 mcm around the tips of the diamond anvils. The design and construction of the system is described in detail. The performance of the system is illustrated by magnetization measurements of EuTe under high pressures. copyright 1995 American Institute of Physics. [J39]

"Effect of the beam-vessel angle on the received acoustic signal from blood"

In order to explore the feasibility of algorithms to determine the three dimensional (3D) velocity magnitude from the received ultrasonic blood echo from a single line of sight, the signal from small sample volumes is studied as a function of beam-vessel angle. As opposed to previous treatments of the effect of the beam-vessel angle on the received acoustic signal, a wideband signal is transmitted and the returned signal in each sample volume is analyzed. High-resolution experimental M-mode images of radio-frequency (rf) echo signals are used to visualize the flow in individual regions of interest. These experiments confirm the predictions of a theoretical model for the signal and its second moment. It is shown that the two major effects limiting the correlated signal interval are the spread of axial velocities within the sample volume and the transit time across the lateral beam width. Particularly for small beam-vessel angles, the spread of velocities limits the correlated signal interval. In addition, the experimental results demonstrate that accurate velocity estimation for low volume flow rates and particularly for large beam-vessel angles may involve detection of changes in the correlation magnitude. For low volume flow rates, the shape of the correlation surface can be affected by small regions of blood with a strong scattering intensity located near the initial region of interest [J40]

"Self-calibrating magnetic field diagnostics in beam emission spectroscopy"

Magnetic field diagnostics in tokamaks using the motional Stark effect in fast neutral beams have been based on two kinds of polarimetry which we call "static" and "dynamic." A detailed analysis shows that static polarimetry presents a number of advantages over dynamic polarimetry, provided it is made complete in the sense that a sufficient number of polarization analyzers are installed and different parts of the spectrum are explored to yield full information on the set of unknowns inherent in the problem. A detailed scheme of complete static polarimetry is proposed, including the case where an in-vessel mirror with changing characteristics (coating by impurities) is placed in front of the optical detection system. The main merit of this scheme relies on the fact that it is self-calibrating with respect to both the characteristics of the mirror and the transmission of the different polarization channels, the latter item implying that it is uniquely based on relative measurements of spectra. Further advantages are a greater flexibility with regard to different kinds of diagnostics and the circumstance that the technical equipment is less involved. The above scheme is based on a detection system of moderate etendue exploiting a large spectral domain, which is the regime where static polarimetry usually operates. It is also possible, however, to work with large etendue and a small spectral domain, such as commonly adopted in dynamic polarimetry. Using such a regime, static polarimetry loses the advantages mentioned above but gains, as a new advantage, the benefit of a comparatively lower level of photon noise. copyright 1995 American Institute of Physics. [J41]

"Growler detection in sea clutter with coherent radars"

Ship navigation through ice-infested waters is a problem of deep concern to the Canadian shipping and exploration industry. Conventional marine radars have difficulty detecting small pieces of glacial ice called growlers which are very hazardous to vessels if struck. In an effort to improve detection performance, X-band radar measurements were collected and analyzed to determine the characteristics of clutter and growler returns that could lead to their separability. These analyses suggested that coherent medium dwell-time processing (i.e., integration times of a fraction of a second) could provide improvement In growler detectability over conventional methods; and long dwell-time processing (i.e., integration times on the order of seconds) could provide even

further improvement. We report on the performance of two new coherent, medium dwell-time detectors. A third detector which is representative of conventional marine radar serves as a basis for comparison Although significant improvement in growler detectability is achieved, the two coherent detectors still fall short of operational requirements. This leads to the development of a long dwell-time detector which provides considerably better performance. Empirical results indicate that this new detector could well satisfy stringent operational requirements [J42]

"TFTR microwave reflectometer (abstract)"

A microwave reflectometer is in operation on TFTR for the measurement of density fluctuations. The system operates in the X mode and comprises three channels with fixed frequencies of 140, 132, and 125 GHz, and one with stepped frequency of 111-123 GHz. All channels use solid state Gunn oscillators and a heterodyne detection scheme. The system is located outside of the TFTR test cell with the power conveyed to the tokamak vessel by low-loss corrugated waveguides and remotely controlled parabolic mirrors. Preliminary results indicate that the level of density fluctuations with k 1 cm-1is very small in the central region of Ohmic plasmas (c/n 10-3), and that it increases monotonically with minor radius to values of 10-2at r/a=0.9. This work supported by U.S. Department of Energy Contract No. DE-AC02-76-CHO-3073. [J43]

"Construction of a large superconducting spectrometer magnet"

A sector-type superconducting spectrometer magnet for nuclear physics experiments has been constructed. The central magnetic field is 3 T with a magnet gap of 50 cm and a stored energy estimated to be 11.2 MJ. Three-dimensional magnetic field calculations and a stress analysis have been performed to design the coil and supporting structures. The magnet has a flexible helium transfer line to measure angular distributions at nuclear physics experiments. To simplify the transfer line, a small-size G-M refrigerator, which is installed on a service port of the helium vessel, is used for thermal insulation at 80 K and 20 K in combination with a medium-size refrigerator for cooling the magnet at 4 K. The heat leak at 4 K is estimated to be 3 W at 4 K. The maximum operation current of 500 A is selected by considering the maximum temperature of the coil at quench. In preliminary cooling tests, the magnet has been cooled within 52 h as expected [J44]

СПИСОК ЛИТЕРАТУРЫ

J1. Debing Zeng. Long-Wavelength IR Imaging System to Scuba Diver Detection in Three Dimensions. / Debing Zeng, Benilov A., Bunin B., Martini R. // IEEE Sensors Journal. - 2010. - Vol. 10, No. 3. - P. 760-764.

J2. Pinter S.Z. Objective Selection of High-Frequency Power Doppler Wall Filter Cutoff Velocity for Regions of Interest Containing Multiple Small Vessels. / Pinter S.Z., Lacefield J.C. // IEEE Transactions on Medical Imaging. - 2010. - Vol. 29, No. 5. - P. 1124-1139.

J3. Changren Zhu. A Novel Hierarchical Method of Ship Detection from Spaceborne Optical Image Based on Shape and Texture Features. / Changren Zhu, Hui Zhou, Runsheng Wang, Jun Guo. // IEEE Transactions on Geoscience and Remote Sensing. - 2010. - Vol. 48, No. 9. - P. 3446-3456.

J4. Vakoc B.J. Statistical Properties of Phase-Decorrelation in Phase-Resolved Doppler Optical Coherence Tomography. / Vakoc B.J., Tearney G.J., Bouma B.E. // IEEE Transactions on Medical Imaging. - 2009. - Vol. 28, No. 6. - P. 814-821.

J5. Werner Andreas. W7-X magnetic diagnostics: Rogowski coil performance for very long pulses. / Werner Andreas, Endler Michael, Geiger Joachim, Koenig Ralf. // Review of Scientific Instruments. - 2008. - Vol. 79, No. 10. - P. 10F122-10F122-4.

J6. Zetik R. UWB short-range radar sensing-The architecture of a baseband, pseudo-noise UWB radar sensor. / Zetik R., Sachs J., Thoma R.S. // IEEE Instrumentation & Measurement Magazine. - 2007. - Vol. 10, No. 2. - P. 39-45.

J7. Yi Zheng. Detection of tissue harmonic motion induced by ultrasonic radiation force using pulse-echo ultrasound and kalman filter. / Yi Zheng, Shigao Chen, Wei Tan, Kinnick R., Greenleaf J.F. // IEEE Transactions on Ultrasonics, Ferroelectrics and Frequency Control. - 2007. - Vol. 54, No. 2. - P. 290-300.

J8. Gemignani V. A System for Real-Time Measurement of the Brachial Artery Diameter in B -Mode Ultrasound Images. / Gemignani V., Faita F., Ghiadoni L., Poggianti E., Demi M. // IEEE Transactions on Medical Imaging. - 2007. - Vol. 26, No. 3. - P. 393-404.

J9. Yufeng Zhang. The Removal of Wall Components in Doppler Ultrasound Signals by Using the Empirical Mode Decomposition Algorithm. / Yufeng Zhang, Yali Gao, Le Wang, Jianhua Chen, Xinling Shi. // IEEE Transactions on Biomedical Engineering. - 2007. - Vol. 54, No. 9. - P. 1631-1642.

J10. Kouame D. Adaptive AR and Neurofuzzy Approaches: Access to Cerebral Particle Signatures. / Kouame D., Biard M., Girault J.-M., Bleuzen A. // IEEE Transactions on Information Technology in Biomedicine. - 2006. - Vol. 10, No. 3. - P. 559-566.

J11. Tanaka K. Homodyne reflectometer for neutral beam injection interlock on large helical device. / Tanaka K., Ejiri A., Ito Y., Kawahata K., Tokuzawa T., Osakabe M., Takeiri Y. // Review of Scientific Instruments. - 2006. - Vol. 77, No. 10. - P. 10E912-10E912-3.

J12. Rgis Guinvarc'h. On the Use of HF Surface Wave Radar in Congested Waters: Influence of Masking Effect on Detection of Small Ships. / Rgis Guinvarc'h, Marc Lesturgie, Rmi Durand, Anil Cheraly. // IEEE Journal of Oceanic Engineering. - 2006. - Vol. 31, No. 4. - P. 894-903.

J13. Wu D. On the adaptive detection of blood vessels in retinal images. / Wu D., Ming Zhang, Jyh-Charn Liu, Bauman W. // IEEE Transactions on Biomedical Engineering. - 2006. - Vol. 53, No. 2. - P. 341-343.

J14. Ngatchou P.N. A real-time PCR analyzer compatible with high-throughput automated processing of 2-µL reactions in glass capillaries. / Ngatchou P.N., Holl M.R., Fisher C.H., Saini M.S., Jianchun Dong, Ren T.T.H., Pence W.H., Cunningham D.L., Moody S.E., Donaldson D.A., Meldrum D.R. // IEEE Transactions on Automation Science and Engineering. - 2006. - Vol. 3, No. 2. - P. 141-151.

J15. Holland Stephen D. Leak detection in spacecraft using structure-borne noise with distributed sensors. / Holland Stephen D., Roberts Ron, Chimenti D. E., Strei Michael. // Applied Physics Letters. - 2005. - Vol. 86, No. 17. - P. 174105-174105-3.

J16. Giovannetti Giulio. Study for a portable IR sensor to detect the blood temperature during coronary bypass implantation. / Giovannetti Giulio, Hartwig Valentina, Francesconi Raffaello, Landini Luigi, Benassi Antonio. // Review of Scientific Instruments. - 2005. - Vol. 76, No. 8. - P. 084302-084302-5.

J17. Bouma H. Correction for the dislocation of curved surfaces caused by the PSF in 2D and 3D CT images. / Bouma H., Vilanova A., van Vliet L.J., Gerritsen F.A. // IEEE Transactions on Pattern Analysis and Machine Intelligence. - 2005. - Vol. 27, No. 9. - P. 1501-1507.

J18. Raghupathi L. An intestinal surgery simulator: real-time collision processing and visualization. / Raghupathi L., Grisoni L., Faure F., Marchal D., Cani M.-P., Chaillou C. // IEEE Transactions on Visualization and Computer Graphics. - 2004. - Vol. 10, No. 6. - P. 708-718.

J19. Sussman M.S. Adaptive averaging for improved SNR in real-time coronary artery MRI. / Sussman M.S., Robert N., Wright G.A. // IEEE Transactions on Medical Imaging. - 2004. - Vol. 23, No. 8. - P. 1034-1045.

J20. Perry S.W. Pulse-length-tolerant features and detectors for sector-scan sonar imagery. / Perry S.W., Ling Guan. // IEEE Journal of Oceanic Engineering. - 2004. - Vol. 29, No. 1. - P. 138-156.

J21. Askinazi L. G. Heavy ion beam probe development for the plasma potential measurement on the TUMAN-3M tokamak. / Askinazi L. G., Kornev V. A., Lebedev S. V., Tukachinsky A. S., Zhubr N. A., Dreval N. B., Krupnik L. I. // Review of Scientific Instruments. - 2004. - Vol. 75, No. 10. - P. 3517-3519.

J22. Zweben S. J. Measurement of the internal magnetic field of plasmas using an alpha particle source. / Zweben S. J., Darrow D. S., Ross P. W., Lowrance J. L., Renda G. // Review of Scientific Instruments. - 2004. - Vol. 75, No. 10. - P. 3610-3612.

J23. Perry S.W. A recurrent neural network for detecting objects in sequences of sector-scan sonar images. / Perry S.W., Ling Guan. // IEEE Journal of Oceanic Engineering. - 2004. - Vol. 29, No. 3. - P. 857-871.

J24. Frangi A.F. A registration-based approach to quantify flow-mediated dilation (FMD) of the brachial artery

in ultrasound image sequences. / Frangi A.F., Laclaustra M., Lamata P. // IEEE Transactions on Medical Imaging. - 2003. - Vol. 22, No. 11. - P. 1458-1469.

J25. Jansson T. Frequency dependence of speckle in continuous-wave ultrasound with implications for blood perfusion measurements. / Jansson T., Jurkonis R., Mast T.D., Persson H.W., Lindstrom K. // IEEE Transactions on Ultrasonics, Ferroelectrics and Frequency Control. - 2002. - Vol. 49, No. 6. - P. 715-725.

J26. Cavusoglu M.C. Design of bilateral teleoperation controllers for haptic exploration and telemanipulation of soft environments. / Cavusoglu M.C., Sherman A., Tendick F. // IEEE Transactions on Robotics and Automation. - 2002. - Vol. 18, No. 4. - P. 641-647.

J27. Can A. A feature-based, robust, hierarchical algorithm for registering pairs of images of the curved human retina. / Can A., Stewart C.V., Roysam B., Tanenbaum H.L. // IEEE Transactions on Pattern Analysis and Machine Intelligence. - 2002. - Vol. 24, No. 3. - P. 347-364.

J28. Bjaerum S. Clutter filters adapted to tissue motion in ultrasound color flow imaging. / Bjaerum S., Torp H., Kristoffersen K. // IEEE Transactions on Ultrasonics, Ferroelectrics and Frequency Control. - 2002. - Vol. 49, No. 6. - P. 693-704.

J29. Savrukhin P. V. Tangential x-ray imaging system for analysis of the small-scale modes in the T-10 tokamak. / Savrukhin P. V., Klimanov I. V. // Review of Scientific Instruments. - 2001. - Vol. 72, No. 3. - P. 1668-1671.

J30. Solomon W. M. Collective microwave scattering diagnostic on the H-1 heliac. / Solomon W. M., Shats M. G., Korneev D., Nagasaki K. // Review of Scientific Instruments. - 2001. - Vol. 72, No. 1. - P. 352-354.

J31. Hoelen C.G.A. Detection of photoacoustic transients originating from microstructures in optically diffuse media such as biological tissue. / Hoelen C.G.A., Dekker A., de Mul F.F.M. // IEEE Transactions on Ultrasonics, Ferroelectrics and Frequency Control. - 2001. - Vol. 48, No. 1. - P. 37-47.

J32. Yim P.J. Gray-scale skeletonization of small vessels in magnetic resonance angiography. / Yim P.J., Choyke P.L., Summers R.M. // IEEE Transactions on Medical Imaging. - 2000. - Vol. 19, No. 6. - P. 568-576.

J33. Ruola Ning. Flat panel detector-based cone-beam volume CT angiography imaging: system evaluation. / Ruola Ning, Biao Chen, Rongfeng Yu, Conover D., Xiangyang Tang, Yi Ning. // IEEE Transactions on Medical Imaging. - 2000. - Vol. 19, No. 9. - P. 949-963.

J34. Gens F. Estimation of the correlation amplitude of RF signals in small cutaneous vessels. / Gens F., Remeuieras J.-P., Diridollou S., Patat F. // IEEE Transactions on Ultrasonics, Ferroelectrics and Frequency Control. - 2000. - Vol. 47, No. 6. - P. 1455-1462.

J35. Tohyama O. Fiber-optic tactile microsensor for detecting the position of the tip of a fiberscope. / Tohyama O., Maeda S., Itoh H. // IEEE Journal of Selected Topics in Quantum Electronics. - 1999. - Vol. 5, No. 1. - P. 115-118.

J36. Yi Sun. Performance analysis of maximum intensity projection algorithm for display of MRA images. / Yi Sun, Parker D.L. // IEEE Transactions on Medical Imaging. - 1999. - Vol. 18, No. 12. - P. 1154-1169.

J37. Guang-Zhong Yang. CT image enhancement with wavelet analysis for the detection of small airways disease. / Guang-Zhong Yang, Hansell D.M. // IEEE Transactions on Medical Imaging. - 1997. - Vol. 16, No. 6. - P. 953-961.

J38. Sonka M. Adaptive approach to accurate analysis of small-diameter vessels in cineangiograms. / Sonka M., Reddy G.K., Winniford M.D., Collins S.M. // IEEE Transactions on Medical Imaging. - 1997. - Vol. 16, No. 1. - P. 87-95.

J39. Ishizuka Mamoru. Precise magnetization measurements under high pressures in the diamond-anvil cell. / Ishizuka Mamoru, Amaya Kiichi, Endo Shoich. // Review of Scientific Instruments. - 1995. - Vol. 66, No. 5. - P. 3307-3310.

J40. Ferrara K.W. Effect of the beam-vessel angle on the received acoustic signal from blood. IEEE Transactions on Ultrasonics, Ferroelectrics and Frequency Control. - 1995. - Vol. 42, No. 3. - P. 416-428.

J41. Voslamber D. Self-calibrating magnetic field diagnostics in beam emission spectroscopy. Review of Scientific Instruments. - 1995. - Vol. 66, No. 4. - P. 2892-2903.

J42. Nohara T.J. Growler detection in sea clutter with coherent radars. / Nohara T.J., Haykin S. // IEEE Transactions on Aerospace and Electronic Systems. - 1994. - Vol. 30, No. 3. - P. 836-847.

J43. Mazzucato E. TFTR microwave reflectometer (abstract). / Mazzucato E., Nazikian R., Bretz N., McCarthy M., Nagy A. // Review of Scientific Instruments. - 1992. - Vol. 63, No. 10. - P. 4657.

J44. Shintomi T. Construction of a large superconducting spectrometer magnet. / Shintomi T., Aoki K., Doi Y., Makida Y., Hashimoto O., Kitami T., Miyaji T., Nagae T., Sekimoto M. // IEEE Transactions on Magnetics. - 1991. - Vol. 27, No. 2. - P. 1961-1964.

© В.И. Карнышев, 2011
Тематический реферативный сборник сгенерирован в атоматическом режиме
с использованием специализированного программного модуля (ПИО ТУСУР)