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ТЕМАТИЧЕСКИЙ РЕФЕРАТИВНЫЙ СБОРНИК № 29-2

**“Photonics Device Design Principles”
(«Принципы проектирования приборов фотоники»)**

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ТЕМАТИЧЕСКИЙ РЕФЕРАТИВНЫЙ СБОРНИК № 29-2

"Photonics Device Design Principles" («Принципы проектирования приборов фотоники»)

Публикации в трудах конференций

"Active and reactive power control of Proton Electrolyte Membrane Fuel Cell based Distributed Generation System"

This paper deals with the design, analysis, modeling and control of Fuel Cell based Distributed Generation System. This includes the modeling of Proton Electrolyte Membrane Fuel Cell and the Power Conditioning Unit interfacing the Fuel Cell to the Utility Grid with proper power flow control. The output of the Fuel Cell Stack is connected to the DC side of the Voltage Source Inverter for interfacing to the Grid. The active power transfer is based on the phase angle between DC-AC converter output voltage and Grid voltage and reactive power management is based on magnitude of these voltages. The entire system is modeled in MATLAB/Simulink environment and simulations carried out to verify the operation and the control principle. Various simulation results are presented for the proposed Fuel Cell Grid interfaced system. [C1]

"A 12kW three-phase modular converter with unity power factor for telecom power supplies"

In this paper, a new 12kW single stage modular ac-dc converter is presented with unity power factor for telecom power applications. The combination of three single phase modules and a virtual neutral terminal device is a powerful method to design a three-phase modular converter system with power factor correction. It is based on the principle of connecting three single-phase modules in a three-phase group by creating a virtual neutral using a zig-zag transformer. The steady state analysis and design of the modular converter in continuous conduction mode (CCM) is illustrated with a simplified design example. The performance of such a modular converter system is studied and evaluated with extensive MATLAB simulation. [C2]

"Voltage-mode controller design for soft-switching high gain boost converter"

In this paper digital voltage-mode controller design for a zero-voltage turn-on high gain boost converter is presented. Firstly, the converter steady-state performance is analyzed by using circuit theory principles. This analysis shown that this converter circuit exhibits five different modes of operations in one switching cycle and also results in zero-voltage transition to the switching devices. Control-to-output z-domain transfer function is formulated, using system identification toolbox of the MATABL, and then used in the direct digital controller design. A pole-zero placement technique is adopted to arrive at final digital voltage-mode controller. Closed-loop converter performance is predetermined, for a 24 to 100 V 100 Watt prototype both in matlab and PSIM software, and then compared with experimental measurements. Experimental measurements are in close agreement with simulations. [C3]

"Decision method based on relational synthetic analysis"

Often in face of deciding schemes with many factors in production and life, relational analysis of the factors is an important basis of decision. The decision method is analyzed and studied to avoid strong subjectivity and improve weighting rationality. Optimization and entropy of information are used to adjust the weighting values of each factor and BP neural network to learn how to train assignment. According to principles of gray relation, a decision method based on gray relational synthetic analysis has been proposed, the decision model established and decision processing algorithm designed. The simulation with Matlab software proves the decision result is correct, which realizes the purpose of decision in the condition of multiple factors. [C4]

"Study on enterprise training design of MOODLE"

The competitiveness of enterprises is embodied in the competition of talents to a large extent. The foundation and development source of Enterprise is to have sufficient talents with innovative ability. Good corporate training, which is wide attention from the society, cultivates a large number of talents for enterprises. Firstly, the thesis analysis the common problems in the current corporate training and the advantage of MOODLE, which raises the enterprise training model based on MOODLE platform and aims to solve the general problem of enterprise training. Secondly, This thesis analysis the system design stage of MOODLE platform, constructs system

structure on MOODLE platform and analysis the principles of application on the MOODLE training platform. Finally, the advantages and disadvantages of MOODLE technology's application in enterprise training are summarized in total. [C5]

"Design and realization of county land and resources management information system based on grid system"

Taking grid system as the basic of land management, this paper focused on the establishment of county land and resources management information system based on grid system. Presentation layer, application layer and data layer were proposed to construct the frame of county land and resources management information system. After the principles of grid dividing been clear, methods and thoughts based on three-level land grid were explained in detail. And the mechanisms and processes of county land data were discussed in detail. Finally, combined with the actual design in Shapingba of Chongqing, the prototype of county land grid management information system was realized. The results provide guidance and reference for other county in land management information system. [C6]

"Research and realization of CAN-TCP/IP embeded gateway based on uClinux"

Introduced the basic principles of CAN bus and the uClinux application development model, described how to design and implement embedded CAN-TCP/IP gateway applications in the uClinux detailly, and explained interface design of the PC-Windows Ethernet communications. [C7]

"Research of high-speed nondestructive detector for powerful conveyor belt based on x-ray"

This paper has carried out a research on high-speed nondestructive detector for powerful conveyor belt based on x-ray, which also implements Ethernet communication based on Sopc. It also proposes the design plan of nondestructive detector for powerful conveyor belt based on high-speed x-ray; with the adoption of the embedded FPGA chip Spartan-3E from Xilinx which has a high performance-and-price ratio, it also designs the hardware circuit under Altium Designer 6.7 and utilizes the high-speed PCB principle to design the circuit board of the detector, which ensure the reliability of the detector; it has proposed a algorithm fit for the images of powerful conveyor belt based on high-speed x-ray, used the EDK,Sopc development tool to set up the hardware system based on 32 bits embedded soft core MicroBlaze, developed the application software of the detector on the embedded operating system of Xikernel and utilized μ C/OS-II as the operating system, Lwlp of TCP/IP protocol stack and application-level protocol-HTTP to implement the Ethernet communication based on Sopc. [C8]

"An estimating system using electromyography for therapeutic exercise"

This system uses the principle of therapeutic exercise in continuous passive motion (CPM) to establish an efficiency estimating system to supply scientific, quantified data as the basis of estimation in treatment. The proposed system can assist doctors in diagnosing and treating patients, decrease therapy duration, and enhance therapeutic efficiency. The proposed system combines an estimating system and a traditional continuous passive motion machine, and uses electronic circuit design technology. Parameter analysis was performed using electromyography (EMG) signals to establish a prediction and diagnosis system for therapeutic exercise efficiency estimation. [C9]

"Fabrication and design of Diffractive Optical layer applied to Resonant Cavity LED"

To optical packaging cost and enhance alignment accuracy, a new application strategy of Diffractive Optical Element (DOE) had been proposed to develop a new technology that can integrate DOE and Resonant Cavity LED (RCLED) in semiconductor manufacture processing. The passivation layer SiO₂used to fabricate the integrated DOE of Dammann Grating. Applied scalar diffraction principle through using G-solver software, Binary Phase Fourier Grating (B.P.F.G.) was designed to control the spatial distribution of emitted light energy along LED surface through adjusting geometric shape and depth of grates. Confirming several B.P.F.G. designs by measuring outcome light distributions, such DOE had been successfully manufactured directly on LED wafers. [C10]

"About distributed intrusion Detection System's research"

With the risk factor of network security continuously improving, firewalls, which once as a means of the most important safety precautions, can no longer satisfy people's demand for network security. As a complement of the firewall, Distributed Intrusion Detection System can effectively improve the security. This article describes the framework, the structure, the Working principle, the functional structure and the development status quo, the

development trend and the algorithm design of Distributed Intrusion Detection System, analyzes the data collection module operation of Distributed Intrusion Detection System. As Distributed Intrusion Detection System can prevent internal attacks, external attacks and disoperation, it plays a crucial role in the network security protection. [C11]

"The evaluation method of multi-objective optimization in engineering network planning based on coordinating degree"

It is an effective evaluation method of multi-objective optimization in engineering network planning put forward in this paper. The optimization of schedule control subsystem, cost control subsystem, resource control subsystem and quality control subsystem is based on the technology of engineering network planning. According to the principle of system coordinating control, the model of coordinating function is established and the evaluation criteria system of coordinating degree is designed. With the combination of four targets-short time limit, low cost, proportionate resources and high quality and AHP method, we can get the most proportionate network planning whose validity is verified through illustration. [C12]

"Classic brand across time and space the case analysis of world-famous brands L'Oreal Paris"

We'll to find out the real reason of its success through the analysis of world-famous brands L'Oreal Paris. Through the unique strategy, sword pointing extraordinary position, with the particular approach, use science and technology to build high-end products, of L'Oreal Paris to study its product and its design positioning. Meanwhile the principle of "people-oriented" is always insisted on during the product development. With the humanization idea and pursuit of natural beauty, it's research and development of green products for desire of consumers. Furthermore, as a result of surprise attack L'Oreal Paris is good at grasping the "business management" in the varied market. Not only gained a huge commercial interests but also achieve success in China which is the world's largest potential market depend on its unusual advertising strategy. These are the fundamental reasons why L'Oreal could become a classic brand across space and time. [C13]

"A design for architecture model of Web Access Patterns Mining system"

Web Access Pattern Mining (WAPM) technology can automatically discover such knowledge as users' access preferences, interests and trends etc from log files of web server or browser. It has gradually been one of hot topics in the web mining. Firstly, this paper presents a full general architecture model of WAPM system and introduces the work principles of main parts in this system. On the basis, many new advances of major steps in WAPM are elaborated and analyzed, including data collection, data preprocessing, patterns discovering and visualization interface. Finally, some future important works on research field of WAPM are given. [C14]

"Coherent Direct Sequence optical en/decoding employing low cost DFB lasers with narrow optical band consumption-towards realizable photonic label switching"

We have tested experimentally the use of low cost DFB pulsed sources with narrow spectral bandwidth for all optical en/decoding based in Direct Sequences coherent technique and employing SSFBG which can be considered like a low cost alternative for header generation and recognition in PLS networks. The working principle was proven employing 20 ps pulses and SSFBGs designed with chip rates of 104 and 174 Gchips/s, obtaining an ACP versus XC ratios of 9 and 7 respectively. [C15]

"Iterative demapping and decoding for bit-interleaved coded modulation in optical communication systems"

Considering the growing demand for high-rate data services, the capacity of optical fibers has to be exploited close to its theoretical limit. In addition to techniques mitigating dispersions, coherent detection and polarization multiplexing (PoLMUX) as well as forward error correction (FEC) using high-rate block codes are already applied. However, to approach channel capacity, multi-level signaling for high spectral efficiency is mandatory. Orthogonal frequency division multiplexing (OFDM) in combination with multiple-input/multiple-output (MIMO) PoLMUX equalization is a straightforward approach to cope with dispersions. Since higher modulation formats like 16-QAM and beyond are increasingly sensitive to noise, additional FEC for optical OFDM, also referred to as coded optical OFDM (CO-OFDM), has to be considered for a bit error rate (BER) $< 10^{-15}$. In order to achieve a performance close to the capacity limit, we apply an additional high-rate inner code to protect the multi-level signaling scheme, so-called bit-interleaved coded modulation (BICM), in combination with soft demapping and iterative decoding techniques. In this contribution the design principles of a BICM system using iterative demapping and decoding (BICM-ID) and its promising performance will be discussed. [C16]

"Anchor-based programming teaching embedded with Ch platform"

C Programming learning is a hard task. On one hand, complex concepts and principles in C programming is tedious for many novices. On the other hand, even when students know about the syntax detail, they fell still confused on how to construct a real application. To solve the problems, we presented the "student-centered" environment to facilitate programmers' knowledge and ability construction. Based on the theory of anchored instruction, the "student-centered" environment consists of anchor, an efficient Ch platform and group learning. Ch platform support efficient principle learning while group learning on anchor helps programming development. The anchor in this paper is indicated as an application of "student performance management system". In this paper, we proposed also the design of "student-centered" environment with a successful teaching implementation to support it. [C17]

"Nanoplasmonic cavities and waveguides: From design principles to active modulation and gain"

The design of plasmonic cavities and waveguides will be elucidated, focusing on new developments in nanoplasmonics such as coherent effects for cavity mode shaping, and hybrid structures including active materials for modulation and gain. [C18]

"Fault-tolerant Localization for multi-UAV cooperative flight"

A novel fault-tolerant localization method for low-cost UAVs flying at constant altitude is proposed in this paper, which is based on measuring relative ranges from one UAV to other UAVs. Contrast to the traditional navigation methods of single aerial vehicle, like INS/GPS and SINS/GPS, the proposed method is more suitable for low-cost small-size UAVs because of its low requirement to the navigation device. Furthermore, its localization accuracy is higher than other methods for multi-UAV because the sharable information in multi-UAV network is made full of use. Similar to the principle of GPS, the method takes three other UAVs as the reference points of an UAV whose GPS receiver works improperly due to failure. Thus the UAV's location in 2D horizontal plane can be determined by using the relative ranges from the faulty UAV to the other three UAVs at known location in inertial coordinate system. In order to improve the accuracy of estimated location, a Kalman filter is designed, which can calculate the variance of observations in terms of horizontal dilution of positioning (HDOP) adaptively. Meanwhile, option of the reference points is also optimized in the paper. Simulation results in MatlabSimulink show the effectiveness of the proposed approach. [C19]

"Intelligent Traffic Management system base on WSN and RFID"

With wireless communication and the speedy development of micro-electro-mechanical system (MEMS), the wireless sensor network (WSN) has aroused enthusiasm in the world. The research of intelligent transportation system base on WSN is a hotspot to solve the traffic problems in recent years. This paper first introduces intelligent transportation system base on RFID and WSN, then discusses the hardware and software design principles of the system. It has produced the wireless long-distance automatic monitor sensor network design realization plan, finally it forecasts the development of intelligent transportation system. Practice shows that the system is characterized by low cost, economic and pragmatic and high reliability. [C20]

"CIC interpolation filter design in the audio decoder"

In order to get high-quality audio output in the audio decoder, analog low-pass filter to reduce the design difficulty, then the interpolation filter as its digital signal processing part of an integral important part of CIC filters are commonly used in the interpolation process highly efficient filters, with a simple structure, easy to implement advantages. This article is in the possession before the two half-band filter to provide the basis of four over-sampling, in order to further improve the over-sampling rate designed for multi-stage cascade CIC interpolation filters. First introduced the principle of CIC filter is given CIC filter design methods, and analysis of cascaded CIC filter order of magnitude and the filter selection of the pass-band attenuation and the impact of side lobe suppression, through the MATLAB simulation results validate the design effectiveness and feasibility of the method. For digital audio signal processing provides a feasible method of link. [C21]

"Research and modeling the ancient architecture system in VRML"

VRML has already become the standard for the distribution of 3D virtual worlds on the Internet. Modeling the ancient architecture system is one of the important contents of virtual reality technology, which has a broad prospect for application in the fields of architecture, tourism, military and computer game design. This paper firstly introduces the principle of virtual reality modeling language VRML, analyzes its operating principle and basic elements. Then it introduces the process of system design and realization including developing tools, whole model establishing, collision detecting, effect romancing, file optimizing, scene combining and system

releasing. Finally, the ancient architecture system constructs taking Fragrance Hill as the background and introduces the web-browse module and the optimization mode of the scene. [C22]

"Resonant lenses as building blocks for advanced narrow-band integrated receivers"

Paper describes the electromagnetic performance of compact-size dielectric lenses typically used as building blocks for integrated lens antennas operating at the microwave to optical ranges. Three configurations of lenses are studied, namely: multi-shell spherical, extended hemielliptical, and shaped ones. Although lenses are usually considered as wideband devices whose operation principles are based on the Fresnel laws, under certain circumstances the modal (resonant) features of the aforementioned lenses can become dominant and significantly affect their focusing and collimating capabilities. In most scenarios excitation of internal resonances is an unwanted phenomenon. Nevertheless, we demonstrate that it can be used to design hybrid-type resonant-lens integrated receivers with enhanced sensitivity achieved thanks to exploitation of both optical and modal features of the lenses. [C23]

"GMPLS energy efficiency scheme for Green Photonic Networks"

Since its emergence the internet has been a significant part of today's modern living. Defined by its interconnections and routing policies, it has fuelled increased demands for provisioning of new more advanced services that are able to dynamically react to changes within the network. These services however, lead to enormous energy consumption in contrast to a global drive for a greener environment. Hence the existence of an optical infrastructure that complies with the principles of zero-carbon emission is imperative. Subsequently, in this paper, we present an energy model of Generalized Multi-Protocol Label Switching (GMPLS) network for more power efficient Green Photonic Networks. We are proposing a greener network design based on a novel routing algorithm to deliver power reduction through implementation of so called "Hibernation" approach. The scheme includes network topology such as group the nodes configuration, segmentation of the link/ports, and wavelength provisioning via partitioning. The performance evaluations of these energy saving schemes are investigated by including various challenging issue on "greening the internet" and reduces carbon footprint. In addition, to study the impact of wavelength request, blocking probability and power consumption in relation to network load is taken into account. A trade-off is observed between energy per bit, wavelengths offered (Erlang) and blocking probability as a result of the idling nodes. [C24]

"Notice of Violation of IEEE Publication Principles 3-D Spherical perfectly matched layer for finite-volume domain truncation"

Notice of Violation of IEEE Publication Principles "3-D Spherical Perfectly Matched Layer for Finite-volume Domain Truncation," by Hong-Xing Zheng, Wei He and Chong Peng in the Proceedings of the 2010 International Conference on Microwave and Millimeter Wave Technology (ICMMT), pp.113-116, May 2010 After careful and considered review of the content and authorship of this paper by a duly constituted expert committee, this paper has been found to be in violation of IEEE's Publication Principles. This paper contains significant portions of original text from the papers cited below. The original text was copied without attribution (including appropriate references to the original author(s) and/or paper title) and without permission. Due to the nature of this violation, reasonable effort should be made to remove all past references to this paper, and future references should be made to the following articles: "Spherical Perfectly Matched Absorber for Finite-volume 3-D Domain Truncation," by C. Fumeaux, K. Sankaran, R. Vahldieck in the IEEE Transactions on Microwave Theory and Techniques Vol. 55, No. 12, pp. 2773-2781, December 2007 "Finite-Volume Time-Domain Analysis of a Cavity-backed Archimedean Spiral Antenna" by C. Fumeaux, D. Baumann, R. Vahldieck in the IEEE Transactions on Antennas and Propagation Vol. 54, No. 3, pp. 844-851, March 2006 To reduce computational area, the 3-D radial perfectly matched layer is proposed. Using a generalized approximate formulation, a spherical absorber modeling is set up. The performance of this absorber is characterized with numerical experiments. As practical application of the technique, a newly designed spiral antenna is simulated. Result is very good agreement with measured data. The excellent performance of the spherical absorber is demonstrated. [C25]

"First Principle Study of the Adsorption of Mercury on the Carbon Surface"

The interactions of mercury with the carbon surface are investigated by performing the density functional electrical structure calculation. The five different carbon groups bonded with the elemental hydrogen and chlorine are proposed to build the carbon surfaces. The calculations are presented for mercury sorption on both on-top (T) and sixfold-angle (A) sites. The adsorption energy curve reveals that the adsorptive capacity for mercury on the T or A site absorbed on the symmetrical carbon groups can be improved following the increasing size of molecules, which can not be suitable for the unsymmetrical carbon group structures. For the mercury on the A site, the carbon group with the different absorptive positions on the sixfold carbons usually have equal adsorption

energy. Even though several carbon groups present the inequable cases, the differences remain a constant value. The conclusion is significant to design and operate the mercury emission control based on the carbon surface. [C26]

"Environmental Monitoring System Based on GIS and Wireless Communications"

To solve the problems in environmental monitoring arising from remote data acquisition, real-time transmission and analysis, this paper researched the principle of wireless communications SMS / GPRS and the technology of seamless integration with GIS. The system architecture was designed and key technical solutions were implemented. Based on the SMS / GPRS technology, the wireless real-time transmission of the remote monitoring data was achieved, and GIS visualization technology was carried out to visualize the monitoring data. Geographic affected areas were analyzed by GIS spatial analysis. The system is applicable to the environmental protection departments to realize applications such as monitor data acquisition, communication transmission, GIS management and analysis and decision-making. [C27]

"Experiment Simulation of Tumor Target Breathing Movement Inversely Tracking System"

Objective In order to reduce the region of the tumor target's breathing movement . **Method** This method adopts a set of inversely tracking system developed by us to inversely track the path of tumor target's breathing movement, and we use the protel SE software to design a set of simulation circuit system to imitate the working principle of the inversely tracking system. **Result** The motor stepper which is used to drive the tracking couch to work can turn around synchronously and inversely relative to the phase of the input control sine signal . The input sine signal is assumed as the periodical regulation of the tumor target's breathing movement. **Conclusion** In this way we can effectively reduce the influence on Radiation Therapy caused by tumor target 's breathing movement. But what we should do is how to increase the accuracy of the motor stepper's working in order to make the tracking couch offset the displacement of tumor's breathing movement at largest extend. [C28]

"Simulation Analysis on the Bionic Micro Robot Operating in the Vascular Environment"

Based on the motion principle of gastropod, a novel interventional minimal invasive robot which has the ability to run smoothly in the biological lumen with impulsive flowing liquid has been presented. Simulation models of the interventional micro robot operating in the straight or the bend blood vessels have been established with the software of Fluent. Blood flow distribution and the impact force acting on the robot by the impulsive blood flow have been simulated and calculated. All the results will provide strong proofs for the structure design and motion control of the micro robot. [C29]

"Eutrophication Prediction Model of Bohai Bay Based on Optimized Support Vector Machine"

In this research, optimized SVM models were designed to describe eutrophication processes, based on the field measured data from Bohai Bay. A new data-driven model called Support Vector Machine (SVM) based on structural risk minimization principle was presented, which minimized a bound on a generalized risk. In the eutrophication model, the Principal Component Analysis (PCA) was used to identify the model inputs. After data scaling, cross-validation via parallel grid search and genetic algorithm were respectively employed to select the optimal parameters of SVM. The model performance was evaluated by means of the squared correlation coefficient R^2 and the Root Mean Square Error (RMSE). The results suggest that parameters optimization is very important and necessary for SVM, and SVM-GA (Genetic Algorithm integrated with SVM) possesses slightly better searching optimization ability. It was shown that this optimized SVM techniques could be applied to predict the concentration of Chlorophyll_a in Bohai Bay and capture the non-linear information in eutrophication processes. [C30]

"Application of multimedia technology in football theory course"

From multiple angles, the application of multimedia technology in teaching in football theory course can provide sound, image, icon and other information for students across time and space, which will enable them to receive good effect. Multimedia teaching helps students to take interest in learning, which can improve learning efficiency. Multimedia teaching helps to resolve the important and difficult teaching points, which is conducive to individualized, personalized instruction. This paper focuses on the study of design and application in football multimedia courseware. It also presents the student-centered design principles and analyses the structural design, teaching content as well as functional design of football multimedia courseware. And this paper discusses the application of multimedia technology and deficiencies of multimedia teaching. [C31]

"Design and realization of multiplexer based on Schematic and VHDL Language"

In electronics, a multiplexer is a device that performs multiplexing; it selects one of many analog or digital input signals and forwards the selected input into a single line. In this paper, we propose a design method for multiplexer design in the environment of single-cycle CPU system based on the MIPS instruction set, and the software Schematic and VHDL is introduced in order to speed up the development cycle. Furthermore, we discuss the consideration and operational principle of design and realization in detail. The simulation results for the part constructed by FPGA are also presented. [C32]

"Leveling control technology of hydraulic system based on fuzzy decoupling algorithm"

Hydraulic leveling system has been widely used in modern national defense and civilian technologies. The control of hydraulic automatic leveling is a complex nonlinear time-varying system, and during the hydraulic leveling, the system will appear the "implicated coupling" problems between hydraulic legs as well as between the angle and legs. In this paper, the "surface -adjust-surface" leveling technique is proposed by the leveling method. The method is based on the target surface with multi-point and multi-direction control by outputting control variables from leveling the relative position between leveling surface and target surface. We design the decoupling fuzzy controller of MIMO(multiple input multiple output) nonlinear dynamic solution. Besides, we adopt fuzzy decoupling algorithm to correct the output variables on line, so as to solve the coupling problem in the process of leveling and realize the multi-point adjustment. After on-site commissioning and target practice test, the result shows that the method not only has the advantage of simple principle and stable-reliable control performance, but also perfectly realizes precise and rapid leveling of hydraulic overloading platform. It can be promoted applies in the multi-spot automatic leveling system. [C33]

"Review of ICA Based Fixed-Point Algorithm for Blind Separation of Mixed Images"

The blind separation of mixed images is a very exciting area of research. However, classical techniques such as eigen and singular value decomposition, which are based on second order statistics, fail to blindly separate mixed signals in many circumstances. A rapidly developed statistical method during last few years, Independent Component Analysis (ICA), which is based on higher order statistics, aims at searching for the components in the mixed signals that are statistically as independent from each other as possible. This paper introduces the fundamental theory and basic model of ICA, and analyzes the math principle of frequently-used fast fixed point algorithm for ICA, and applies the algorithm in blind separation of randomly mixed images. The results shows that the algorithm is very effective and reliable. [C34]

"Adaptive Neural Network Control of FES Cycling"

FES cycling is a safe and easy way for the rehabilitation of spinal cord injury (SCI) patients. In order to design an control system for FES cycling, this paper presents a control strategy of the cycling induced by FES. The control system is developed based on artificial neural networks and consists of two layers: the outer layer controls the FES cycling model dynamics and generates desired torque; the inner layer controls multi-muscle to generate the torque that tracks the desired torque. And the distribution of multi-channel FES stimulation intensities is optimized based on the energy and muscle fatigue minimization principles. The simulation results show that the control system designed in this paper is stable and robust to muscle fatigue. Finally, some remarks are given on the clinical experiments of this control strategy. [C35]

"Detection DNA Point Mutation with Rolling-Circle Amplification Chip"

We present a protocol with isothermal rolling-circle amplification (RCA) to detect DNA point mutation on chip. The basic principle of the method is an allele-specific oligonucleotide circularization mediated by special DNA ligase. The probe is circularized when perfect complementary sequences between the probe oligonucleotide and target DNA. Mismatches around the ligation site can prevent probe circularization. The circularized probe (C-probe) can be amplified by rolling circle amplification to generate multimeric singlestranded DNA (ssDNA) Under isothermal condition. There are sequence regions to bind respectively with fluorescent probe, solid probe and Artificial template in the C-probe which we designed. These ssDNA products are hybridized with fluorescent probe and immobilized on a glass slide composing a regular microarray pattern. The signal of fluorescence can be monitored by a scanner in the presence of nucleic acids templates, whereas the probe cannot be circularized and signal of fluorescence cannot be found. The stringency discrimination of the molecular templates are up to 102-103folds between matched and mismatched sequences. The development of C-probe-based technologies offers a promising prospect for situ detection, microarray, molecular diagnosis, single nucleotide polymorphism, and whole genome amplification. [C36]

"A Ku band waveguide bandpass filter with E-plane metallic diaphragm"

The equivalent network parameters of the E-plane metallic diaphragm mounted in waveguide are analyzed

based on variation principle in this paper. The complete design formulas and parameter optimization objective functions of the E-Plane metallic diaphragm filter are presented. The Powell optimization and HFSS modeling are adopted in the filter design. The filter has very good performance on insertion loss and square ratio. Relevant test results are recommended. [C37]

"Minimized Ku band microstrip circulator design"

Double Y-junction is a traditional central conductor shape for microstrip circulator. In order to minimize the dimension, An improved double Y-junction microstrip circulator design in Ku band is described in this paper. In addition, a simple principle of how to select a proper kind of ferrite is introduced. The experimental model and test results are given proved the efficiency of the design. [C38]

"Design of improved quad-ridged orthomode transducer"

A high performance quad-ridged orthomode transducer (OMT) with small size was designed based on the traditional quad-ridged OMT for C band receiver of shanghai 65m radio telescope. The structure and working principle of the improved OMT were introduced, detail size and main performance characteristics were given, and FEM and FIT methods were used to verify the reliability of the improved quad-ridged OMT. Finally, the tolerance of the OMT is analyzed. [C39]

"Classification of radar signals using time-frequency transforms and fuzzy clustering"

A method based on Smoothness Pseudo Wigner-Ville distribution and kernel principle component analysis is proposed to extract features of radar emitter signals. Then, these discriminative and low dimensional features achieved were fed to the classifier which is designed based on fuzzy Support Vector Machines (SVMs). In simulation experiments, the classification of two-class LFM signals was compared with four kernel functions. And the classifier attains over 83% overall average correct classification rate for five radar signals. Experimental results show that the proposed methodology is efficient for complex radar signals detection and classification. [C40]

"Simplified treatment for radiation mode in coupled-mode analysis"

In coupled-mode analysis, an approximate treatment for radiation modes in open waveguides by equivalent leaky modes in equivalent closed waveguides is presented. The equivalent closed waveguide obtained by enclosing an open waveguide with properly designed PML (perfected matched layer) terminated by PEC (perfect electric conductor) consists of a complete set of orthogonally discrete complex modes. From the solution system of the present equivalent model, a finite number of equivalent leaky modes are chosen to represent the radiation modes to be known according to the condition of phase matching in mode couplings. The coupling with radiation modes is thus treated with the same fashion as that between guided modes and greatly simplified. The equivalent principles and schemes are discussed, meanwhile the effectiveness and accuracy of this treatment is validated by the simulation results of long period fiber gratings (LPG) with an outer cladding of a high or equal refractive index. [C41]

"Exploiting finite precision information to guide data-flow mapping"

Advanced handheld applications are demanding for implementations of higher energy efficiency and higher performance. In typical implementations, the finite precision information is only known after fixed-point refinement, once the data-flow has been frozen. Instead, in this paper we suggest the propagation of finite precision information to drive data-flow transformations in order to achieve a higher mapping efficiency. Then, provided a flexible architecture with low run-time switching overhead, the data-flow under execution can opportunistically be tuned to provide the instantaneous computational accuracy required by the application. Thereby, the average number of operations and the precision of those is minimized. This principle is demonstrated with the implementation of the 128-point FFT present in a WLAN receiver. Compared to a conventional implementation, a reduction of 49% to 65% of the number of cycles can be achieved depending on conditions external to the receiver. [C42]

"Joint DAC/IWBDA special session engineering biology: Fundamentals and applications"

In the nascent field of synthetic biology, researchers are striving to create biological systems with functionality not seen in nature. This special session features talks that emphasize the fundamental engineering principles underlying this endeavor, highlighting possible synergies with electronic design automation (EDA). Pamela Silver will describe designing and constructing proteins and cells with predictable biological properties. These serve as potential therapeutics, cell-based sensors, factories for generating bio-energy, and bio-remediation. J.

Christopher Anderson will demonstrate how complex biological functions can be decomposed into modular devices. He will describe the construction of therapeutic organisms and new tools for building complex systems. Richard Murray will discuss the use of concepts from control and dynamical systems in the analysis and design of biological feedback circuits at the molecular level. [C43]

"Design and fabrication of planar GaAs Schottky barrier diodes for submillimeter-wave applications"

The design consideration and fabrication of a planar GaAs Schottky barrier diode with cutoff frequency up to 650 GHz is presented in this paper. The theory and design principle was given at the beginning. Then, the key material and geometrical parameters are analyzed using electron behavior analysis and the finite element method. Considering the analyzed results as well as fabrication cost and complexity, a group of trade-off parameters was determined. Finally the Schottky diode was fabricated and measured. [C44]

"Smart antenna design for GPS/GLONASS anti-jamming using adaptive beamforming"

Smart antenna has the advantage of suppressing jamming in spatial region and improving signal to Interference plus Noise Ratio (SINR) of receive signals, thus it is recognized as the promising technologies and indispensable anti-jamming methods. This paper presents a practical design of smart antenna system for GPS/GLONASS anti-jamming base on adaptive beam-forming. It firstly introduces the basic concepts and principles of the smart antenna, provides the structure of the system, analyses and discusses each component, then designs a anti-jamming smart antenna for GPS and GLONASS, ultimately realizes a flexible hardware platform base on the technology of digital signal processor (DSP), field-programmable gate arrays (FPGA), and software defined radio (SDR). [C45]

"A broad-band analog phase shifter design on I-Q vector modulator"

Phase shifter is widely applied in some area, including communication and radar. In the study, the principle of broadband analog phase shifter on I-Q modulating is introduced, which is validated by the theory design using Ansoft serenade. The microwave phase shifter on I-Q modulating broadband is simulated and the corresponding entity is designed. Finally, some test are done to the phase shifter, and we sum up the design experience, all those can provide some design experience with the engineers. [C46]

"A computer based simulator for Erbium-Doped Fiber Amplifier"

This paper presents new open source computer based simulator for the implementation of single stage Erbium-Doped Fiber Amplifier (EDFA) such as single pass (SP), double pass (DP) and triple pass (TP) EDFA. In this software it is possible to manipulate the design parameters such as pump power, pump wavelength, signal power, signal wavelength, fiber length, doping concentration etc. and based on the design parameters, the performance parameters i.e. gain and noise figure will be shown on the display. The proposed simulator has been developed by using the mathematical model of EDFAs. The working principle of this software has been explained in this paper. Matlab GUI has been used to design the proposed software. [C47]

"A cognitive developmental robotics architecture for lifelong learning by evolution in real robots"

This paper is devoted to a detailed presentation of the current state of the Multilevel Darwinist Brain (MDB) cognitive architecture for lifelong learning in real robots. This architecture follows the cognitive developmental robotics approach and it is based on concepts like embodiment, open-ended lifelong learning, autonomous knowledge acquisition or adaptive behaviors and motivations. In addition, this version of the MDB architecture incorporates several improvements related with more practical issues, which are the result of the experience gained through several experiments with real robots in the last few years. The MDB uses evolutionary algorithms in the knowledge acquisition process, which implies the need of paying attention to the efficiency of the computational implementation. Here, we first describe the cognitive model on which the basic operation of the architecture is based and, secondly, we detail the main aspects and working of the current version of the MDB. Finally, we have designed a very simple but illustrative real robot lifelong learning example, where we can show how to set up an experiment using the MDB. Hence, with this simple example we show the successful behavior of the MDB cognitive developmental robotics principles. [C48]

"An open-source real-time system for remote robotic control using Neuroblastoma cultures"

This paper introduces an open-source real-time system that controls remotely a robot using Human Neuroblastoma cultures and basic Braitenberg principles. Multielectrode Arrays Setups have been designed for direct culturing neural cells over silicon or glass substrates, providing the capability to stimulate and record

simultaneously populations of neural cells. The main objective of this research is to modulate the natural physiologic responses of human neural cells by tetanic stimulation of the culture. If the system is able to modify the selective responses of some cells with a external pattern stimuli provided by a robot over different time scales, the neuroblastoma-cultured structure could be trained to process pre-programmed spatio-temporal patterns, controlling in this way the robotic behaviour. [C49]

"Hardware implementation of stochastic-based Neural Networks"

In this work we review the basic principles of stochastic logic and its application to the hardware implementation of Neural Networks. In this paper we show the mathematical basis of stochastic-based neurons along with the specific circuits that are needed to implement the processing of each neuron. We also propose a new methodology to reproduce the non-linear activation function. The proposed methodology can be used to implement any kind of Neural Network. [C50]

"Current sensor with the DSP"

The objective of this paper is to describe a method of current measurement by using sensor without magnetic core based on the principle of Hall sensor. This method doesn't use any robust ferrite magnetic field concentrators. The measurement system is protected towards the external disturbances by signal processing. The field sensors are connected directly to the DSP board. This current measurement system is designed for measuring in the field of power electronic devices. Therefore it must fulfil the requirements for galvanic isolation, DC and AC current sensing, high frequency bandwidth (more than 30 kHz), overloading and high electromagnetic disturbance immunity. The outputs of sensors are computed by the DSP algorithms. The expansion interface of all peripheral circuits was designed and proved. The standard evaluation kit with TMS320F2812 made by Texas Instruments is used. [C51]

"Nonlinear dynamics of coupled oscillators: State space energy approach"

The presented contribution is motivated by some fundamental questions arising in theoretical analysis of communication systems with chaotic synchronization. Knowledge of principles of nonlinear dynamics and synthesis of chaotic attractors is found to be very important also for other potential applications, such as encryption by secure communication, modeling of nonlinear phenomena in power networks, etc. This provides a strong motivation for the current research on exploiting some new chaotic attractors and their implementations. In this paper, an electronic circuit was designed and built to confirm typical behavior of a class of nonlinearly coupled chaotic oscillators. It was explained theoretically, as well as demonstrated by computer simulation combined with laboratory experiments that some typical chaotic phenomena can appear as a consequence of irregular energy exchange between two coupled oscillators. In our experiments, the system consists of a 2-nd order nonlinear antidissipative subsystem nonlinearly coupled with a linear oscillator with dissipation. [C52]

"Framework of MEMS high accelerated stress test"

Given the reliability principles and failure mechanism of MEMS, this paper discussed the accelerated test from three aspects as follows: the connotation of the test including concept and meaning; the scope of application concerned with product levels for applicants in types of stress; test process includes the test objective determination, test stressing selection, the test profile designing, the implementation scheme determining, analysis and improvement measures. [C53]

"Effects of non-ideal fabrication on the dilution performance of serially functioned microfluidic concentration gradient generator"

Presently, serial dilution microfluidic chip attracts tremendous interests due to the important applications in generating logarithmic concentration gradients in chemical and biochemical experiments. In this work, effects of fabrication errors on the dilution performance were numerically studied and several guiding principles for the device design were presented. Based on the microfluidic resistance network, channel dimension and flow rate were found to be two important factors in obtaining a stable and precise logarithmic gradient generator. Considering the fabrication errors in the DRIE process of fabricating microchannels on a wafer, placement of chips was optimized to minimize the geometrical error effects on the dilution performance. [C54]

"Microfluidic immunosensor based on insulator dielectrophoresis and electrowetting-on-dielectric"

We designed a microfluidic immunosensor based on the principle of insulator-based dielectrophoretic (iDEP) and electrowetting-on-dielectric (EWOD). We fabricated a 30- μm -thick SU-8 film containing microapertures placing between two EWOD-driven droplets to create a nonuniform applied electric field. With such a device, we can

separate beads with different sizes by iDEP. Furthermore, the detection of protein, fluorescent-labeled streptavidin specimens, in diluted suspension by biotin-labeled polystyrene beads can also be carried out. We used EWOD technique to make biotin detectable protein, streptavidin, by means of affinity which forms a strongest non-covalent bond among them. Our device provides a simple, portable, effective means of particles focusing with diluted suspension, according to the uncomplicated fabrication process by photolithography and the large surface-to-volume ratio of biotin-labeled polystyrene beads on micro scale. With this technique, we can decrease the detection time and concentration limit of the specimens with a small volume of reagent consumed.

[C55]

"Performance evaluation of structural design for microgyroscope based on system vibration modes"

A new energy-analysis method for microgyroscope to evaluate the dynamical performance is presented in the paper. The principle of performance evaluation is based on system vibration modes of a typical 2-mass microgyroscope in the view of the energy analysis. The natural frequency and corresponding mode shapes can be obtained by the combination of mode analysis and finite element analysis (FEA). And then the contribution of each mode for the whole performance is achieved by modal superposition. The energy distribution in the frequency domain of each mode for the microgyroscope is obtained. Using two types of complex tuning-fork microgyroscope, this principle is consequently verified. The proposed method can provide a reference for designers to estimate quickly without experimental investigations whether the structure has excellent characteristic, and can reduce production cost and development cycle of microgyroscope. [C56]

"A LTCC microsystem vacuum package substrate with embedded cooling microchannel and Pirani gauge"

This paper reports the designing, simulation and initial experimental investigation into a LTCC vacuum microsystem package substrate acting both as a vital panel and a functional structure for compact system-in-package (SiP) integration. Design, validation and experimental results for microchannels with different planar axial shapes are presented. Experimental and simulated temperature distribution over the substrate demonstrate the effectiveness of microchannel design, with substrate temperature rise cut by over 70% compared with those without microchannels. The effect of vacuum on cooling is simulated and potential ways to enhance heat transfer are suggested. The structure and principles of a Pirani gauge integrated onto the substrate are displayed. This micro gauge is formed by wire bonded, instead of by micromachining, and is proved to be both simple and effective in in-situ vacuum measuring inside a compact package. Therefore, this substrate proves an promising option for SiP applications in defense, industrial and consumer domains demanding high packaging density and vacuum or airtight circumstances. [C57]

"Modelling and anti-sway control of rotary cranes"

Dynamics of rotary cranes is described by a complex non-linear system of governing equations with 5 DOF. This complexity of motion complicates the design of control system and its practical application. Using the principle of motion separation into a fast and a slow component facilitates considerably control task. [C58]

"Optimization of multi-junction solar cell performance at infrared light by application of thin film Si:Ge solar cell"

High Ge concentration Si:Ge solar cell based on low cost Si substrate fabricated by RTCVD can be applied in multi-junction solar cell system to absorb infrared light. First principle design shows that ideally Si:Ge solar cell with 90% Ge concentration can contribute 6.2% efficiency with 16.6mA/cm²Jsc, 472mV Vocand 79.5% FF to a multi-junction solar cell system with a 300um silicon solar cell on its top under one sun. Under 50X suns, for the same multi-junction solar cell system, efficiency of bottom Si:Ge solar cell can reach to 7.8% with 574mV Voc, 82.2% FF. Modeling results show that for 90% Ge concentration Si:Ge solar cell, if optical thickness which is 8 times of its physical thickness can be achieved, Jsc can be 11.3mA/cm², Voc of 462mV, and FF of 79.2%. In this case, under 50X sun efficiency can reach to 5.2% with 565mV Vocand 81.9% FF. Our initial Si:Ge solar cell without light trapping experimental results for 90%Ge with 5um absorber shows a Jsc of 5.76mA/cm² with Si filter on top under one sun. For the same cell, Voc reaches to 205mV under 33X suns. [C59]

"PPS sampling of Web graph using preferential jumping strategy"

Sampling is the most powerful tool for researchers to study important characteristics of the continuously growing Web. On Web page sampling problem, we collect a number of pages which are representative to the Web population. However, we believe Web sampling greatly differs from generic sampling problem. First of all, the randomness principle can not be applied to Web sampling mechanically; Secondly, randomness on page level

should not be the only goal of Web sampling. We believe that there is still space to improve the randomness goal, and other than pursuing randomness on page level, new objectives should be set for host and domain levels. In our work, we designed a new Web sampling method, called the Probability Proportional to the Size of Websites (PPSW for short) sampling. After certain preliminary experiments and analysis, we concluded that no former sampling methods took into account the host and domain level of the Web. Therefore we seek new Web sampling methods that can yield samples that are representative on host and domain level. With regard to the new objective, we redesigned the jumping strategy of the random walk while sampling. This preferential jumping strategy markedly increased the validity of random walk on host and domain level. More particularly, random walk based sampling methods have two configurations: whether the random walk has random jump probability, and whether the random walk is conducted on undirected Web graph with the help of search engine. Controlling these two configurations, together with our newly designed preferential jumping strategy, we conducted four kinds of new sampling experiments. Among the four groups of experiments, the directed one with random jump showed great performance improvement. For evaluating our new PPSW sampling methods, we put forward new objectives, along with corresponding formula. The first two are coverage objectives. Comparatively speaking, the number of domains is several orders of magnitude smaller than the number of Web pages. Usually we are capable of handling this number data. Therefore, we wish the sample can cover as many hosts and domains as possible. In addition to the two coverage objectives which are crude, we also proposed four proportion objectives. These four objectives tell us whether a sample reflects the sizes of hosts and domains from different angles: Domain Host Distribution, Domain Page Distribution, Host Page Distribution and Single Domain Page Distribution. We conducted 150 comparison experiments for the three classical random walk based Web sampling methods and our PPSW sampling methods under a same environments that is as real as possible. By observing the process and results, we discussed their performances in the following aspects: Conventional Evaluations: e.g., out-, in-degree and PageRank distribution, and "Bucket Standard Deviation". New Evaluations: by examining the two coverage and four proportion targets, we found that among all the sampling methods, our PPSW sampling methods has the best performance. Other Aspects: e.g., the length of walk, the stability and efficiency of sampling methods, the number of starting page set and search engines' influences. [C60]

"High efficiency LTE transmitter considering a polar PWM architecture and RF front-end blocks"

This paper presents validation of a high efficiency multi-radio transmitter applied to the LTE transmission features. Our design takes into account the influence of RF components, such as frequency synthesizer, switched-mode power amplifier and RF band-pass filter. Architecture of the transmitter is based on the Envelope Elimination and Restoration (EER) principle and uses a Pulse Width Modulator (PWM) to code the envelope of the modulated signal. It is demonstrated, that this architecture can offer power added efficiency of up to 72%, when considering the E-UTRA band number 1 operations with a 10 MHz channel and QPSK modulated signal. The obtained Error Vector Magnitude (EVM) is less than 8.5% and the output signal respects the power mask given by the standard. [C61]

"Design consideration of multi-band RF CMOS filter based on active inductors"

In this paper, topology of gyrator-C active inductors are briefly reviewed. A novel structure of multi-band RF active inductor using transistors is presented. Issues of the active inductor related to stability, Q-enhancement principle, and noise are considered. The design of the multi-band Q-enhancement RF filter with 0.18 μ m CMOS process is achieved based on the active inductors. Simulated results show the filter centered at 2.48GHz with about 84MHz bandwidth (3-dB) is tunable in frequency from about 2.19GHz to 4.14GHz, and it exhibits -6.1dBm input third-order intercept point at 2.48GHz with about 80MHz bandwidth while the DC power consumes only 3.9mW. [C62]

"Investigation and analysis of a MOEMS gyroscope based on novel resonator"

In this paper, a micro-optical-electro-mechanical system (MOEMS) gyroscope was developed taking a new optical microcavity-planar microdisk cavity as the core sensing element. The planar microdisk cavity was designed with high Q value and small volume, and the processing technology of the planar microdisk cavity was discussed in detail with the micro-nano machining process technology. To obtain resonance curve, a resonant cavity proof-of-principle experiment was performed. As the light source and planar microdisk cavity dimensions have a decisive influence on the Q value of microcavity and angular rate measurement limit of gyroscope, a method was discussed that using traditional F-P cavity resonance curve for optimization of planar microdisk cavity geometric parameters. [C63]

"A motor surge voltage suppression method with surge energy regeneration"

A novel motor surge voltage suppression method is proposed in this paper. Features of the proposed method

are that (1) no requirement for an inductor-capacitor (LC) filter for suppression of the motor surge voltage on the motor terminal, (2) the energy stored in the main power cable, which causes the motor surge voltage, is regenerated to the inverter dc-bus line, and (3) the motor surge suppression effect is not influenced by the power cable length. Therefore, this method has advantages in volume and efficiency compared with conventional surge suppression methods. The circuit configuration of the system is presented and the operation principle is explained. The method for design of the circuit parameters is shown. Surge suppression effectiveness of this method is confirmed through the experimental results. [C64]

"Digital controlled bidirectional DC/DC converter for electrical and hybrid vehicles"

In this paper, a bidirectional converter for hybrid electrical vehicles addressing high efficiency and digital control is proposed. It is based on two switching converters linked through a high frequency transformer and exploits soft-switching technique and an active-clamp circuit. Operating principle, theoretical analysis and design guidelines are provided, as well as simulation and experimental tests performed on a 1.5kW lab prototype. [C65]

"Experimental verification of energy saving position control algorithm applied to the drives with PMSM"

Main contribution of this paper is an experimental verification of a new position control algorithm exploiting principles of forced dynamics control capable to operate in energy saving mode. To minimize energy loss a specified velocity-time profile based on prescribed maneuver time is computed to achieve prescribed dynamics for demanded reference position. Settings of the velocity-time profile parameters respect influence of load torque, which is used for deceleration or acceleration of the drive. The control system exploits principles of vector control, maintaining perpendicular stator current vector and the rotor flux vector. A zero dynamic lag pre-compensator is included to achieve precise following of a pre-planned rest-to-rest maneuver. The simulations predicted and presented experimental results confirmed possibility to achieve prescribed speed profile and to precisely follow of pre-planned rest to rest maneuvers for the drive with PMSM. [C66]

"Open identity management framework for mashup"

Mashups have emerged as a Web 2.0 phenomenon, connecting disjoint applications together to provide unified services. However, scalable access control for mashups is difficult. To enable a mashup to gather data from legacy applications and services, users must give the mashup their login names and passwords for those services. This is not user-centric and the all-or-nothing approach violates the principle of least privilege and leaves users vulnerable to misuse of their credentials by malicious mashups. To overcome the limitations, this paper proposes an open identity framework, which leverages open identity protocol such as OpenID and OAuth. The framework can bring benefits to all the roles involved in the system in a non-intrusive and user-centric way. Open is a good design principle, and it is also the attitude and spirit of collaboration. We think that a mashup system based on open technologies could make the composition of services easier and accelerate the on-boarding of service providers. Moreover, more customers might also be attracted by the openness of the system. [C67]

"Research on the evaluation of knowledge management performance of High-tech Enterprise"

The ultimately intention of knowledge management is to get the most income, it is necessary to measure the effect of knowledge management, thus the key problem of this study is how to evaluate the performance of knowledge management in High-tech Enterprise. Based on both case studies and model building, this paper analyzed the content and principle of the performance evaluation of knowledge management in High-tech Enterprise, and then established the evaluating index system of knowledge management performance and designed the evaluating method and steps. It gave the corresponding evaluation index weight by using expert evaluation method. Further, this paper made empirical research on the performance evaluation of knowledge management based on the fuzzy and comprehensive evaluation method. The results can explain how the performance is after knowledge management and put forward to views of rectification at evaluation results. The research of this paper provides essential theoretical method and tactical support for high-tech enterprises to implement effective knowledge management and enhance comprehensive competitiveness. [C68]

"Control scheme to improve DPFC performance during series converter failures"

The Distributed Power Flow Controller (DPFC) is a new device within the FACTS family. It is emerged from the UPFC and has relatively low cost and a high reliability. The DPFC consists of two types of converters that are in shunt and series connected to grids. The common dc link between the shunt and the series converters is eliminated. The active power exchange between the shunt and series converters that is through the common dc link in the UPFC, is now though the transmission line at the 3rd harmonic frequency. The redundancy of the

series converters provides the high reliability of the system. In this paper, the DPFC behavior during the failure of a single series converter unit is considered. A control scheme to improve the DPFC performance during the failure is proposed. The principle of the control is based on the facts that, the failure of single series converter will lead to unsymmetrical current at the fundamental frequency. By controlling the negative and zero sequence current to zero, the failure of the series converter is compensated. In this paper, the principle of the DPFC are firstly introduced, and followed by the behavior of the DPFC during the failure of a single series converter. The design of the control scheme and corresponding simulation are presented. [C69]

"Wideband RF MIMO channel measurement in Frequency band 5.2 GHz"

For the simulation and design of smart antenna transmission principles in mobile radio, precise knowledge of the time-variant directional multipath structure in various radio environments is required. This paper describes a measuring campaign by using real-time multiple-input-multiple-output (MIMO) vector radio channel sounder. The measured results can also be used directly for the simulation of MIMO transmission principles, space-time coding and multi-user receivers. [C70]

"Human activity recognition based on morphological dilation followed by watershed transformation method"

Efficiency and accuracy are the most important terms for human activity recognition. Most of the existing works have the problem of speed. This paper proposed an efficient algorithm to recognize the activities of the human. There are three stages of this paper, segmentation, feature extraction and recognition. In this paper our contribution is in segmentation stage (based on morphological dilation) and in feature extraction stage (using watershed transformation). The proposed algorithm has been tested on six different types of activities (containing 420 frames). The recognition performance of our method has been compared with the existing method using Principle Component Analysis (PCA) to derive activity features. The results of our proposed method are comparable with the existing work. But in-term of efficiency, our algorithm was much faster than the existing work. The average accuracy and efficiency of the proposed algorithm for recognition was 80.83 % and 302.2 ms respectively. [C71]

"Limitation of treelike structure application for designing of multielement attenuators and dummy loads for high dissipation powers with use of thin-film resistive elements"

This article examines the scope of one of the schematic principles for construction of multielement attenuators and dummy loads for high dissipation powers-in parallel-series treelike (dendritic) connections of separate resistive elements. It is shown that technological limitations on rated and actual dissipation power of a single resistive element do not allow creating attenuators for power dispersion above 2000 W on their basis. The possibility to apply serial ladder-type structures for construction of attenuators and dummy loads as alternative to the treelike structure is considered for designing broadband attenuators and dummy loads for high and very high dissipation power. [C72]

"A new node-split algorithm in R-tree based on spatial clustering"

R-tree is widely used in spatial database as a spatial access method. The node-split algorithm is the key sub-algorithm to generate R-tree. In traditional methods, the one-to-two split mode is applied. However, this leads to uneven node-shape. A brand-new node-split method is put forward. In this method, the 2-to-3 split mode is utilized based on spatial clustering principle, which can guarantee more average node shape. This feature can make the query performance more stable. [C73]

"A new method of mining frequent closed trees in data streams"

In this paper, we present a closed labeled tree mining algorithm, FBMiner, based on the add-remove principle of closed sets which is newly introduced. Also, we propose a time-decay module to solve stream data mining which gives more attention on the latest data. Compared to the traditional mining algorithms in data stream, FBMiner performs well even that the data is of high complexity. The experiment shows that FBMiner is efficient in data streams mining by reducing consuming dramatically. [C74]

"An Light-weight Algorithm for Unorganized Point Cloud"

In order to improve entity reverse building, a light weight algorithm is proposed to reduce the mass of cloud data. Firstly a model of unorganized point cloud are improved to compact with an octree and principle component analysis. A PCA (principle component analysis) is carried out to prove that features of the local surface defined by points in a leaf node can be detected. For a specific feature in a leaf node of the octree, a simplification

algorithm is propose to sample points form the unorganized points cloud. The results of the new algorithm show that the new algorithm is very effiecient. [C75]

"An SOA Based Enterprise Application Integration Approach"

The main concerns of Enterprise Application Integration (EAI) are making applications work together and reducing their complexity. Service Oriented Architecture (SOA) has been presented as an architectural design style and principles which can better align IT initiatives with business requirements. An SOA based Enterprise Application Integration approach is proposed in this paper. Using SOA methods and design styles, we model the business process of the enterprise and identify process blocks that can be group as services. The existing legacy applications are analyzed to look for functionalities that can be mapped to the identified services. In situations where a service in the business process cannot be mapped to any existing legacy implementation or composed from existing services, the service has to be developed as a new service which is loosely couple, re-useable, extensible as well as interoperable and maintainable. It is verified that this approach ease the composition of existing services and orchestration new business processes. [C76]

"IC Cloud: A Design Space for Composable Cloud Computing"

Cloud computing has attracted great interest from both academic and industrial communities. Different paradigms, architectures and applications have emerged. However, to the best of our knowledge, only few efforts have been devoted to study the architecture as well as implementation details for building up a cloud computing system. In this paper, we present our design and implementation oftextit{Imperial College Cloud (IC Cloud)}. The goal of IC Cloud is to provide a generic design space where various cloud computing architectures and implementation strategies can be systematically studied. The IC Cloud design strictly follows the SOA principle and incorporates a highly flexible system design approach. [C77]

"Enterprise Cloud Service Architecture"

Cloud computing, a new paradigm of distributed computing, introduces many new ideas, concepts, principals, technologies and architectural styles into enterprise service-oriented computing. The enterprise service-oriented architecture (ESOA) style is an abstraction of concrete enterprise service-orientated architectures, which includes SOA architectural elements, service design patterns as well as principles, and SOA quality attributes. It can be extended to a new style for realizing enterprise cloud computing. Meanwhile, the principles and style of enterprise service-oriented computing facilitate the enterprise-wide adoption of cloud computing. This paper extends the ESOA style to a new hybrid architectural style, Enterprise Cloud Service Architecture (ECSA). The style is described by extending enterprise service-oriented formula for ESOA. We model the style through specifying each element in the formula with both service-oriented and cloud architectural styles. [C78]

"A Lifetime Supporting Framework for Cloud Applications"

This paper proposes a framework, which integrates the development and operation environments for cloud applications. Adopting perspectives on lifecycle management, the framework is equipped with tools and platforms, which seamlessly integrate lifetime phases: requirement analysis, architecture design, application implementation, operation and improvement. These are predicated on theories in design engineering, enabling identification of constraints arising in the development process and of dependencies among functional modules. A case study shows the feasibilities of the design principles, and indicates possibilities for the framework to be an Application Platform as a Service (APaaS), which can form an ecosystem of datacenter operators, systems integrators and application providers. [C79]

"Study on spatial block topological identification of Excavation Damaged Zone (EDZ) for rock mass"

Within a certain domain of rock mass, identification of all blocks cut by three-dimensional finite random or fixed discontinuities is a critical basic problem in jointed rock mass researches. At the same time the estimations of Excavation Damaged Zone (EDZ) are important for design and construction of rock engineering. Based on these characteristics of rock, the principle of block and general method of spatial block topological identification with stochastic discontinuities cutting, the block identification of cavern rock mass is studied. Three-dimension numerical method of block theory is proposed in this paper. Identification of block is finished by the method that structural planes cut rock mass in sequence and the data of blocks is stored in dynamic array, which make sure that storage capacity is not limited by algorithm. On these bases, the three-demission Geotechnique Structural modeling and Analysis code (GeoSMA-3D) is developed to identify the quantity of the complicated blocks (including the concave form) which are cut by numerous structure planes. It is shown by example analysis and accuracy test results that the method is effective to search the strong commonality and reliability. A better

understanding of the mechanics of influence, especially regarding the assessment of EDZ is required. Finally, case of caverns is studied. [C80]

"Immunodomaince based clonal selection clustering algorithm"

Based on clonal selection principle and the immunodominance theory, a new immune clustering algorithm, Immunodomaince based Clonal Selection Clustering Algorithm (ICSCA) is proposed in this paper. An immunodomaince operator is introduced to the clonal selection algorithm, which can realize on-line gaining prior knowledge and sharing information among different antibodies. The proposed method has been extensively compared with Fuzzy C-means (FCM), Genetic Algorithm based FCM (GAFCM) and Clonal Selection Algorithm based FCM (CSAFCM) over a test suit of several real life datasets and synthetic datasets. The result of experiment indicates the superiority of the ICSCA over FCM, GAFCM and CSAFCM on stability and reliability for its ability to avoid trapping in local optimum. [C81]

"Automatic determination of parameters' values for Heuristics Miner++"

The choice of parameters' values for noise-tolerant Process Mining algorithms is not trivial, especially for users that are not expert in Process Mining. Exhaustive exploration of all possible set of values is not feasible, since several parameters are real-valued. Selecting the "right" values, however, is important, since otherwise the control-flow network returned by the mining can be quite far from the correct one. Here we face this problem for a specific Process Mining algorithm, i.e. Heuristics Miner++. We recognize that the domain of real-valued parameters can be actually partitioned into a finite number of equivalence classes and we suggest exploring the parameters space by a local search strategy driven by a Minimum Description Length principle. We believe that the proposed approach is sufficiently general to be used for other Process Mining algorithms. Experimental results on a set of randomly generated process models show promising results. [C82]

"Species based evolutionary algorithms for multimodal optimization: A brief review"

The species conservation technique is a relatively new approach to finding multiple solutions of a multimodal optimization problem. When adopting such a technique, a species is defined as a group of individuals in a population that have similar characteristics and are dominated by the best individual, called the species seed. Species conservation techniques are used to identify species within a population and to conserve the identified species in the current generation. A 'species-based evolutionary algorithm' (SEA) is the combination of a species conservation technique with an evolutionary algorithm, such as genetic algorithms, particle swarm optimization, or differential evolution. These SEAs have been demonstrated to be effective in searching multiple solutions of a multimodal optimization problem. This paper will briefly review its principles and its variants developed to date. These methods had been used to solve engineering optimization problems and found some new solutions. [C83]

"Automated discovery of vital knowledge from Pareto-optimal solutions: First results from engineering design"

Real world multi-objective optimization problems are often solved with the only intention of selecting a single trade-off solution by taking up a decision-making task. The computational effort and time spent on obtaining the entire Pareto front is thus not justifiable. The Pareto solutions as a whole contain within them a lot more information than that is used. Extracting this knowledge would not only give designers a better understanding of the system, but also bring worth to the resources spent. The obtained knowledge acts as governing principles which can help solve other similar systems easily. We propose a genetic algorithm based unsupervised approach for learning these principles from the Pareto-optimal dataset of the base problem. The methodology is capable of discovering analytical relationships of a certain type between different problem entities. [C84]

"Metamorphic systems: A new model for adaptive system design"

The evolvable hardware field has been an area of research interest since the early 1990s. However, the number of significant accomplishments has noticeably diminished in recent years. In this paper we discuss several reasons why this is so. We then introduce a new model called metamorphic systems that builds upon evolvable hardware principles placing more emphasis on adapting system behavior rather than evolving desired system behavior. Our metamorphic system approach is better suited to non-electronic systems. Two example metamorphic systems are presented. [C85]

"Modular dimmable light-emitting-diode driver for general illumination applications"

This paper aims to present a modular dimmable high brightness (HB) light-emitting-diode (LED) driver for

retrofitting general/residential illumination systems. An improved micro-controller based pulse-width modulation dimming technique is studied and implemented for selecting the brightness of LEDs. Under universal input voltage operation, high power factor and high efficiency can be achieved by a power-factor-correction converter followed by a coupled inductor fly-back converter. The operation principles of the proposed modular HB-LED dimmer and driver will be analyzed and discussed. A laboratory prototype is also designed and tested for verification. [C86]

"Power management with energy harvesting devices"

Traditional power management for battery powered devices does not meet the requirements of energy harvesting systems. Transducers that extract energy from the environment significantly differ from batteries in that their power output is limited. Besides, the energy source can be of variable nature and energy availability can be virtually infinite. Electronic systems that rely on energy harvesting sources have to be harvesting aware designed, both from the hardware and software perspectives. Proper Harvesting Aware Power Management (HAPM) should allow a harvesting system to operate indefinitely and within the expected operational utility. An energy neutral mode of operation can guarantee that the system will operate forever, but not that the utility meets the desired utility. This paper presents an introduction to HAPM, including topologies of Energy Harvesting Systems, the Energy Neutrality Principle and Power Management Techniques. [C87]

"Fuzzy predictive control based on Takagi-Sugeno model for nonlinear systems"

In this paper, a method of designing a nonlinear predictive controller based on a fuzzy model of the system is presented. The Takagi-Sugeno fuzzy model is used as a powerful structure for representing nonlinear dynamic systems. So, the strategy of the fuzzy predictive control based on a fuzzy Takagi-Sugeno model is applied to the control of a chemical reactor. Indeed, the work consists to develop, in a first step, a fuzzy model from a merger of a number of local models obtained by the principle of linearization around an operating point, or by learning through the gradient algorithm. In a second stage and basis on local models already developed, a fuzzy predictive control is synthesized with different approaches. The principal aim is to apply local generalized predictive control. [C88]

"A hybrid Memory-based ACO algorithm for the QAP"

The performance of ant colony optimization (ACO) algorithms significantly improves when hybridized with local search procedures which strongly bias the search towards promising regions of the search space. In this work, we study a recently proposed Memory based ACO algorithm (MACO) which incorporates some tabu search principles into the solution construction process. This algorithm has also been hybridized with two local search procedures: 2-opt (M-ACO-2opt) and Tabu Search (M-ACO-TS). The performances of the two hybrid versions of M-ACO are analyzed on a set of instances of the Quadratic Assignment Problem (QAP). The results show that the hybrid versions of M-ACO are able to improve the quality of the best known solutions for several of the instances studied. [C89]

"Artificial foraging weeds for global numerical optimization over continuous spaces"

Invasive Weed Optimization (IWO) is a recently developed derivative-free metaheuristic algorithm that mimics the robust process of weeds colonization and distribution in an ecosystem. On the other hand central to an ecosystem is the foraging behavior that pertains to the act of searching for food and forms an integral part of the daily life of most of the living creatures. For over past two decades, a few significant optimization algorithms were developed by emulating the foraging behavior of creatures like ants, bacteria, fish, bees etc. This article presents a hybrid real-parameter optimizer developed by incorporating the principles of Optimal Foraging Theory (OFT) in IWO, with a view to improving the search mechanism of the latter over discontinuous and multi-modal fitness landscapes, riddled with local optima. The hybridization does not impose any serious computational burden on IWO in terms of increasing number of Function Evaluations (FEs). The performance of the resulting hybrid algorithm has been compared with eleven other state-of-the-art metaheuristic algorithms over a test-suite of 16 numerical benchmarks taken from the CEC (Congress on Evolutionary Computation) 2005 competition and special session on real parameter optimization. Our simulation experiments indicate that the proposed algorithm is able to attain comparable results against the nine other optimizers. Owing to its promising performance on benchmarks and ease of implementation (without requiring much programming overhead), the proposed algorithm may serve as an attractive alternative for a plethora of practical optimization problems. [C90]

"Development of photovoltaic grid-connected inverter assistant power supply using toposwith chip"

Solar power based on the technology of grid-connected photovoltaic power has become the fastest growing and most widely application in the view of solar energy application. In this paper, the working principle and designing

desire of assistant power in grid-connected photovoltaic system was presented, TOPSwitch chips is the core of This assistant power and the design course of main component is given. Through experiment result, it can be proved that the design is correct and valid. The design method not only simplify the circuit of the assistant power and reduce the production cost, but also improve the Electro Magnetic Compatibility characteristics. It has high practical value. [C91]

"Design and optimization of Serial communication system interface module"

Serial communication system has been widely used in data communications and control system because of less hardware resources, anti-jamming ability, and easy to implement features. A FPGA-based high performance Serial communication system interface module which includes full functions of UART16550 is designed and optimized based on the communication protocol and working principles in this paper. Various technologies are adopted during the design and optimization procedure, such as the three always block coding style, EDA optimization, circuit optimization, and so on. The frequency of the optimized design is up to 166MHz, and the power consumption is reduced to 0.147W by 63.9%. The test data at typical baud-rate of 115200 and the analyzed result by using Matlab are presented. The test results indicate that the optimized design can be communicated correctly and steadily. [C92]

"Design and test of a reciprocating-rotary pump"

In order to improve the capabilities of the pump in the Vacuum Oil Purifier used in the power plant, researched the principle of the reciprocating pump and the rotary pump, and combined their advantages and structures. A new reciprocating-rotary pump was designed by using the crank-turn mechanism. After analyzed and calculated, a model machine was designed by operational requirements. Under the given conditions, and referenced to "Mobile Reciprocating Pump Test Method" the capability test of the pump was carried out. According to the results of the test, the difference between actual and theory oil amount was only 5.0%. The new reciprocating-rotary pump not only met the design requirements, but also had features of high volumetric efficiency, large exclusive, low flow pulse and good seal. [C93]

"The design and application of one kind of multi-channel high-speed serial data acquisition system"

A multi-channel high-speed serial data acquisition system based on LVDS interface is introduced. In the system, the FPGA APA300 produced by ACTEL Company used to control the serial to parallel conversion and data caching of multi-channel high-speed serial data. Then the parallel data is collected by the data acquisition card. The system can adjust itself by the standard data source generated by itself. The principle of the system, function realization of FPGA, and logic design of the LVDS interface are expounded. The system has high data acquisition rate, high reliability and strong anti-interference capability. [C94]

"Focusing control system of photoelectric theodolite based on CAN bus"

The development trend of focusing control system is high speed, reliable control and miniaturization. A new auto-focusing control system based on CAN bus is designed, which realizes the real-time communication and synchronization control among the distributed control system. A design process of CAN interface based on TJA1050 is presented. The principle of focusing control and the hardware and software design are presented in detail. All experiments show that the control system has the advantages such as high accuracy and anti-interference ability, and meets the requirements of high speed and good stability. [C95]

"An active defense system based on immune principle study"

This In this paper, the community is now growing network security issue, which is based on principles of active immune intrusion defense system. First, design improvements based on immune mechanisms of the existing intrusion prevention system, detection engine, and use mathematical methods to be proved. Then proposed a model of active defense system, in which the model was introduced honey net system as a network module lured them with the traditional intrusion prevention system combines creative to join attack on the module, thereby achieving intrusion prevention real-time and initiative. [C96]

"Design of three-phase intermediate frequency aviation power based on single chip microcomputer"

A three-phase intermediate frequency aviation inverter power with single chip microcomputer and SA8282 as its main controller is designed in this paper. The overall structure of the proposed system is given. The working principle and design method of the main circuit are presented in detail. Among the control circuit design process, the generation of SPWM waveforms, the main parameters design of SA8282, the digital PI regulation and the software design process are analyzed. The proposed control strategy has been implemented on a 9KVA, 400Hz

three-phase power supply. Experimental results show that the three-phase output voltage waveforms are quite good, the performance of the supply meets the demand. [C97]

"Improved optics detection system and incident light energy control analysis in PDT"

Photoelectric detection target (PDT) mainly was applied to gain the information of flying projectile in shooting range, however, the traditional PDT cannot satisfy current need, it exists detection view small and sensitivity low. To solve those questions, an improved design method was put forward. In this paper, rectangle linked photoelectric detector with low noise and high response was used to design optics detection system in new PDT, and analyze design principle. Base on selected detector, adjustable active slit diaphragm was adopted to eliminate the influence of background light, and use self-adjusting mode to control slit window. Through experimentation in shooting range, it proves that the improved design technology can satisfy current test demand and reach the aim of improving detection sensitivity and augment detection view in PDT. [C98]

"Designing and implementation of education simulation system base on PLC"

This article introduces an education simulation system built on Programmable Logic Controllers (PLC). The structure and the function of the system is designed and realized according to the basic features of the PLC industrial control system, combining the information of the technique requirement and the equipment condition in a practical cement production control, etc. The article emphatically discusses the organization, implementation and adaptability of the equipment simulation subsystem and explains the essential designing principles of the equipment simulation, combined with the rotary kiln which is an important equipment in the cement production. This education simulation system has been applied to practice currently. [C99]

"Cloud computing model based on MPI and OpenMP"

According to the features of Message Passing Interface (MPI) and OpenMP, the cloud computing application methods based on MPI and OpenMP, including the MPI and OpenMP cloud computing algorithm design model, cloud computing principles, the core model, and the process are proposed. The distributed characteristic and parallel characteristic are introduced. Theoretical analysis results show this algorithm is feasible, effective and superior to the traditional parallel technology, and it can provide the new method to distribute and parallelize the ordinary algorithms. [C100]

"Design and parametric study of anti-vibration devices for offshore platforms"

A vibration control scheme is proposed in this paper based on the principle of the tuned mass damper. An anti-vibration device is designed and installed on a similar model of a jacket platform. There are two structural types for controlling the horizontal and vertical vibrations. The parametric study is performed in order to control the vibration effectively. The results show that satisfactory control effects can be achieved when the parameters of the device take the recommended values. [C101]

"Coupled vibration of hoist rope with complicated operating condition"

In order to provide help for designing hoist control system to avoid resonance and enhance the safety in mine or elevator hoist system, coupled vibration behavior of hoist rope was investigated with complicated boundary such as the hoist rope restricted by guide pulleys. According to Hamilton principle, the mathematical model of extensional-torsional coupled considering arbitrary concentrated-mass of guide pulleys and torsional displacement boundary condition was built. Basing on the property of step function, the mode function of hoist rope was obtained and the method of numerical solution for displacement was proposed. At last, the analytical expressions of extensional and torsional displacements were obtained by supposing that the extensional and torsional damping coefficients were same. And the coupled displacement was obtained as an application example while a cargo merged into a conveyance. [C102]

"Enterprise authorization analysis and enterprise authorization design based on PMI"

The existence of super user in the enterprise information center broken the least privilege principle of information security. This would be a vulnerability in management. This vulnerability can be solved by adopting a multi-party authorization mechanism in the enterprise PMI. The relationship of the authorizations within the enterprise is analyzed and an enterprise PMI design with multi-party authorization is given in this paper. [C103]

"Design of a Magneto-rheological fluid clutch based on electromagnetic finite element analysis"

Basic operating principle of the Magneto-rheological fluid clutch was stated. A Magneto-rheological fluid clutch

used to control the fan speed of engine cooling system was designed based on the electromagnetic finite element analysis. The magnetic lines of force and the magnetic flux density distribution were analyzed. And the influence of material and structure forms of the clutch shell on the magnetic flux density was studied. Research results show that the material of clutch shell has significant effect on the distribution of magnetic flux density and air gap in the clutch shell has great effect on the magnetic flux density in MRF working area, which are expected to provide references for the design of similar products. [C104]

"The application of multi-function interface MVB NIC in distributed locomotive fault detecting and recording system"

Locomotive condition monitoring and fault diagnosis system is an important component of modern locomotive, it needs a reliable, high-speed communication network to ensure that the system's reliable operation in the complex locomotive environment. The Controller Area Network (CAN) used in the existing distributed locomotive fault detecting and recording system is not suitable for vehicles bus, so the paper brought forward the scheme using the Multifunction Vehicle Bus (MVB). Firstly, it described the alteration of system structure and operating principle key design concepts in detail, next designed the multi-function interface MVB NIC using SOPC (system on a programmable chip) technology, given the realization of hardware and software, ultimately proceeded the network test in the lab, and verified the correctness and feasibility of the design. The improved network has farther transmission distance, higher rates, better reliability and real-time. [C105]

"Computation of standard sag of overhead lines for power grid based on mathematical model of iterative technique"

The computation of the sag for overhead lines plays a significant role in design and construction of lines. The common way to obtain the sag value is to lookup the curves provided by the design departments, but the standard sag obtained by this way is prone to make a personal error. Aimed at above problems, this paper proposes a computing method of standard sag for overhead lines based on iterative technique. The method establishes a mathematical model by computing theory of the stress sag. The model makes use of high-speed iterative of computer to compute standard sag of any given span through state equation of stress and judgment principle of control climate conditions. The method possesses many advantages, such as, clear thinking, easy to understand and without considering complex logic judgment to solve critical span. Finally, an example proved that the method to solve the stress is rapid and high accuracy. [C106]

"Research on the monitoring system of the grain quantity based on the CAN-bus"

In order to measure the grain quantity in the barn, the pressure sensors are mounted on the ground and the wall, the quantity can be calculated by using these sensors' value. The principle of measurement method is given firstly, then the monitoring system based on the CAN-bus is put forward, and the circuit structure of the communication interface, relay and the data sampling node are designed. To verify the effectivity and the reliability of monitoring system, some experiments are done, the results shown that, the measurement error is no more than 3% under the conspicuous level is equal to 0.05, the grain quantity can be measure by this system completely. [C107]

"Genetic algorithm principle and the application in oilfield development"

The genetic algorithm is a global optimization method and good at flexibility and robustness. It conducts undirected random search, which is not limited by search space. The computational procedure of the algorithm is easy and simple. The genetic algorithm is especially suited to solve multivariate and nonlinear complex problems which are impossible or difficult to be settled by other scientific technologies. The paper introduces the current wide application of genetic algorithm in oil-field development planning, measure optimization, well location deployment, multilateral well design, well testing, steam stimulation, the design of oil production technologies, and so on, which represents the algorithm's advantages in solving problems of oil field development, and reveals the wide ranging application prospect in the field of oilfield development. [C108]

"Design and implementation of Directory Service network management system based on event bus pattern"

Directory Service is used widely in modern communication networks. In this paper, we proposed and implemented a management system based on event bus pattern to manage directory service network constructed by improving OpenLDAP [1]. The management system presents good architecture while implementing complex management functions. The principles and use of event bus pattern in the system is described in detail and experience shows that this pattern makes the system have considerable flexibility,

maintainability, extensibility and a general applicability to many other applications. [C109]

"Developing usability measure structure: Process and principles"

This paper reviews different models of usability measure related to definitions of usability. It is concluded that difference among varying measure structures is intrinsic. So how usability measure structure is developed is more meaningful than what it is. Based on the perception, four characteristics of usability measure structure are identified. And then general process of developing measure structure is proposed. This paper also points out two crucial rules in the procedure: assumption of weak correlations among usability aspects and users' participation which shall affect satisfaction level of the final improvement of usability quality. [C110]

"PC lock software design based on removable storage device and dynamic password"

The traditional mechanical key of PC has only the device authentication or the static password authentication function, which is easily copied, decrypted and forgotten. To solve these problems, the PC lock software based on removable device is developed. The software design principles and the MD5 (Message-Digest Algorithm 5) encryption algorithm are introduced, and the modules of the software are described in detail. Some important code was also provided. The advantages of the software are as follows. First, the use of removable storage device lock makes unlock unique. It breaks through the traditional password that anyone who knows the password can login the computer. Second, the dual protection of equipment certification and dynamic password card nearly eliminates the possibility of brute force cracking the code. It protects the personal computer security more effectively. Finally, the one-way hash encryption algorithm of MD5 ensures the uniqueness of the key, the technology of double process protection prevents an illegal program to forcibly damage this software. The experiment indicated the software is low cost, high stability, easy to use. It is suitable for a variety of computer equipments. [C111]

"Multimedia learning machine based on non-deterministic finite automaton"

With the increasing international communications, people are eager to learn foreign languages. As an auxiliary tool, multimedia learning machine (MLM) is welcomed by foreign language learners. So, it is very necessary to design a powerful MLM efficiently. How to deal with the state transition of MLM's different states is a key issue. In this paper, we describe a solution to design a MLM based on non-deterministic finite automaton (MLM-NFA) and present in detail the state transition model, state transition diagram and the core algorithm. The finite automaton helps us distinguish clearly the relation of state transitions of MLM and the mapping between MLM states and buttons in MLM user interfaces. The MLM-NFA has many advanced functions, such as point-to-read, A-B repeating and role playing. At the end of the paper, we implement an MLM-NFA which proves that the model based on non-deterministic finite automaton principle is quite efficient in practice and makes it very simple and flexible in development. [C112]

"Electrically small loop surrounded by a "shell" of concentric split rings: Principle and properties"

The paper describes a novel electrically small antenna structure and investigates its physical principle and properties. The antenna is formed by small planar loop with a "shell" of three concentric split rings with external electrical dimension $ka=0.4$. The structure has been designed with complex impedance $Z_{in} \sim 22 + j195 \Omega$ to be utilized as UHF RFID tag antenna. The physical principle is explained via the simulated surface current distribution and several parametrical studies. [C113]

"The Temporal Development of Representational Practices: Implications for Theory and Analysis of Situated Learning"

Technological resources for collaborative learning are productively conceived of as resources appropriated by learners as they develop their competencies. Therefore, to understand the implications of technological designs for collaborative learning, it is necessary to examine learners' practices over time. Microanalytic approaches are most suitable for understanding learners' practices, but have traditionally been applied primarily to single small episodes of learning. This limitation is related to an unnecessarily strict interpretation of the temporal locality of situated action. Drawing on a prior analysis of the temporal development of practices through which inscriptions become representations in online mathematics problem solving, this paper generalizes microanalysis to include temporally prior episodes in which interactionally relevant resources and practices are constructed. Related theoretical points concerning the relationship between the concept of practices and ethnomethodological principles of relevance and contingency are discussed. [C114]

"A class of time-frequency product optimized biorthogonal wavelet filter banks"

The time-frequency product of any function in $L_2(\Gamma, \mathbb{B})$ is bounded by the uncertainty principle. This paper presents a method to design linear phase biorthogonal filter banks with the time-frequency localization as the optimality criterion. The design philosophy is to optimize the time-frequency product of the iterated wavelet, after fixing the number of vanishing moments of the analysis and synthesis lowpass filters, by adjusting a single parameter. [C115]

"Taking Universal Perspective in Design: A Plea for Two Reflective Principles and Mechanisms"

Current approaches to the design of interactive systems emphasize openness, dynamic behavior, and evolution of the system. There is also a growing interest in accounting for human values and norms. This paper takes a universal perspective informed by discourse ethics and it argues that value and norm issues cannot be fully resolved in the design process and that they require the continuous participation of users in use time. On the other hand, the increasing complexity in global contexts necessitates exploiting machine intelligence to adapt the system behavior to the interaction context. This paper comments on two complementary reflective principles for interactive systems (i.e., the meta-adaptation and meta-communication principles) and argues that both principles need to be implemented as system's features to support computer's as well as users' reflections. [C116]

"Service Oriented Device Integration-An Analysis of SOA Design Patterns"

Service oriented device architecture (SODA) is a promising approach for overcoming interoperability issues and especially for extending the IT support of business processes to devices. It is based on the encapsulation of devices as services, and therefore on design principles of service oriented architectures (SOA). However, there is a lack of generalized concepts that resolve SODA-specific design problems. This paper contributes to this research gap by a) identifying a set of SODA-specific design problems, b) analyzing existing SOA design patterns regarding their applicability for SODA, and c) proposing a set of new pattern candidates which resolve open SODA design problems. [C117]

"Engineering Dialectical Inquiry: Lessons Learned from Lab Explorations"

A Design Science approach is applied to the engineering of a dialectical inquiry process for group model building. Insights from three research streams in collaboration literature are used for the practical engineering of a facilitation script. Dialectical inquiry is the process developed by Churchman and used in Comprehensive Situation Mapping (CSM) as recently described by Acar and Druckenmiller. The software artifact developed for this approach was tested with usability testing to compare the ease of use of this computerized technique with the original manual method. While this software was easy to learn and to use, its development did not fully address the accompanying facilitation model that provided a tested script for use in actual field cases. This research uses the principles of user-centered design as an iterative search component of the Design Science approach. Its application to the development of such scripts, as well as the initial results of an exploratory phase of testing are described. [C118]

"Dynamic closed-loop supply chain network design based on recall and return of goods"

On the basis of the minimum principle of the total cost, using the structure of logistics network and Mixed-integer Non-linear programming, we propose a mathematical model, taking the uncertainty of demand and number of recall and return of goods, the dynamicity of closed-loop network, the environment of E-commerce, and the time value of currency into account. And then we use LINGO to solve the problem, in order to determine the number of constructing or expanding the facilities, and optimum flows of transportation between the various facilities. At the end of this paper, we prove the validity and feasibility of the model through a practical example. [C119]

"Advanced drug delivery through an inhaler utilizing a venturi"

Our design utilizes the venturi principle to accelerate an emulsification of powdered medication through a series of ribs, imparting shear and inertial forces to any particle agglomerates, separating them to a size suitable to be fully inspired and diffused into pulmonary circulation. A blister package, containing the medication, will be snapped into the inhaler, punctured, and emptied into the venturi throat during the inhalation performed by the patient. [C120]

"Robust design based on model of product design quality"

Nowadays, enterprises continually realize that perfect quality of products is not achieved by manufacturing, but by designing. Therefore, it is necessary to start from the headwaters of quality. That is to say, product quality must be controlled from design phase. Taguchi Method is just the most powerful weapon in improving design

quality. In this paper, mainly started from the fluctuation theory, the design model of product quality is put forward. To reduce tolerance and to reach zero defects with great efforts, it is the necessary by implementing robust design. Therefore, the thrice design (system design, parameter design and tolerance design) is just the most way for reaching the above targets. In this paper, the basic concept and principle connected with implementing Thrice Design are profoundly discussed. [C121]

"Read-out Circuit Analysis for High-speed Low-noise VCO Based APS CMOS Image Sensor"

A detailed read-out circuit analysis of the VCO based APS CMOS image sensor is presented in this paper. According to the mathematic analysis and simulation results, the read-out speed should be decreased when reducing the bias current. Moreover, the feature of the device gain factor and the source follower's threshold voltage are vestigated, showing important effects with respect to not only the read-out time but also the energy consumption. The proposed VCO based read-out circuit and frequency counter consist an equivalent bandpass filter. According to the transfer function analysis of this equivalent filter, the noise cancellation efficiency is jointly determined by the bias current, device gain factor and source follower's threshold voltage, which constitute the basic principles for high-speed low-noise CMOS APS image sensor design. [C122]

"16-QAM Transmitter and Receiver Design Based on FPGA"

The FPGA technology has been playing a considerable role in portable and mobile communication. This is due to the features of flexibility, accuracy and configurability in designing and implementation. The paper presents a complete design for a 16-QAM transmitter and receiver based on the Virtex4 FPGA Kit. The implemented system can be applied in particle. Based on the principles of carrier synchronization, time synchronization, core tools for phase-different detecting as well as adaptive equalization processing in System Generator (a software of Xilinx), the authors have designed a complete baseband IF 16-QAM system, in which the baseband signal is upconverted into IF frequency (up to 12MHz) at the transmitter and then is downconverted at the receiver. After timing synchronizing, the adaptive equalizing and phase recovering, the received baseband signal is displayed in the oscilloscope's screen. These accurate experiments conducted in Virtex 4 FPGA board kit have shown a promising foundation for developing coding, algorithms in 16-QAM modulation scheme. [C123]

"IS Alignment Improved with Co-Evolutionary Principles: An Open Source Approach"

Despite extensive research, results on the sources, components and mechanisms to create or sustain information systems (IS) alignment are still lacking. The quest for an IS alignment remains a critical unsolved problem. In an attempt to address this situation, we present and test a comprehensive theoretical model in an OSS context. We explain how IS alignment at the individual level between the Open source system (OSS) project performance and open source developer's activity level is improved. We integrate the co-evolutionary theory (adaptive tension, change rate and modular design) to understand how IS alignment is improved. This study is based on data gathered from over 750 open source projects developing enterprise applications on sourceforge.net over one year. The results support all the hypotheses and we conclude that use of the co-evolutionary theory will better help IS alignment in an OSS context. [C124]

"VHDL code generation for FPGA implementation of digital control with co-simulation step"

The principle of an automatic VHDL code generator dedicated to the control of the electric systems is presented in this paper. From the definition of classic regulator, it is possible to envisage a direct integration of the digital regulator in a FPGA component. The advantage of using a FPGA rather than a micro-controller lies in the fact of reaching very high sampling frequencies, allowing to obtain better performances with important bandwidths. It can be then considered that the digital regulator works in a quasi-analog mode. Experimental results are obtained for a Direct Current Power Flow Control (DCPFC) application to prove the better overall performance. [C125]

"Design and simulation analysis of electromagnetic repulsion mechanism"

Electromagnetic repulsion mechanism is a new rapid actuator based on the principle of eddy current, which is better than ordinary spring and permanent magnet actuator in much performance. The electromagnetic repulsion mechanism will be analyzed and designed in this paper. The designed model is simulated by the finite element analysis software Maxwell and the rationality is verified. The main factors which affect dynamic characteristics of the mechanism are also researched. Theoretic reference for electromagnetic repulsion mechanism design is obtained. [C126]

"Resonant flexional piezoelectric force sensor based on the analysis of electromechanical"

impedance for aircraft application"

In this article a new structure of a force sensor based on piezoelectric materials is proposed. The design and choice of measuring principle is based on the direct piezoelectric effect, for the measurement of the dynamic force, and on the analysis of the electromechanical impedance technique, for measuring the static force. This technique is based on the measurement of modes of the structure. Indeed, the application of stress on the structure will cause changes in the modes of the structure and appearance of new eigenmodes. Thus far these methods should allow for measurement of static force applied. A preliminary literature review has highlighted the benefits and potential of the technique of electromechanical impedance analysis to design a force sensor. After choosing an original structure that allows the sensor function, for different types of dynamic and static effort, a study of this technique was undertaken and led to analytically model the structure by a Mason's scheme and determine the eigenmodes and the scale factor. The simulation on ANSYS® software was used to determine the electromechanical parameters of the structure, using the Lagrangian approach. An experimental study of a demonstrator has validated the chosen structure, according to the dynamic and static effort by studying the variation of parameters of equivalent electromechanical scheme for different applied forces and the establishment of the scale factor for the dynamic and static effort. [C127]

"Virtual prototyping of diplexers by using CST Studio"

The article deals with automatization of diplexer design in CST environment. A unique library of macros has been developed to support coaxial filter modeling, tuning and optimization in CST Microwave Studio. Comprise general filter topology, cavities, internal couplings and external couplings respective. Next, basic principles of Tuning Space Mapping (TSM) method implemented into CST are mentioned. The function of fine and coarse model and their link between each other is explained. The whole algorithm is illustrated on the particular UMTS diplexer design and optimized results are compared to measured ones. [C128]

"Twenty engineering principles for undergraduate mechatronics engineering students"

A number of engineering principles are introduced to the students of undergraduate mechatronics courses that arm them with a valuable tool in design and problem solving. These twenty principles are first introduced to the students and then reinforced during various courses by the use of case studies and projects. Each of the twenty principles is reviewed and examples given where appropriate. An example of the study of a final year graduation project as a tool to illustrate and clarify one of the principles is also given. It is important that the principles become second nature to the students rather than something interesting they hear or read about or a set of points that they memorise. This is ensured by providing them with a large number of opportunities to apply the principles and understand the great benefit they provide in their engineering careers. [C129]

"Design Principles for Power Grid Cyber-Infrastructure Authentication Protocols"

Recently, there has been an increased focus and a sense of urgency in developing standards for Power Grid systems centered on the need for interoperability. Given the threat against these systems an important goal is the development of effective cyber security standards. However, past experience shows that security protocols are prone to design errors. Focusing on authentication protocols, in this work we discuss key design principles and engineering practices that we believe can help ensure the correctness and effectiveness of standards for authentication in Power Grid protocols; e.g., DNP3. This work builds on past work in the area of principles of authentication in Internet protocols but focuses the discussion on the constraints of the Power Grid; in particular, the need for efficient and highly available systems. [C130]

"Challenges of Mobile Clinical System Design: What do Nurses Think?"

Mobile clinical systems hold great potential for facilitating nursing documentation and communication activities. In this paper, we explore the possibilities of evaluating a mobile clinical system prototype by nurses in the early system design stage. Nurses' concerns and perceptions regarding the mobile system were solicited using a scenario-based design approach. The results revealed tensions between managing general usability principles of ease of use and efficiency with the medical principles of dealing with medical errors, privacy and interruptions. The findings can be used to inform future nursing mobile system design and to provide evidence for supporting nurses' involvement in the early system design and evaluation process. [C131]

"A Goal Oriented and Knowledge Based E-Government Project Management Platform"

There is a growing need for better project management in e-Government endeavors to bring together people with diverse knowledge and skills so they can develop and implement project activities effectively and efficiently. This paper is a research report on eGTPM (e-Government Transformation Project Management) platform, a

project management tool which assists implementers and decision-makers in e-Government project planning and control. eGTPM Platform improves most existing commercial tools by integrating goal orientation and dynamic enterprise modeling (DEM) principles into the knowledge building tool developed at the Decision Systems Laboratory in National Technical University of Athens. By employing goal orientation and DEM principles' concepts, eGTPM facilitates communication and collaboration among all involved parties in order to jointly identify project needs and requirements and to reduce the number of changes due to misunderstandings. eGTPM also includes a knowledge based project control advisor which contains heuristic knowledge to guide users to possible design alternatives. The paper describes eGTPM's components and possible directions for future work. [C132]

"Exponential stability for NCS with time-varying delay and dynamical state feedback"

This paper concerns the problem of the model, stability and controller design for networked control system (NCS) with time-varying delay and dropped out packet. For the NCS with time-varying delay and data packet dropout, four new control methods of dynamical state feedback control, dynamical state feedback proportional-integral (PI) control, state feedback proportional-derivative (PD) control and dynamical state feedback PD control are presented. The NCS with time-varying delay and data packet dropout based on the four control methods is modeled as an asynchronous dynamical system (ADS) constrained by event rates. Furthermore, based on the ADS theory, principle of Lyapunov stability and method of linear matrix inequality, both the semi-negative definite matrix conditions of exponential stability and the controller design for NCS are given. Finally, numerical example illustrates the feasibility of the results. [C133]

"Intelligent control of coke oven"

Coke oven is a complex plant with the characteristics of large time-delay, strong non-linear, multivariable coupling and changeable parameters. The longitudinal temperature was affected by many reasons, the control principle of combining the intermittent heating control with the heating gas flow adjustment was adopted. Intelligent control methods, namely fuzzy control and neural network, were proposed to establish intelligent control strategy and model of coke oven, which combined two feedback control, one feed forward control and intelligent control. Initial gas flow was given by heating supplied feed forward model according to coking mechanism, and carbonization index feedback model was proposed in the model to revise the goal temperature to control coking management of coke oven. Flue temperature soft measurement model based on linear regression and neural network was built to supply temperature feedback control. According to artificial operation and actual condition, fuzzy controller was designed. Intelligent control methods were used to adjust stopping heating time and heating gas flow. The practical running results indicate that the system can achieve heating intelligent control of coke oven, stabilize production of coke oven, effectively improve quality of coke and decrease energy consumption, and has great practical value. [C134]

"A more efficient classification scheme for ID3"

Analyzed the principles and implementation steps of ID3 and the existing two improved ID3 algorithms proposed in [4] and [5]. ID3 has the shortcoming of inclining to choose attributes which have many values. Although the current two improved classification algorithms have solved the shortcoming of ID3, their classification time is not enough short, and their classification accuracy is not enough high. We proposed a new scheme. Our scheme solved the shortcoming of ID3 and improved the existing two algorithms effectively. Finally we use experiment to prove that the new scheme has shorter classification time and higher classification accuracy than ID3 and the existing two classification algorithms. [C135]

"System analysis of realization of physical laws symmetry for contemporary signal energodynamics for MEMS synthesis"

There is shown the cause and effect of some kind bifurcation and even dissociation of physicists thinking which have been provoked by pandomination of so-called general relativity theory. A system analysis of invariance concept and term origination instead of relativity ones and real perceiving of physical laws symmetry for investigations and its necessity for education process is given. [C136]

"An on-board differential Bunny-Ear Antenna design for 60 GHz applications"

A design of differential Bunny-Ear Antenna (BEA) for the application of 60 GHz frequency band is presented. This antenna is fed by differential microstrip transmission line (MTL) and to be connected to the transceiver chip by bondwire. The bondwire introduces inductance and high impedance which destroys the matching, so the compensation structure for the interconnect is included in the design. In the simulation, the return loss is better than -10 dB. The radiation patterns are similar from the very low frequency of 57 GHz to high frequency of 65

GHz, with a 3-dB beamwidth of about 28 degrees in the principle planes. The measurement verifies the simulated radiation characteristics and shows that a gain of more than 9.7 dBi can be achieved by using this antenna. [C137]

"Design principles and sensitivity analysis of MEMS cantilever sensors"

The aim of this work is to establish design principles and model equations for analysing sensitivity of MEMS cantilever sensors. Sensitivity and quality factor were estimated to be the most important parameters for MEMS cantilever sensors. [C138]

"B+-tree in database design for decision-making information system"

This paper describes the design of the database for decision-making information system based of the B+-tree principles of database indexation. [C139]

"The concept of software structure for automatization project's replies for various CAD"

Conceptual structure of design automatic software answers to question and principles of interaction between the main blocks of subsystem. [C140]

"The study on new energy saving controller for oil-pumping units in oilfield"

The energy-saving effect of Y/ Δ change-over controller is better than the silicon controlled rectifier(SCR) voltage regulating style when the load rate of oil-pumping unit is low; but the silicon controlled rectifier(SCR) voltage regulating style is better than the energy-saving effect of Y/ Δ change-over controller when the load rate of oil-pumping unit is high. Based on high-precision three-phase electrical energy measurement IC-ATT7022A, a new energy saving controller of combining the advantages of both controllers is designed. On the analysis of based on the principle of voltage regulating and energy saving of electric motor of pumping units. This paper analyzes the system's hardware and software design. Through the installation of Y/ Δ -SCR controller and comparison tests at the scene in five oil wells, every well saves 21000 kW.h annual. [C141]

"Study of variable-pitch wind turbine based on fuzzy control"

First, the analysis of developing status of wind turbine control strategy has been made; Second, some mathematical models about aerodynamic parts are established according to the principle of the wind power generating units various parts. At the same time, some sub-modules of the wind turbine are established in MATLAB. At last, the control strategy based on Fuzzy controller is design and simulated by MATLAB/simulink. Both in the low wind speed and high speed the power output of the generator can quickly reached a stability (about 4s), which improve the control system respondent time. [C142]

"A new design concept for high performance fading channel simulators using random wobble"

In this paper, a new technique which employs random wobble on the method of exact Doppler spread (MEDS) for the design of high performance Rayleigh fading channel simulators was proposed. The new method could be used on any deterministic parameter computation method in theory, such as the method of equal areas (MEA), the method of equal distance (MED) and the LP norm method (LPNM), etc, and if the random wobble amplitude is set to be an infinitesimal real value, the autocorrelation (ACF) of inphase (quadrature) components will converge to the ones of reference model exactly. Due to the ACF arithmetic errors of the inphase and quadrature components compensate each other over a determined domain; The ACF of complex waveform matches the desired ones perfectly even if the number of sinusoids is a single-digit integer. Simulation results show that the proposed method is useful for the design of simulation models for diversity-combined fading channels, frequency-selective channels, and multiple-input multiple-output (MIMO) channels; moreover, it has many kinds of realization and can be directly used to simulating multiple uncorrelated Rayleigh fading waveforms with low model complexity and low computation costs. [C143]

"Efficiency enhancement of class-F GaN power amplifiers using load modulation"

In this work a 10 W GaN based class-F amplifier at 1 GHz is presented. The presented amplifier uses load modulation principle to achieve high efficiency over 11 dB output dynamic range. The output matching network is an L matching network with a tunable inductor and a tunable capacitor. The tunable inductor is based on a $\lambda/4$ impedance inverter and a switchable capacitor bank. The tunable inductor presents a short circuit for the second harmonic and an open circuit to the third harmonic; additionally together with the tunable capacitor they present the optimum working impedance for the transistor. The designed amplifier has a power added efficiency of 82%

at an output power of 40 dBm and through using adaptive matching it can achieve a PAE of 60% at an output power of 29 dBm, in contrast to a PAE of only 22% in the case of using a fixed matching network. [C144]

"Design of a moisture independent microwave mass flow detector for particulate solids"

Simulations on a novel moisture independent mass flow detector based on a mass flow sensor with open an cylindrical resonator where carried out. The massflow sensor consists of two MicroStrip Patch couplers integrated in a Composite Right-/Lefthanded Transmission line resonator. The design of a particulate mass flow detector based on this sensor is given and the algorithm to detect the average solids concentration is shown. The simultaneous detection of the velocity and the moisture independent solids/air concentration from a single measurement, ensures a true mass flow detector. Since it was already shown formerly, both sensor principles are able to measure the moisture dependent massflow rate with high precision, we expect for the combination of both principles a detection accuracy in the range of both single sensor principles. Measurements of natural substance granulate with different amounts of moisture up to 18% (vol.) were done in order to proof the concept. The novel detector design is promising for industrial applications with various scenarios of gas/solids, gas/liquid and liquid/solids flows. [C145]

"Methods and schemes of measuring the electric circuit resistance parameter value"

A short analysis of the existing methods and schemes of measuring the unknown value of the electric circuit resistance parameter is conducted in present article. Their principle advantages and disadvantages are specified from the point of view of their prospective improvement aimed at solution of the problem of electric resistance measuring accuracy in MEMS technologies. [C146]

"The investigation of learning websites in teaching English to college students"

With the need for language study and the popularity of personal computers, college students are requesting more and more resources for language learning. In this case, many English learning websites are emerging. This paper presents the investigation of learning websites in teaching English language to college students. First, the concept of online learning website is explained by answering some commonly asked questions, and the relationship between the college students and teachers in websites environments are considered. Then, the relationship between personal computer usage and performance in English language learning is investigated; it is showed that college students who spent one or more hours in the English learning websites could achieve higher scores in English. Finally, some essential evaluation criteria for English learning websites are introduced, and suggestions and principles for designing learning websites are presented. [C147]

"Improved Utilization of NoC Channel Bandwidth by Switch Replication for Cost-Effective Multi-processor Systems-on-Chip"

Virtual channels are an appealing flow control technique for on-chip interconnection networks (NoCs), in that they can potentially avoid deadlock and improve link utilization and network throughput. However, their use in the resource constrained multi-processor system-on-chip (MPSoC) domain is still controversial, due to their significant overhead in terms of area, power and cycle time degradation. This paper proposes a simple yet efficient approach to VC implementation, which results in more area- and power-saving solutions than conventional design techniques. While these latter replicate only buffering resources for each physical link, we replicate the entire switch and prove that our solution is counter intuitively more area/power efficient while potentially operating at higher speeds. This result builds on a well-known principle of logic synthesis for combinational circuits (the area-performance trade-off when inferring a logic function into a gate-level netlist), and proves that when a designer is aware of this, novel architecture design techniques can be conceived. [C148]

"Education reform on the course-education of "Principle of Reinforced Concrete Structures""

Civil engineering is a discipline with very strong practicality. "Principle of Reinforced Concrete Structures" is one of the major courses of civil engineering discipline, which has close connection with the practical engineering. With the hasty improvement of the computer technique, and with the rapid development of civil engineering structural scale, structural style, structural system, most reinforced concrete structures are designed by the special engineering softwares. According to the course characteristic of "Principle of Reinforced Concrete Structures", it is proposed that the engineering software can be introduced into the process of course teaching. Based on the personal teaching experience in the course teaching of "Principle of Reinforced Concrete Structures", objectives of education reform on the course-education of "Principle of Reinforced Concrete Structures" are analyzed and discussed in detail as well. [C149]

"Teaching innovation of geotechnical engineering based on CDIO"

A curriculum based on the CDIO (Conceive-Design-Implement-Operate) principles was proposed for the Geotechnical engineering programme in the School of civil Engineering at Henan Polytechnic University in China. The CDIO engineering education principle is introduced in brief. Some problems in the process of geotechnical engineering teaching are analyzed, then the revelation on the teaching innovation practice of geotechnical engineering based on CDIO are detailed discussed. It is indicated that curriculum based CDIO puts students in a broad and active engineering environment where they learn and use engineering science, technology and non-engineering knowledge, and exercise their communication, project management, leadership and other skills.

[C150]

"An exploration on the reformation of distillation comprehensive experiment of chemical Engineering Principle"

The distillation experiment is of significant importance in the course of chemical Engineering Principle, in which all kinds of knowledge is involved, such as heat and mass transfer. To enhance the creative thinking of the students, the distillation experiment was extended into an integrated design experiment in our university. A preliminary exploration on the teaching mode and experimental methods was carried out and the problems existed were summarized. And as a basic data, it will provide a reliable evidence for the experimental teaching reform. [C151]

"Design principle for low bending losses in all-solid photonic bandgap fibers"

The structural dependence of factors which mainly affect a bending loss property is theoretically investigated in all-solid photonic bandgap fibers. A design principle for realizing a low bending loss is successfully figured out.

[C152]

"Frequency transformation of harmonic signals"

The article briefly discusses some modern methods of transformation frequency harmonic signals. Also consider working principle and construction of several frequency divider and describes their use. Formulated the advantages and limitations of existing approaches and open questions in this area that are relevant for further research. [C153]

"Optimizing nano-patterned metal films for Use as transparent electrodes in optoelectronic devices"

We optimize the optical properties of nano-patterned metallic films for use as transparent conductive electrodes in optoelectronic devices by performing a constant-sheet-resistance transformation. Our design principles apply to both one- and two-dimensionally patterned films. [C154]

"Optimizing piezoelectric ceramic thickness in ultrasonic transducers"

The thickness of the individual piezoelectric ceramics should be one of the most fundamental decisions made by designers of ultrasonic transducers. The overall piezoelectric stack length is normally determined by pragmatic guidelines based on the wavelength at the resonating frequency (e.g., j wave). However, the thickness and number of the individual ceramics are often determined by the capability of the drive electronics (e.g., maximum voltage), rather than by fundamental transducer design principles. This research quantifies the performance of ultrasonic transducers based on the thickness and number of the piezoelectric ceramics for a given overall stack length. The motivation for thinner ceramics includes a higher and more uniform electric field for the same voltage and lower impedance, but this results in more joint interfaces-increasing impedance and manufacturing costs-and a four-fold capacitance increase with thickness (e.g., halving the thickness doubles the capacitance and the number of elements); these drawbacks are precisely the motivation for thicker ceramics. This investigation focuses solely on the common Navy Type III, PZT8 piezoelectric material. Several metrics are investigated such as impedance, tool displacement gain, capacitance, quality factors, and electromechanical coupling factor. The experimental and theoretical research methods include Bode plots, admittance loops, equivalent circuits, scanning laser vibrometry, finite element analysis and use of a materials testing machine. [C155]

"Quantum kinetics of transport and gain in quantum cascade lasers: Looking for the essential principles of design"

The complex interplay by tunneling and scattering in quantum cascade lasers is analyzed with nonequilibrium Green's functions. Data for a recently proposed simple structure based on only two wells per period is presented. This simple structure allows to visualize the relevance of the tunneling resonance very clearly. It is

argued that a QCL design needs at least three levels per period, thus further simplifications of the design are not likely to occur for THz lasers. Finally the similarities and differences between quantum cascade lasers and superlattices are addressed. [C156]

"Design and implementation of FIR digital wave filter based on DSP"

This paper discusses the general principles of FIR digital wave filter, describes a design method for FIR digital electric wave filter based on DSP processor with TMS320VC54x fixed point series. The coefficient of wave filter is obtained using the MATLAB window function calculator and verified with the DSP measuring system. The digital electric wave filter's all functionalities met design expectations. [C157]

"Quantum mechanical tunnelling in nanoelectronic circuits: Design of a nanoelectronic single-electron RAM"

Single-electronics is a nanoelectronic technology that makes possible the control of transport and position of a single or a small number of electrons. The fundamental physical principles of single-electronics are the quantum mechanical tunnelling and the Coulomb blockade. Bits of information are represented by the presence or absence of a single or a small number of electrons in conducting islands. The design and operation of two basic single-electron gates and the basic memory cell are presented. Furthermore, a single-electron random-access memory array is designed and its operation is analyzed using Monte Carlo simulation. Simulation shows that selective read and write operations can be performed in this memory array. [C158]

"Building a Believable Agent for a 3D Boxing Simulation Game"

This paper describes an approach used to build a practical AI solution for a 3D boxing simulation game. The features of the designed AI agent are based on our deliberate concentration on believability, i.e. human-likeness of agent's behavior. We show how learning by observation and case-based reasoning techniques can be used to create an AI decision-making system for an industrial-level computer game. The chosen AI design principles support high usability and maintainability, which is important for game developers. We prove experimentally that our AI system provides both believable and effective behavior. [C159]

"Cause-and-effect function analysis"

TRIZ has been getting spotlight in technology innovation due to a set of excellent practical tools for problem solving. And especially the 40 inventive principles are the representative and basic tool of TRIZ. However some criticize these principles as they are not so easy for ordinary users to utilize. Firstly, it is very difficult to select the most appropriate principle among the 40 principles including 39 irrelevant ones. Secondly, it is still difficult to apply selected principle to problems. Therefore, this paper suggests the cause-and-effect function analysis to overcome this problem. With this methodology, we can build function network which has two main contributions, finding inventive principles and discovering new functions. As a result, the cause-and-effect function analysis and function network can make a system which leads technology innovations. [C160]

"Contradictions determination method in product design using Petri net"

The core of product innovation is the design to resolve contradictions, how to determine contradictions in the innovative design has become one of the key issues. Petri net is applied to product design and used for describing the logical relation of principle solution. The paper redefines the contradiction in Petri net theory and proposes a new method of contradiction identified based on Petri net. An engineering case is used to show the process of the new method. [C161]

"Function evolution and forecasting for product innovation"

The evolution of product function is the result of demand evolution or system evolution, which is governed by certain laws and is predictable. The composition of function structure and function classification are proposed to lay the foundation for function evolution. The stages division and laws of function evolution are proposed to point out the direction for function design, and the approaches of function are proposed to give the concrete method of function design. The forecasting zones of function evolution are proposed to provide a practicable space. The contradiction analysis is to make evaluation of function evolution, then TRIZ tools and CAI software can help designer to solve the contradiction and generate principle solutions. Integrated above contents, the product innovation process model based on function evolution and forecasting is proposed, which provides a systematic approach to product innovation from functional design angle. A innovative design example of pill dispersing machine demonstrates the proposed method is feasible. [C162]

"Design of castor shucking machine key component and study on parameter optimization experiment"

Through the study on the shucking principle of castor shucking machine, this paper designs the key working mechanism of castor shucking machine. By orthogonal experiment, it finds that the main parameters influencing the rate of insufficient shucking and breakage rate are roller speed, gap and material and studies the influence degree of various parameters on shucking effect and the relationship between them in the process of shucking. Shucking net rate: the influence of roller speed and gap on it is relatively significant but the influence of roller material on it is not significant; breakage rate: the influence of roller speed, gap and material on it is significant. The best optimization combination is A2B2C3, i.e. shucking roller speed is 10r/min, shucking roller gap is 18mm and shucking roller material is steel base covered with plastic material outside. [C163]

"Prognosis technology for roll eccentricity based on the difference evolution algorithm"

This paper proposed a modified Fast Fourier Transformation algorithm of the difference evolution to solve the problem of inaccurate result for analyzing roll eccentricity signal by FFT. Firstly, the basic principle, realization process and pertinent algorithm program were realized. Then the algorithm had been tested. The simulation results have shown that first-harmonic and harmonic components of eccentricity force signals can effectively analyzed by the MFFT of the difference evolution under conditions that sampling duration is not to the integral multiple of the signal fundamental periodicity. The result demonstrated that the eccentricity influence of the first stand is the most serious and the eccentricity influence of the fifth stand in five-stand cold tandem mill is second. Furthermore the effect of watermarks before hot rolling was the primary factor of periodical rolling force variation. This algorithm is valid for the qualitative analysis and on-line control and compensation of the roll eccentricity. [C164]

"Design of DHCP protocol based on access control and SAKA encryption algorithm"

The paper described the working principle of DHCP and analyzed the unsafe features under the IPv4 network, an based on access control and SAKA encryption algorithm was proposed. It combined the key exchange algorithm with DHCP protocol to overcome the original protocol flaws. The improved protocol plays a preventive part in the common attack methods such as packet sniffer, dictionary attack, man in middle attack, and provides a reference for management of high security in the network. [C165]

"Research on Spectral Clustering algorithms and prospects"

Along with the expansion and in-depth of the application domain of cluster analysis, one kind of new cluster algorithm called Spectral Clustering algorithm has been aroused great concern by scholars, Spectral Clustering algorithm is newly developing technique in the field of machine learning in recent years. Unlike the traditional clustering algorithms, this can solve the clustering of non-convex sphere of sample spaces and has globally optimal solution. This paper introduces the principle, the induction summary to the current research situation of Spectral Clustering algorithm as well as in various application domains. Firstly, the analysis and induction of some Spectral Clustering algorithms have been made from several aspects, such as the ideas of algorithm, key technology, advantage and disadvantage. On the other hand, some typical Spectral Clustering algorithms have been selected to analyze and compare. Finally, it points out the key problems and future directions. [C166]

"Application of eigenvector centrality in metabolic networks"

Topological analysis methods have been developed to study the fundamental organizational principles of large-scale metabolic networks, which would be operated maintain life in human and other organisms. Among a lot of topological analysis methods, a number of recent studies have focused on the centrality methods, which could be help to seek for important metabolites in metabolic networks, and would greatly aid drug target identification and therapy design. In this paper, we engage eigenvector centrality method to study metabolic networks of 20 organisms from different species, we analyze the first 10 important metabolites in these 20 metabolic networks and discuss their biological signification. [C167]

"FPGA-Based Design and Implementation of Reduced AES Algorithm"

This paper introduces the principle of AES algorithm and the detailed description and implementation on FPGA. This system aims at reduced hardware structure. Compared with the pipeline structure, it has less hardware resources and high cost-effective. And this system has high security and reliability. This AES system can be widely used in the terminal equipments. [C168]

"Congestion control with the fixed cost at the domain border"

CSFQ is designed as an open loop controller to provide fair best effort service, which supervises the bandwidth consumption of pre-flow and has become helpless after P2P flows dominate the traffic of the Internet. Token-Based Congestion Control (TBCC) is based on a closed loop congestion control principle, which restricts the token resource consumed by an end-user and provides fair services with $O(1)$ complexity. As Self-Verifying CSFQ, it is heavy load to police inter-domain traffic for lack of trust. In this paper, Token-Limited Congestion Control (TLCC) is presented, which appends inter-domain congestion control to TBCC. TLCC provides the fixed cost to the inter-domain congestion charging with $O(1)$ complexity. By simulations, it is demonstrated that TLCC can provide stable and fair bandwidth allocation across the domain border. [C169]

"Dynamic inversion based on neural network applied to nonlinear flight control system"

Modern flight control system is always a complicated nonlinear flight control system, this paper presents a control method of dynamic inversion based on neural network applied to nonlinear flight control system. Through analyzes the decoupling inversion and tracking principle of neural network, a dynamic neural network is presented, which consist of static neural network and integrators. Based on the dynamic neural network, a control method of dynamic inversion used for multi-variable nonlinear flight control system is designed, and simulation of flight control system of power parafoil is made. Simulation results demonstrate that the control method has strong ability of control and robustness. [C170]

"The design of variable frame length LT code based on limiting conditions"

Because the LT code has the drawback of coding efficiency is not high, decoding time is too long and decoding probability is low, a mathematical method of limiting analysis is introduced to the distribution of LT code, which analysis the effects of different source data frame length, different parameters for LT code from principle, then a system program of variable frame length LT code is proposed, whose core idea is to make a appropriate design of frame length of the source data, split the source data and encode them separately to meet different performance requirements. Theoretical analysis and simulation results show that: Compared with the conventional LT codes, variable frame length LT codes can effectively improve the coding efficiency and decoding probability, enhance the feasibility of LT code in actual system. [C171]

"The design on the wireless wrist device of vital movement index for solitary elders"

The paper introduced the solitary elders' monitoring system by using the wireless communication chip-nRF9E5 of embedded microprocessor, in order to facilitate and help elders to get first aid during sudden disease or disaster, and to improve old-age service system and their quality of life. This paper mainly illustrated the design principle of the wrist device for solitary elders, showed the circuit design in detail, meanwhile it conducted a detailed description on the working principle of the wrist device and the realization of low-power program. Proven, the wrist device with easy to carry, the use of flexible, low cost, easy expansion of functions, is applicable to many areas. [C172]

"Design of time difference of arrival estimation system based on fast cross correlation"

A time difference of arrival (TDOA) estimation system based on fast cross correlation is introduced in this paper. The system takes ADS8365, FPGA and DSP as the core devices to implement multichannel synchronous data acquisition and real time data processing. Comparison between cross correlation and fast cross correlation in aspects of the principle and time complexity is also discussed. Experimental results show that the performance of fast cross correlation is 4 times and 13 times better than cross correlation in simulation and actual hardware test, respectively. Finally, performance of time difference of arrival estimation is given which meets the requirements. [C173]

"Development of Energy Transmission External Deep Brain Stimulator"

Wireless power transmission for external deep brain stimulator is researched and designed in this paper. The principle of loose coupling of the power transmission is introduced in this paper. Factors that affect the power transmission are analyzed in theory and solutions to solve those factors are given. At the end of this paper, wireless power transmission for external External deep brain stimulator is designed and the results of the experiment show it can provide enough and effective transmission efficiency for external deep brain stimulator. [C174]

"Progress in Water Quality Monitoring Based on Remote Sensing and GIS"

This paper reviews the progress of the application of RS and GIS integration technology and the design of

integration system in water quality monitoring domain. Key aspects of available remote sensing techniques and the present application domain of water quality monitoring by remote sensing applications are briefly summarized. Special attention has been focused on the main principles of using remote sensing to monitor water quality, and the main retrieved algorithms and available satellite data sources. Recent advances are examined and limitations of water environment remote sensing and the future research prospect are discussed. [C175]

"Design of the Tensile Testing Machine Computer Control System Based on MCGS"

In order to solve the problems caused by using traditional materials in the experiments, such as complicated operation process, poor control, low testing accuracy, inconvenience of recording test data, lack of timely data processing and so on, the control of the tensile test must be improved. This paper in details analyzes the operational principle of the tensile test machine, on which a tensile test machine control program is proposed based on MCGS. By selecting the appropriate sensor and using PCI_1716 data acquisition card, a tensile testing machine control system's hardware platform is founded. The control system software based on MCGS, can monitor the process of tensile testing, display and record real-time testing data. Practice has proved that the tensile testing machine control system has many advantages of high accuracy, good real-time, stability, easy operation etc, which can meet the needs of practical applications. [C176]

"Improvement of Chinese spam filtering method based on Bayesian classification"

The paper described the basic principle of Naive Bayesian spam filter, and analyzed some major factors which influence Chinese spam filter mostly. On the basis of these, proposed a method to optimize the feature databases. Some experiments were designed to study the filter performance on correctness and efficiency. Some detailed analysis of the experiments also presented in this paper. The experimental results illustrate that the improved method can enhance the precision and efficiency of Bayesian classifier and lower the error rate of legitimate emails. [C177]

"An Improved RSA Signature Algorithm Based on Complex Numeric Operation Function"

Digital signature can be realized by using RSA algorithm. RSA is widely used in public-key cryptosystem. But running this algorithm needs lots of time and memory. This paper proposes a RSA signature algorithm to fit for the devices with low computational power. The new signature algorithm is based on complex numeric operation function. This paper expounds the fundamental principles of RSA algorithm. The realization of RSA algorithm includes the generation of RSA cryptographic key and the encryption and decryption of data. By using RSA algorithm, we can use the private key of the sender to sign the plaintext and the public key of the receiver to encrypt. For the receiver, he can use his private key to decrypt and the public key of the sender to verify the signature. [C178]

"Broad area semiconductor lasers with tailored gain"

According to the principle of carrier diffusion, we fabricated an electric pattern high power single quantum well broad area semiconductor laser. The designed devices have special current injection stripe which forms Gaussian-like photon gain laterally. Utilizing this principle, tailored gain lasers exhibiting near single lobe far field patterns were found. The tailored gain lasers emitting at 808 nm with the measured full width at half maximum angle of 4.1°, the maximum continuous wave output power up to 3.4W, and slope efficiency as high as 0.89 W/A were reported. The beam quality of the broad area semiconductor single quantum well laser has been improved obviously by the designed devices. [C179]

"Guided inquiry laboratory exercises designed to develop qualitative reasoning skills in undergraduate engineering students"

We describe inquiry-based lab exercises designed to develop qualitative reasoning skills. The exercises require students to predict outcomes before making measurements, and to compare predictions to measurements as soon as those measurements are available. The predict-then-confirm process aims to develop both qualitative and quantitative reasoning as a practical engineering skill and as a method of gaining deeper understanding of the material. Qualitative reasoning involves the use of engineering models and formulas to draw conclusions without resorting to numerical computation. In this paper, examples of qualitative reasoning are demonstrated for measurements on a kitchen blender and a toaster. Because this equipment familiar to students and has readily understood operating principles, qualitative reasoning can be introduced as a way to extend common sense ideas about how and why the equipment works. [C180]

"A Computer Engineering Technology Body of Knowledge"

Educational programs in engineering and engineering technology have been developed to address many technical aspects associated with computers. Computer Engineering programs typically focus on the theoretical foundations related to machine and algorithm designs used to develop computers, producing highly skilled design and research engineers. Computer Engineering Technology (CpET) programs span a wide range of focus, from hardware and software development principles and practices to the latest advances in "applications". Other programs tend to focus on Information Technology concepts and practices for the enterprise. This paper compares and contrasts CpET to other forms of computer, information, and network technology academic disciplines. We identify educational gaps that can be filled by 4-year CpET programs using the 2004 IEEE and ACM Joint Task Force on Computing Curricula "Body of Knowledge" for computer engineering, industry input, and institutional factors. This work also captures situations where combining CET and IT-centric disciplines can be useful to academic institutions, students and employers. [C181]

"Innovative approach to teaching undergraduate reinforced concrete design"

This paper highlights innovative teaching techniques aimed at improving understanding and comprehension of reinforced concrete design theory. These techniques include: 1) Use of American Concrete Institute (ACI) building code-based analysis and design techniques, which focus on strain compatibility and equilibrium concepts; 2) students are required to develop five sets of team-based spreadsheet programming assignments; and 3) incorporation of a term project requiring students to design, construct, and test full-scale reinforced concrete beams. This course focuses on improving student's abilities to think critically and apply their knowledge of fundamental engineering principles to solve reinforced concrete design problems. Taught with the same pedagogical techniques for the past ten years, the course regularly earns positive feedback from current students and graduates, and is rated as one the most valuable undergraduate courses taken during their four-year educational program. [C182]

"Homography matrix genetic consensus estimation algorithm"

Homography matrix plays an important role in image stitching, camera calibration and other areas of computer vision. This paper presents a novel robust algorithm HM-GCE to estimate homography matrix with principles of genetic algorithm. Related experiments prove its superiority on the robustness, precision and time-consuming compared to the RANSAC algorithm. [C183]

"The research on line features extraction from images of industrial parts based on CAD data"

For features extraction of image measurement and reconstruction from industrial parts images, this paper puts forward a mathematical model guided by CAD designed data which can detect image lines with high accuracy. Firstly, based on CAD data getting line initial values by projecting object line features through the conversion of 3D CAD coordinate and image, and then extracting a sequence of edge points by least squares template matching (LSTM) and acquiring image line equations by the points based on principle of least squares fitting, finally precisely obtaining the contours of industrial parts by solving the intersections of image intersecting lines. By using the algorithm on real images of industrial parts we make a line feature extraction experiment that proved this algorithm was given a high automation extraction, strong stability, and can be used to the image measurement and reconstruction of industrial parts with high accuracy. [C184]

"Work in progress-Impact of early design instruction on capstone experiences"

In the Olin College curriculum, students have significant, early, and continuous exposure to user-oriented design principles. As a result, our students have a very user-centered approach to problem solving that has affected our yearlong, industry-sponsored capstone in several ways. We have reflected on five years of capstone engagements in order to learn how our program has changed because of the design emphasis in our curriculum. The significance of our work is to inform the many departments that are already undertaking design-centric curriculum reform on how they may modify their capstone experiences to best take advantage of new student understanding, and what to expect when using design principles to engage industry problems. [C185]

"Hallelujah! using topical examples to illustrate Ethical and business issues for engineers"

Technically-oriented undergraduate students are often reluctant to engage with "Legal, Social, Ethical and Professional Issues". In particular many learners appear to have an increasingly cavalier attitude to intellectual property in digital media. Meanwhile local employers complain of graduates' "unworldliness". This case study describes the creation of a reusable learning object that uses topicality to make these issues seem more relevant to first year undergraduates in a School of Computing. Based on first delivery we identify principles for the design and maintenance of topical RLOs. One unexpected issue is how quickly topicality wanes and we identify that learners themselves are the best placed to identify future topical examples. [C186]

"Improving learning effectiveness with hands-on design labs and course projects for the operating model of a pipelined processor"

In teaching Computer Organization and Architecture courses, one of the major topics that reflect the techniques of high-performance processors is the analysis and design of high-performance pipelined processors. It covers three interrelated areas: computer architecture, computer organization and implementation. In the context of computer architecture, a pipelined processor works on the principle of exploiting instruction-level parallelism inside the pipeline and exploiting thread-level parallelism among multiple concurrently operating pipelines of a superscalar processor. During the study of computer organization and implementation, students often find it is difficult to understand (1) the operation of an instruction pipeline in its complicated space-time relationships of running an instruction stream over multiple stages of the pipeline, (2) the extensive existence of various types of data and control hazards among instructions, and (3) the distributed control mechanism of handling variable latencies of operations. To help students overcome these difficulties, we designed and developed a series of laboratory activities that were put together into a course project for the design and implementation of an operating model of a pipelined processor. Our multi-year experiences show that these activities and the course project significantly improved students' hands-on experience and understanding of the principle of operation of computer pipelines. [C187]

"ARMs for the poor: Selecting a processor for teaching computer architecture"

Teachers of computer architecture and organization courses have to choose a target processor to illustrate the basic principles of instruction set design. In this paper we suggest that it is time to choose the ARM processor architecture that is markedly different to those used in most current courses. A specific computer architecture is required as a vehicle to teach about registers, addressing modes, instruction types, and so on. Resorting to a hypothetical teaching machine reduces the student's learning burden and makes their learning curve shallow, but failing to introduce them to the complexities they will encounter in the real world can destroy their motivation. Teachers are concerned not only with covering a body of knowledge; they must motivate students and create a sense of excitement. In a discipline as rapidly changing as computer science, only those students who can adapt to change are likely to thrive over the four or more decades of their career. This paper explains why the ARM architecture is an excellent vehicle for teaching computer architecture; in particular, its predicated execution, inclusion of shifting in all data-processing instructions, and its compressed code (Thumb) mode. Moreover, the ARM has a RISC architecture with some traditional CISC architectural features. [C188]

"Understanding the effectiveness of cognitive and social constructivism, elements of inductive practice, and student learning styles on selected learning outcomes in materials engineering"

Research studies in engineering education indicate that students build scaffolds from existing cognitive structures to new information when the students are able to make connections to their existing knowledge base. That research is founded upon the basic principles of social and cognitive constructivism. The effectiveness of two such active course contexts is compared, thus evaluating the characteristics of effective context based active experiences. This study also investigated whether the two contexts resulted in different outcomes for students with different learning styles. The framework of the active experiences in a materials engineering course was changed from music strings and stringed instrument design to biomedical devices which experience significant loads in service because selected student outcomes were still below expectations. Simultaneously, the research project was changed from an individual activity to a cooperative learning experience. More in-class active experiences were also completed cooperatively. The net result was an improvement in thirteen student outcomes and in written and oral language usage. The effect of student learning styles on outcomes was not apparent, but they may be important in forming effective cooperative teams. Overall, stringed musical instruments were not as robust in building student outcomes when compared to the biomedical device approach. [C189]

"Dimension reduction of photolithography data based on PCA"

Embed system plays an important role in our daily life, among which SoC is a key part. With the development of SoC, the complexity of Photolithography increases sharply. Dimension reduction to assist design is very essential for the photolithography simulation in order to display large scale simulation data. In this paper, an approach to reduce data dimension of the simulation results is proposed. This system is not a photolithography simulator but a dimension reduction display system, in which simulator data source is needed. The principle applied in this system is PCA which is widely used in dimension reduction. In the system the displayed data can be controlled flexibly. The experiment results demonstrate its high efficiency. [C190]

"Event driven multi-context trust model"

Agent reasoning in large scale multi-agent systems requires techniques which often work with uncertainty and probability. In our research, we use trust and reputation principles to support agent reasoning and decisioning. Information about agents past behaviour and their qualities are transformed to multi-context trust. It allows to view a single agent from different point of views, because agents are judged in different aspects-contexts. In this paper we describe event driven multi-context trust model as extension of Hierarchical Model of Trust in Contexts (HMTTC), when different types of events causes trust updates. This extension of HMTTC also provides some solutions for avoiding conflicts which may appear in previous HMTTC. [C191]

"Pronominal anaphora understanding"

We argue that pronominal anaphora understanding must rely on the recovery of argument structure asymmetries in conjunction with principles restricting the set of possible antecedents for pronouns. We provide empirical evidence for the need of deep parsing recovering arguments, both overt and covert, that can be possible antecedents for pronouns. We identify several limits of systems that do not rely on deep parsing for pronominal anaphora resolution. We point to independent evidence sustaining our claim, and we draw more general consequences for Natural Language Understanding. [C192]

"Dempster-Shafer temporalized belief structure on expert knowledge streams: Part I. Theoretical foundations"

In this paper we perform the analysis of Dempster-Shafer temporalized structure for the construction of more precise decisions based on the expert knowledge valuations. The relation of information precision is defined on the bodies of evidence. Negative inaccuracy is defined as the stream of rational expert knowledge in Dempster-Shafer temporalized structure. The principle of negative inaccuracy is developed, as the maximum principle of non-specificity measure of a body of evidence. Corresponding mathematical programming problem is constructed. [C193]

"A multi-touch interface circuit for a large-sized capacitive touch panel"

This study presents a multi-touch sensing circuit for large-sized (more than 12 inches) capacitive touch panel. A new AC sensing technique is developed to enable the touch sensing in a large-sized capacitive touch panel. This novel designs of multi-touch sensing circuit lies in the operation principles through a 4X4 ITO film sensor array, a low-disturbance array circuit, a capacitance to voltage converter circuit and the proposed design procedure of chip parameters by circuit simulation. Furthermore, the sequence control for the array is generated by an FPGA module to accomplish the operation of the whole circuit. Some of objectives are to reduce environmental disturbance of the panel and to distinguish multi-touching locations from the panel. The corresponding output voltages of multi-touch sensing circuit are output in proportional to location touched by a human finger. Finally, the whole circuit is implemented by using TSMC 0.35 μm 2P4M process. The circuit output voltages are used to distinguish touch locations by a proposed algorithm. [C194]

"Principle components analysis and Support Vector Machine based Intrusion Detection System"

Intrusion Detection System (IDS) is an important and necessary component in ensuring network security and protecting network resources and infrastructures. In this paper, we effectively introduced intrusion detection system by using Principal Component Analysis (PCA) with Support Vector Machines (SVMs) as an approach to select the optimum feature subset. We verify the effectiveness and the feasibility of the proposed IDS system by several experiments on NSL-KDD dataset. A reduction process has been used to reduce the number of features in order to decrease the complexity of the system. The experimental results show that the proposed system is able to speed up the process of intrusion detection and to minimize the memory space and CPU time cost. [C195]

"Controller design for DFIG-based wind power generation using Zakian's framework"

In this paper, a real power controller design for wind power generation has been conducted. The wind power station is assumed to be a type of doubly-fed induction generator (DFIG). Zakian's framework has been employed to maximize power output and to limit the system frequency negative impact, concurrently. Under fluctuation of wind speed in two-machine test system, the performances of the design controller are examined. Simulated test results show that the proposed method is effective. [C196]

"Interleaved sepic converter with low switching loss"

An interleaved sepic converter with low turn-on switching loss is presented in this paper. Power switches can be turned on with zero-voltage-switching (ZVS) feature when it is operated at duty cycle greater than 0.5. Although, the proposed converter is operated at hard switching when the duty cycle is less than 0.5, the smooth current by the resonant inductance can reduce the turn-on switching loss. Thus the total switching losses can be reduced compared to the hard switching converter. The interleaved PWM scheme can also reduce the current ripple at the input and output capacitors. Thus the size of inductor and capacitor can be reduced. The circuit configuration, operational principles and design considerations of the proposed converter are discussed in detail. Finally, simulations and experiments from a 120W laboratory prototype are provided to confirm the theoretical analysis and the advantages of the proposed converter. [C197]

"Analysis and implementation of a novel dual resonant converter"

A novel dual resonant converter with two transformers is presented in this paper. Dual resonant tanks are composed by the leakage inductors and resonant capacitors to achieve zero current switching (ZCS) turn-off for rectifier diodes at the secondary side of transformer. Hence, the reverse-recovery problem of the rectifier diodes can be eliminated. Moreover, the active clamp circuit is not only absorbed the energy stored in the leakage inductor but also clamp the voltage stress of power switches. Compared to the conventional dual resonant converter, the ZVS operation of the proposed converter is easily achieved by using two transformers. The operational principles, design consideration and realization are discussed in detail. Finally, experimental results from a 400W laboratory prototype are presented to confirm the effectiveness of the proposed converter. [C198]

"Design and analysis of high efficiency DC-DC boost converter with active resonant technique for small grid-connected PV systems"

In this paper, an analytical analysis and design of an active resonant snubber that is used for reducing the switching loss and switching stress of the dc-dc boost converter in grid-connected PV systems is proposed. The operation principle of the proposed active snubber is analyzed. A design consideration is developed according to the equations derived in various operation stages for determining the optimized values of soft commutation circuit components. The performance of the grid-connected PV system with the soft-switching dc-dc boost converter is demonstrated by simulation results to verify the operation analysis and the efficiency improvement. The results show that less switching loss and switching stress of the converter switch are obtained by the proposed active resonant scheme. The overall efficiency of an improved dc-dc boost converter is increased to about 94% from the value of 93% in its hard-switching PWM counterpart. [C199]

"An analysis of bidirectional superposed dual active bridge DC-DC converter with synchronous rectifier"

This paper describes the principles and characteristics of a novel bidirectional superposed dual active bridge DC-DC converter with synchronous rectifier, which has a mechanism formed from two bridge-type converters that are linked through superposition in additive polarity in series. Conventionally, for an isolated dual active bridge DC-DC converter, the rated voltage of its switching elements is decided according to the DC power source voltage and load current. Therefore, as the voltage and current specifications of a DC-DC converter become higher, physical size becomes larger, conduction and switching losses increase and power efficiency reduces. To solve this problem, the authors devised the proposed DC-DC converter capable of lowering the rated voltage of switching elements, by means of sharing DC power source voltage and load current between two converters. Further, the capacity of the high frequency transformer becomes small, making the DC-DC converter more efficient and smaller. We designed and constructed a 1kW DC-DC converter prototype, and conducted performance evaluation testing. As a result, a conversion efficiency of 98.2% at a rated output of 1kW was obtained. A detailed analysis of power flow was also carried out, to identify the characteristics of the converter developed. [C200]

"Work in progress-Expansion of an undergraduate engineering degree program to include fully online studies at a distance"

In fall of 2007, the University of Virginia (UVA) School of Engineering and Applied Science initiated a partnership with the Virginia Community College System (VCCS) to create a new undergraduate education opportunity that would allow students to remain in their local community for all of their undergraduate engineering studies. Through the partnership, students can complete a two-year engineering associate degree in the VCCS. Successful students can then transfer to UVA for third and fourth year undergraduate studies that lead to an existing, non-ABET accredited Bachelor of Science degree in Engineering Science. All necessary UVA classes are made available in a highly interactive on-line format to the students located across Virginia. The cooperative program was motivated by multiple requests from communities and engineering firms located in Virginia that

wanted increased access to undergraduate engineering education and talent local to their communities. The details of the program design for the distributed learning system that blends on-campus and off-campus learners will be reviewed, and programmatic-level indicators of success to date will be given. This review reflects design-based research principles, and, in addition, the program has adopted an evaluation approach which reviews the systemic impact of the program across the state. [C201]

"Adaptive tracking algorithm for magnetically controlled shunt reactor control"

This paper proposed an adaptive tracking algorithm for dynamic time-varying control of extra and ultra high voltage magnetically controlled shunt reactor (MCSR), based on the extensional model and linear regression algorithm, the output of controlled system will track the control objective, then both of the optimal static and dynamic characteristics can be got. The structure principle of MCSR magnetic circuit was analyzed, the linear regression equation in dynamic time-varying parameters was created according to the theory of dynamic parameter tracking, considering the relevance of power system and MCSR, least squares theory was used to construct the parameters tracking formula, the gain-adjustment adaptive system was formed accordingly, In the processing of data collection, the memory limit principle was used to avoid data saturation, stressing the innovation amendment to the model parameters. The controller can meet the demands of tracking the expected order, fast rapidity of initial convergence and high accuracy of convergence. Computer simulation results used in practical operation parameters confirmed the effectiveness and validity of control algorithm. The electromagnetic transient modular of PSASP has contained the controller model by program, it has the advantages of novel, practical, accuracy, fast-tracking and reliable, which provides the necessary implement for voltage control of extra and ultra high voltage magnetically controlled shunt reactor, also opens a new way to conduct the study of controller design for nonlinear element in power system. [C202]

"A novel design of flexible controlled shunt reactor"

This paper proposed a novel design of flexible controlled shunt reactor (FCSR) which can suppress over-voltages of high voltage transmission line in various situations flexibly, it not only has the smoothly and wide range continuously controllable features for the power frequency over-voltage regulation, but also has the fast-switching ability and the nonlinear characteristics which can competent to rapid change in tide as well as the switching surge or impulse overvoltage control. It has stable control characteristics and fast transient response which can meet the various needs of the system, and has a broad application prospects. The magnetic circuit structure and working principle of FCSR are analyzed as well as the technical features in the paper. Computer simulation results used in standard power system example and practical operation parameters confirmed the above advantages and effectiveness. It opens a new way to the voltage control and reactive power regulation of ultra high voltage transmission line. [C203]

"A new load survey method and its application in component based load modeling"

A new load survey method, which combines load screening on all substations with detailed investigation of typical substations, for synthesis load modeling (SLM) is presented. Firstly, the main process of load survey is described; then the classification indices based on load characteristics and the principle of load classification are expounded in detail, on this basis the census table of load characteristics is drawn up and both sources of survey data and objects to be surveyed are decided; and then, the statistical analysis on load characteristic data from general survey is performed and by use of the results of survey and statistics the 220kV substations, i.e., the load nodes, are classified. Taking the regionality of substation locations into account, the principle to select typical substations, in which the load constituents and types are considered, is proposed, and according to the proposed principle typical substations for each kinds of loads are chosen, and the detailed census forms for these typical loads are designed. Using the proposed method, the survey with higher accuracy can be achieved under relatively low survey complexity. The proposed load survey method is successfully applied in Central China Power Grid, North China Power Grid, Northwest China Power Grid and Northeast China Power Grid.

[C204]

"Study on coordinated reactive power control strategies for power plant auxiliary system energy efficiency and reliability improvement"

From efficiency and reliability standpoints, there are three major issues in coal-fired power plant auxiliary systems: high in-house load, low power factor, and weak disturbance-ride-through capability. This paper presents a cost-effective solution to solve these problems. The proposed solution consists of Variable Frequency Drives (VFDs) with Active Rectifier Units (ARUs), mechanically switched shunt capacitor banks, and coordinated reactive power control strategies implemented in the power plant Distributed Control System (DCS). In this paper, the design principles of the proposed solution will be introduced. Coordinated control strategies of the

ARUs and capacitors for which implement the steady-state power factor control and dynamic voltage support under disturbances will be described. The overall potential benefits resulting from the proposed solution will be discussed and demonstrated with example studies corresponding to a 300MW coal-fired power plant. [C205]

"Research on dynamic simulation of the resonance fault current limiter"

The resonance fault current limiter (RFCL), which avoids the disadvantages of the series reactor, is feasible for EHV and UHV grid. To contribute to project application of the RFCL, and study its running characteristic and impact on relay protection, the dynamic simulation lab of State Grid simulation center carries out the research on simulation technique for RFCL. The principle and technical properties of RFCL applied in EHV power transmission line are analyzed. Considering the features of dynamic simulation system in the lab, the approach to choose parameters of simulation model and corresponding structural design are described. This simulation model has been connected into dynamic simulation system and the simulation experiments for inspecting the control and protection function of RFCL are performed. Experimental results show that the performances of the developed simulation model for RFCL can meet the design requirement, and can be applied in dynamic simulation tests and researches. [C206]

"Study on the SSO damping characteristic and damping control of Mongolia-China HVDC transmission system"

The interaction exists between the China-Mongolia High Voltage Direct Current (HVDC) converters and turbine-generators at the coal-electricity base, and negative electrical damping provided by HVDC may cause subsynchronous oscillation (SSO). This paper studies on the SSO damping controller (SSDC) principle, SSDC input signal select, SSDC broadband design and narrowband design approach, etc. The SSO characteristics and damping control ability of the various turbine-generators and power output, etc. are researched. [C207]

"New converter transformer's mathematical model based on double-graph modified nodal approach"

The new converter transformer and harmonic suppression scheme Filter Commutated Converter (FCC) has a unique connection mode. It is very hard to establish the coupled circuit mathematical model when the FCC only contains unaccompanied voltage sources or voltage controlled voltage sources (VCVSs), because some of their elements have no branch admittances or the impedances equals to zero. However the double-graph modified nodal method can solve the above problems, which removes some redundancy variables by making topological graphs separate into two parts. Based on the orient graph of the coupled circuit, a basic double-graph modified nodal model is established according to the coupled circuit principle and the actual design parameter. Furthermore, two examples are given to verify the accuracy of the mathematical model introduced in this paper, such as admittance continuation and controlled source continuation of the basic model. Their simulation results show that the mathematical model established by double-graph modified nodal method is accurate and effective. The proposed method can be selected flexibly in practical project and will have general significance and broad application prospects. [C208]

"Voltage and frequency control of inverters connected in parallel forming a micro-grid"

The "communication mechanism" to realize the power share of grid-forming inverters is analyzed and a droop control method through active and reactive current is proposed in this paper. The control strategies of inverters connected in parallel forming a micro-grid are described in detail. The droop controller is divided into three units that are current (power) decoupling, the first-order inertia and droop control. From the point of synchronous generator, the design principles of first-order inertia constant and the droop coefficients are analyzed. Finally, simulation models are established in Simulink/Matlab and two prototypes with the capacity of 10kVA are established in laboratory. The simulation and experiment results verify the feasibility of the proposed method. [C209]

"Distributed STATCOM for controlling Output voltage of wind turbine generator"

This paper describes analysis and control design of a distribution level static synchronous compensator (DSTATCOM) to control the voltage at the PCC in order to keep the power constant at the load from intermittent wind speeds. For fast response requirement, a feedforward compensation scheme is derived and employed in the paper. Firstly, the mathematical model of the DSTATCOM is derived. Then the compensation principle is described with applying RDFT in order to immune any undesired signals. Accordingly, a hardware prototype is built with a fix-point DSP TMS320F2812-based system. Use of a current-controlled PWM inverter as the power stage of the DSTATCOM generates needed compensation currents for real-time load compensation. Finally,

experimental results confirm the performance of the proposed DSTATCOM. [C210]

"Parameter design principle of the arm inductor in modular multilevel converter based HVDC"

This paper describes two distinctive functions of the arm inductor in the modular multilevel converters (MMC): suppressing the circulating current and limiting the fault current rise rate. Based on the equality of the instantaneous power, the characteristics of the circulating current are analyzed and demonstrated that it flows through the three phase of the converter in negative sequence at double-fundamental frequency. The relationship between the amplitude of the circulating current and the value of the arm inductor is discussed, and the first principle to design the parameters is proposed. The second principle to design the parameters is based on the calculation of the fault current rise rates, with different values of the arm inductors. A detailed PSCAD/EMTDC model of MMC is developed. Steady state simulation proves the existence of the circulating current at double fundamental frequency. Simulation results show a close agreement with the calculation of the circulating current, with different arm inductor parameters. The fault between the DC terminals of the converter is investigated; the results verify the above parameter design principles of the arm inductor. [C211]

"Research on wind energy distributed generation in microgrid"

Wind power is one of the common distributed generation in microgrid. According to the requirements of microgrid, permanent magnet synchronous wind generator (PMSWG) for wind energy distributed generation was designed in this paper and it has simple structure, easy control and low cost characteristics, non-controllable rectifier and grid-connected PWM convertor is adopted as the AC grid-connected circuit for the distributed generation. Researching on its operating and control strategy, this paper has realized the d/q power decoupling control of the wind energy distributed power and proposed a novel maximum wind power tracking strategy based on the principle of direct-control grid-connected power which can directly realize grid power control through grid current the only one parameter. The experimental system was established and the experiment results have proved correctness and feasibility of the proposed wind energy distributed generation and its control method, it is a suitable wind energy distributed generation for microgrid. [C212]

"The development and implementation of a freshman engineering project in energy scavenging"

Energy scavenging from the environment is a contemporary topic that positively benefits society. This paper describes the development and implementation of an energy scavenging project that uses piezoelectric material. In the fall of 2009, this project was implemented in an introduction to engineering course with over one hundred students from four different engineering disciplines: civil, computer, electrical, and mechanical. Survey results and students' reflection papers showed that the project was appealing to the students and helped them understand several basic concepts as well as principles of the engineering design process. [C213]

"REACH platform-Remote access to smart home facility based computer science laboratory"

The purpose of the REACH (REmote ACcess to smart Home facility) platform is to allow students to learn about basic principles of computer science and software engineering practices, and gain hands-on experience through observable effects of the computing systems in a familiar setting (home). It utilizes virtualization to encourage group collaboration and grants anytime, anywhere access to the smart home facility. It incorporates dynamic binding capability that allows students to either use the sensors and actuators hardware they check out and install locally for development, or to conduct experiments in the smart home facility. Once the development is completed, the programs can be deployed remotely, and students can make observations through web cams strategically situated in the smart home facility and the logs of the system's operations and users' activities. The REACH platform is designed to support a large spectrum of computer science courses, from the equivalence of computer science lab 101, interdisciplinary projects, all the way to research projects in artificial intelligence, pervasive computing, and human computer interactions. [C214]

"Design of a multi-purpose experiment for use in a fluid mechanics lab"

A set of new experiments that include the use of a Pasco force and pressure transducer were created to demonstrate the basic concepts of fluid properties, pressure versus depth, force on a gate and the conservation of mass. By designing a simple multipurpose apparatus all of these basic principles were shown to the students. Preliminary results show that despite the simple nature of the experiments, the student understanding was increased. This paper will describe the concepts behind the design of the new experiments and discuss the preliminary results related to learning improvements discovered as a result of moving to a number of small scale experiments. [C215]

"Machine shop training with a musical note"

Norwich University recently added a hands-on machine shop training activity to the introductory engineering course with the goal of teaching basic shop tool skills while stimulating interest in the exercise by creating a useful object. The object, a simple flute, was designed to have three parts made from machinable wax rods that would require the students to learn and perform basic operations on a milling machine, a lathe, and a drill press. Using tutorial instructions, mechanical drawings, and minimal prefabricated parts, students were able to create a working musical instrument during one three-hour laboratory session. The students were also introduced to the idea that the flute's acoustical design can be modeled on the principles of electrical transmission lines. Options to include a design activity as well as a mechanical drawing component to the project are also discussed. [C216]

"Low cost runway incursion detection system for general aviation airports"

The purpose of this paper is to introduce the reader to a freshman engineering design project where students were required to design a novel low cost runway incursion detection system that might have future application for small general aviation airport operations by applying sound engineering problem solving criterion. Given the direction of Aviation towards autonomous navigation, this project provides a meaningful medium to educate freshman engineering students on both concept and teamwork principles. The goals of the project were (a) to introduce collaboration across disciplines given the students' intended majors, (b) to enhance scientific inquiry, (c) to foster communication among the group as well as enhance communication between the students and the client who provides the project objectives, and (d) the group management structure and its implication as it applies to achieving the overall objectives of the project. As an integrated department with both Engineering and Aviation Science faculty, it was natural for the Aviation Science faculty to serve as clients, who then generate plausible problems that can benefit both the Aviation Science and Engineering students in the program and these problems are then used as the basis for a structured engineering design approach for introducing engineering design fundamentals to the freshman engineering class. The unique nature of the assignment lies in the need for the concept to be low cost and practical. Team leadership styles were evaluated and compared against design outcomes. This paper examines both the engineering aspect of the students' learning as well as their leadership growth and interaction between group members as well as the interaction with the client. With students from various engineering backgrounds involved in the course, this paper also provides the audience the ability to examine the applicability of this approach to other subject areas. [C217]

"Using formal verification methods and tools for protocol profiling and performance assessment in mobile and wireless environments"

The most common use of formal verification methods and tools so far has been in identifying whether livelock and/or deadlock situations can occur during protocol execution, process, or system operation. In this work we aim to show that an additional equally important and useful application of formal verification tools can be in protocol design and protocol selection in terms of performance related metrics. This can be achieved by using the tools in a rather different context compared to their traditional use. That is not only as model checking tools to assess the correctness of a protocol in terms of lack of livelock and deadlock situations but rather as tools capable of building profiles of protocol operations, assessing their performance, and identifying operational patterns and possible bottleneck operations. This process can provide protocol designers with an insight about the protocols' behavior and guide them towards further protocol design optimizations. It can also assist network operators and service providers in selecting the most suitable protocol for specific network and service configurations. We illustrate these principles by showing how formal verification tools can be applied in this protocol profiling and performance assessment context using some existing protocols as case studies. [C218]

"Mathematical modeling of methyl tert-butyl ether reactive distillation synthesis"

This paper is devoted to forming the mathematical model of methyl tert-butyl ether (MTBE) production by means of reactive distillation. The model based on physicochemical principles of the process and can be used for further designing, researching and stability analysis. [C219]

"Design of diversity-achieving LDPC codes for H-ARQ with cross-packet channel coding"

In wireless scenarios an effective protocol to increase the reliability for time-varying channels is the hybrid automatic repeat request (H-ARQ). The H-ARQ scheme with cross-packet channel coding (CPC) is a recently published extension of H-ARQ with several advantages. No full-diversity low-density parity-check (LDPC) code design for the whole range of coding rates yielding full-diversity has been published. In this paper the authors provide a new outage behavior analysis and a new structured LDPC code ensemble achieving full-diversity for H-ARQ with CPC by exploiting the rootcheck principle. Simulation results show that the new code design outperforms the previous approaches, providing full-diversity and good coding gain, also at high coding rates.

[C220]

"Packet retransmission using frequency diversity in OFDMA"

In orthogonal frequency division multiple access (OFDMA) systems, efficient resource allocation is very important to improve the performance of the OFDMA system. The general principle of resource allocation in an OFDMA system is to assign each subcarrier to the user with the best channel condition for that subcarrier. However, in delay tolerant traffic, current work did not consider that packets on retransmissions may have different allocation criteria from those on their first transmissions. In this paper, the resource allocation scheme is investigated by considering different criterions to packets on first transmissions and on retransmissions. Under a bit error rate (BER) constraint, the objective is to maximize the throughput of packets on first transmissions, meanwhile decreasing the longest packet delay caused by retransmitted packets and guaranteeing all packets on retransmissions to be sent out. A low-complexity suboptimal algorithm that separates allocation for packets on retransmissions and on first transmissions is proposed. Adaptive modulation scheme is adopted to guarantee the BER constraint, except the modulation for each retransmitted packet remains the same. In order to improve retransmission liability, the retransmitted packets are combined with its failed packets in previous transmission.

[C221]

"Joint time-frequency linear equalization for OFDM signals"

Within the context of high-data rate transmissions over time varying multipath fading channels, this article presents a new receiver design for orthogonal frequency division multiplexing (OFDM) systems. The received signal is processed jointly in time and frequency domains. A Discrete Wavelet Transform is applied to the received signal before equalization which is based on the minimum mean square error (MMSE) principle. The paper shows that the proposed receiver is able to work also in highly time-variant channels where a traditional frequency domain equalizer gets very bad performance. Moreover, it is shown that this joint time-frequency equalization is able to exploit time diversity without coding. The performance of the proposed equalizer are shown both in case of perfect channel estimation and in presence of a MMSE linear channel estimator. [C222]

"Adaptive swarm intelligence routing algorithms for WSN in a changing environment"

Swarm intelligent algorithms have been used to design distributed and fault tolerant routing protocols for Wireless Sensors Networks (WSN), able to self-adapt to environmental changes. The principle is that each sink emits a message with the highest pheromone intensity (with reference to ant colonies) and with a limited transmission range. Pheromone spreads to the sensors and at the same time is subject to evaporation, producing an intensity gradient that drives the construction of the routing tables. We have studied swarm intelligent algorithms resorting to an analytical technique based on Markovian Agents MA. In the present work, we show that the MA model can be experimentally validated through a real physical WSN. Moreover, we extend our previous research to the study of WSN in dynamically changing environments and we show how the pheromone gradient algorithm is a strong candidate for implementing WSN routing in very critical topologies. [C223]

"Optimal control equation for quantum stochastic differential equations"

Interaction of open quantum systems with fundamental noncommutative quantum noises can be described by quantum stochastic differential equations (QSDE). These equations have a key role in quantum network analysis and design, especially for quantum information processing. Hence, in this paper, we derive a Hamilton-Jacobi-Bellman equation for quantum stochastic differential equations. The Bellman optimality principle is developed for open quantum systems. The cost functional of quantum observable to be minimized is considered to be general noncommutative polynomial of quantum operator. Since the method directly deals with QSDE, then it is a useful tool for optimal control of quantum optical networks. In addition, we will exhibit some electro-optical and all-optical feedback control schematics for implementation of quantum control based on QSDEs. [C224]

"Stability interval for time-varying delay systems"

We investigate the stability analysis of linear time-delay systems. The time-delay is assumed to be a time-varying continuous function belonging to an interval (possibly excluding zero) with a bound on its derivative. To this end, we propose to use the quadratic separation framework to assess the intervals on the delay that preserves the stability. Nevertheless, to take the time-varying nature of the delay into account, the quadratic separation principle has to be extended to cope with the general case of time-varying operators. The key idea lies in rewording the delay system as a feedback interconnection consisting of operators that characterize it. The original feature of this contribution is to design a set of additional auxiliary operators that enhance the system modelling and reduce the conservatism of the methodology. Then, separation conditions lead to linear matrix inequality conditions which can be efficiently solved with available semi-definite programming algorithms. The

paper concludes with illustrative academic examples. [C225]

"Dynamic Maximum Entropy algorithms for clustering and coverage control"

The dynamic coverage problem is increasingly found in a wide variety of areas, for example, from the development of mobile sensor networks, to the analysis of clustering in spatio-temporal dynamics of brain signals. In this paper, we apply control-theoretic methods to locate and track cluster center dynamics and show that dynamic control design is necessary to achieve dynamic coverage of mobile objects under acceleration fields. This is the first work to consider tracking cluster centers when site dynamics involve accelerations. We focus on the relationship between the objective of maximizing coverage in real-time and the Maximum Entropy Principle, and develop the ability to identify inherent cluster dynamics in a dataset. Algorithms are presented that guarantee asymptotic tracking of cluster centers, and for which we prove continuity and boundedness of the corresponding control laws. Simulations are provided to corroborate these results. [C226]

"Decentralized adaptive games for large population coupled ARX systems with unknown coupling strength"

This paper is concerned with decentralized tracking-type games for large population multi-agent systems. The individual dynamics are described by stochastic discrete-time auto-regressive models with exogenous inputs (ARX models), and coupled by terms of the unknown population state average (PSA) with unknown coupling strength. A two-level decentralized adaptive control law is designed. On the high level, the PSA is estimated based on Nash certainty equivalence (NCE) principle. On the low level, the coupling strength is identified based on decentralized least squares algorithms and the estimate of PSA. The decentralized control law is constructed by combining NCE principle and certainty equivalence principle. By probability limit theory, under mild conditions, it is shown that: (a) the closed-loop system is stable almost surely; (b) as the number of agents increases to infinity, the estimates of both PSA and the coupling strength are asymptotically strongly consistent and the decentralized control law is an almost sure asymptotic Nash-equilibrium. [C227]

"Suppression of burst oscillations in racing motorcycles"

Burst oscillations occurring at high speed and under firm acceleration are suppressed with a mechanical steering compensator. Burst instabilities in the subject racing motorcycle are the result of interactions between the wobble and weave modes under high-speed cornering and firm-acceleration conditions. Under accelerating conditions the wobble-mode frequency decreases, while the weave mode frequency increases so that destabilizing interactions occur. The design analysis is based on a time-separation principle, which assumes that bursting occurs on time scales over which speed variations can be neglected. Therefore, under braking and acceleration conditions linear time-invariant models corresponding to constant-speed operation can be utilized in the design process. The inertial influences of braking and acceleration are modelled using d'Alembert-type forces that are applied at the mass centres of each of the model's constituent bodies. The resulting steering compensator is a simple mechanical network that comprises a conventional steering damper in series with a linear spring. This network is a mechanical lag compensator. [C228]

"Decomposability of global tasks for multi-agent systems"

Multi-agent system is a rapidly developing research area with strong support from both civilian and military applications. One of the essential problems in multi-agent system research is how to design local interaction rules and coordination principles among agents such that the whole system achieves desired global behaviors. To tackle this problem, a divide-and-conquer approach was proposed in, and the basic idea is to decompose the requested global specification into subtasks for individual agents in such a way that the fulfillment of these subtasks by each individual agent should lead to the satisfaction of the global specification. Then, the design reduces to achieving the assigned subtasks for corresponding individual agents. In, it was shown that not all global tasks can be decomposed, and a necessary and sufficient condition on the decomposability of a task automaton between two agents was presented. For more than two agents, we then proposed a hierarchical algorithm as a sufficient condition for decomposability. This paper aims to extend the necessary and sufficient decomposability conditions for any arbitrary finite number of cooperative agents. A new necessary and sufficient condition on decomposability of a task automaton is proposed, here. Several examples are provided to illustrate the decomposition scheme and conditions. [C229]

"Evaluating trust elements in the context of Islamic based informational websites"

In the past, many researches have examined and addressed the notion of trust multidimensional in concepts within the areas of e-commerce ranging from business to business (B2B), business to consumer (B2C) and consumer to consumer (C2C). Indeed, the element of trust is vital in ensuring the success of e-commerce.

However, the web evolution has moved the interpersonal and inter-organizational transactions to knowledge and information exchange with the rise of Web Mediated Information Environment (W-MIE) that offer services such as health advice, religion information, political views and financial advice. Hence, the aim of this research is to identify trust elements within the context of Islamic based informational websites. We contend that this environment posed significant emotional values to its users in terms of the overall design strategy for the web content, interface representation and systems characteristics adherence to Islamic values, principles and guidelines. This paper reported the results of an experiment conducted within the scope of Islamic educational based websites by using semantic differential method with 10 Islamic users. The measured elements are derived through literature analysis and Islamic expert review. Through factor analysis we have found 8 trust elements which are significant for the design of Islamic web based content websites. There are "credibility", "benevolence", "Tauheed", "avoid distraction", "presentable", "well-conveyed", "avoid unfairness" and "avoid childish" and discussion towards design implications are further elaborated. [C230]

"The internal model principle: Asymptotic tracking and regulation in the behavioral framework"

Given a plant, together with an exosystem generating the disturbances and the reference signals, the problem of asymptotic tracking and regulation is to find a controller such that the to-be-controlled plant variable tracks the reference signal regardless of the disturbance acting on the system. If a controller achieves this design objective, we call it a regulator for the plant with respect to the given exosystem. In this paper we formulate the asymptotic tracking and regulation problem in the behavioral framework, with control as interconnection. The problem formulation and its resolution are completely representation free, and specified only in terms of the plant and exosystem dynamics. [C231]

"Persistent disturbances rejection on Internal Combustion engine torque in Hybrid Electric Vehicles"

In this paper, a new control strategy of torque ripple reduction in Hybrid Electric Vehicles (HEV) is presented. The Internal Combustion Engine (ICE) ripples are reduced by a Permanent Magnet Synchronous Machine (PMSM). The control strategy uses the internal model principle. It is based on dynamic output feedback controller synthesis. The controller design problem is reduced to solving a system of linear matrix inequalities (LMIs). It is formulated in the time domain with regard to the main order of the fluctuations. A test bed simulator is developed through a complete modeling of a hybrid powertrain propulsion. Simulation results show the control approach interest. [C232]

"Adaptive output feedback control for a class of uncertain nonlinear systems with actuator failures"

In this paper we proposed an adaptive output feedback control for actuator failures compensation for a class of uncertain nonlinear systems. Firstly, we assume full state availability and design an adaptive state feedback control scheme based on dynamic surface control (DSC) technique; where radial basis function neural networks (RBF NNs) are incorporated to compensate system uncertainties. Then, based on the separation principle, an adaptive output feedback controller is obtained replacing in the state feedback control law, the states of the system with the states estimation provided by a high-gain observer. We concern about systems with uncertain locally Lipschitz nonlinearities. It is proven that all closed-loop signals are uniformly ultimately bounded (UUB) and the system output tracks a reference signal with small error, for all but one failed actuators. A simulation example is carried out to illustrate the performance of the control scheme. [C233]

"Computing and controlling the convergence speed of quantum dynamical semigroups"

The speed of convergence of controlled dissipative dynamics to the desired state or set of states is critical in many tasks in experimental physics and quantum information processing. Here we focus on quantum Markovian master equations and, by exploiting the linear character of the dynamical generator, we derive an alternative characterization of the semigroups stabilizing a target subspace, as well as the asymptotic speed of convergence to the desired set. Our analysis highlights the effect of the Hamiltonian parameters (which can be considered as our controls) on the convergence speed, and suggests two basic principles for their design. [C234]

"APESER 2010 Keynote Speech: Shangping Ren"

Summary form only given. A cyber-physical system (CPS) features a tight combination of, and sophisticated interaction and coordination between physical and computational resources. It often consists of a large number of sensing and actuation devices that share information communication networks. There exists a class of CPS applications, such as water/gas distribution networks, power grid transmission networks, and ground/air traffic

networks, which in essence are loosely coupled networked control systems where connections among individual components, or subsystems, are sometimes uncontrollable. Understanding this type of control systems and being able to address the scientific and technological challenges that arise in their development and operation will make the CPS vision a reality and make it possible to fully exploit the great potential and impact in a number of sectors that are critical to national security and competitiveness, including civil infrastructures, transportation systems, and others. Such Cyber-Physical Systems (CPS) involve communication, computation, sensing, and actuating through heterogeneous and widely distributed physical devices and computational components. The close interactions of these systems with the physical world place events as the major building blocks for the realization of CPS. More specifically, the system components and design principles should be revisited with a strictly event-based approach. [C235]

"A new type of controllable multi-spark gap with high reliability applied in high voltage grid"

The existing controllable spark gap has not been able to be widely applied to the high voltage grid so far mainly due to the constraint of reliability. This paper introduces a conceptual design of a new type of controllable multi-spark gap which improves the reliability dramatically on working principle. The multi-spark gap is composed of multiple air gaps and chained R-C network for producing frequency-dependent voltage distribution along the gaps. An even voltage distribution at power frequency operating voltage while extremely uneven distribution at trigger pulse can be achieved by proper parameter setting. The even voltage distribution enables the multi-spark gap to withstand much higher voltage than that in operation, thus avoiding misfiring. In contrast, extremely uneven distribution could initiate cascade discharge at low amplitude impulse, insuring reliable triggering of the gap. The working principle of the multi-spark gap, proper parameter setting of the chained R-C network, simulation of the frequency dependent voltage distribution and its effect on the discharge voltage as well as the experimental performance verification on the prototype are presented in this paper. [C236]

"Analysis and design of a wireless closed-loop ICPT system working at ZVS mode"

Based on the T-type equivalent circuit model of loosely coupled transformer, the theory of series-series (SS) resonant inductively coupled power transfer (ICPT) system was analyzed. By researching the principle of ICPT system working at zero voltage switch (ZVS) mode, the condition for realizing ZVS mode was got that the load resistance should be bigger than its critical value. According to the characteristic of open-loop ICPT system, a wireless voltage-feedback control for ICPT system working at ZVS mode was established. Based on the analysis above, An ICPT system prototype was built and tested, the maximum open-loop output power was 3.4KW, overall efficiency was 90%; the closed-loop output voltage was stable at 260V, and the maximum output power is 1.9KW. [C237]

"An improved magnetic-geared permanent magnet in-wheel motor for electric vehicles"

This paper introduces an improved magnetic-geared permanent magnet (MGPM) in-wheel motor with high power density and torque density for electric vehicles (EVs). Due to the integrating of the magnetic gear and omitting of the gear inner rotor, the motor can achieve the low speed direct driving and high speed compact designing requirements with even simple structure. The principle and optimized structure are described. A 750w optimized motor is designed and analyzed by finite element method. The simulation results validate that the MGPM in-wheel motor can be operated at low speed, high efficiency and high torque. It is suitable for direct-driving EVs. [C238]

"Analysis and optimization of a novel brushless compound-structure permanent-magnet synchronous machine"

A novel brushless compound-structure permanent-magnet synchronous machine (CS-PMSM) is proposed in this paper. The structural characteristics are described and the operation principle is introduced. The equivalent magnetic circuit of the BDRM is established, and the electromagnetic torque is deduced by analytical method. The new type of brushless CS-PMSM consists of one stator machine (SM) and one brushless double rotor machine (BDRM). Using 3D finite element method (FEM), a BDRM prototype is designed and evaluated. Some characteristics including air gap flux density, no-load flux linkage, back-EMF, and torque behavior are obtained. [C239]

"Nonlinear Model Predictive Control for power-split Hybrid Electric Vehicles"

In this paper, a causal optimal controller based on Nonlinear Model Predictive Control (NMPC) is developed for a power-split Hybrid Electric Vehicle (HEV). The global fuel minimization problem is converted to a finite horizon optimal control problem with an approximated cost-to-go, using the relationship between the Hamilton-Jacobi-Bellman (HJB) equation and the Pontryagin's minimum principle. A nonlinear MPC framework is employed to

solve the problem online. Different methods for tuning the approximated minimum cost-to-go as a design parameter of the MPC are discussed. Simulation results on a validated high-fidelity closed-loop model of a power-split HEV over multiple driving cycles show that with the proposed strategy, the fuel economies are improved noticeably with respect to those of an available controller in the commercial Powertrain System Analysis Toolkit (PSAT) software and a linear time-varying MPC controller previously developed by the authors. [C240]

"Dynamic gravity cancellation in robots with flexible transmissions"

We consider the problem of perfect cancellation of gravity effects in the dynamics of robot manipulators having flexible transmissions at the joints. Based on the feedback equivalence principle, we aim at designing feedback control laws that let the system outputs behave as those of a desired model where gravity is absent. The cases of constant stiffness (elastic joints), nonlinear flexible, and variable nonlinear flexible transmissions with antagonistic actuation are analyzed. In all these situations, viable solutions are obtained either in closed algebraic form or by a simple numerical technique. The compensated system can then be controlled without taking into account the gravity bias, which is particularly relevant for safe physical human-robot interaction tasks where such compliant manipulators are commonly used. Simulation results are reported illustrating the obtained performance. [C241]

"Optimality and performance limitations of Analog to Digital Converters"

The paper deals with the task of optimal design of Analog to Digital Converters (ADCs). A general ADC is modeled as a causal, discrete-time dynamical system with outputs taking values in a finite set. Its performance is defined as the worst-case average intensity of the filtered input matching error. The design task can be viewed as that of optimal quantized decision making with the objective of optimizing the performance measure. An algorithm based on principles of optimal control is presented for designing general m -dimensional ADCs. The design process involves numerical computation of the candidate value function of the underlying dynamic program, which is computed iteratively, in parallel with the quantization law. A procedure is presented for certifying the numerical solution and providing an upper bound for performance of the designed ADC. Furthermore, an exact analytical solution to the optimal one-dimensional ADC is presented. It is shown that the designed one-dimensional optimal ADC is identical to the classical Delta-Sigma Modulator (DSM) with uniform quantization spacing. [C242]

"Development and application of data analysis software for transformers PD UWB RF location"

Ultra-Wideband (UWB) RF partial discharge (PD) location technique is a new method for PD sources location in power transformers, which is based on multiple sensors array detection and Huygens-Fresnel principle of PD electromagnetic radiation signal. In this paper, a classification algorithm of multi-PD sources has been proposed, which is based on dynamic search in the TDOA (time difference of arrival) sample space, it is able to distinguish multiple PD sources and complete the TDOA classification of every PD source automatically when there are multiple PD sources has been detected simultaneously. Based on the classification algorithm of multi-PD sources and location algorithm based on Huygens-Fresnel principle, a set of data analysis software used for PD UWB RF location system has been developed based on Labview8.5. It manages multiple test projects using Access Database, and establishes the TDOA sample space for every testing program, finishes the multiple PD sources classification and location calculation for every PD source finally. Meanwhile, multiple functions have been integrated into the software, such as signal processing, report generation, human interface design and so on. Finally, an illustrative example has proved that the software's validity. [C243]

"Regional water right distribution model of multi-objective programming-An empirical study based on the data in Ningxia"

Under the background of frequent occurrence of extreme drought as well as increasing attention to water shortage, regional water right distribution has become a vital approach for local government to advocate water right and manage water resource. The connotation along with subject and object of regional water right are investigated in this article. The manifestations of regional water right include life water right, ecological water right and productive water right. Multi-objective programming model of regional water right distribution in the fields of life, ecology and production is established taking social, ecological and economic targets into account. In accordance with the principle that basic water right superiors than public water right and competitive water right, the distribution priority is confirmed by questionnaires design and AHP method. Finally, empirical research is conducted by data from Ningxia and results are obtained under the condition of objects equilibrium. 0.3188 billion m³water should be distributed to life activities and 0.1109 billion m³water should be distributed to ecological activities, 7.3331 billion m³to production activities according to the abovementioned empirical research. [C244]

"A study of design principles and requirements for the m-learning application development"

This research is concerned with the utilization of mobile devices as a tool for learning (m-learning). Therefore, approaches in developing learning applications that can suit the small screen size and restrictive capabilities of the devices are studied so that they can help the learners in understanding the concepts being delivered from the applications. This paper presents the study of design principles and requirements for the m-learning application development. The study covers the suitable architecture, learning theories and modules that are appropriate for an application developed for the platform. Based on the results of the study, one m-learning course content prototype is developed. Hence, this paper provides some discussions regarding the guidelines utilized in developing the prototype. Finally, usability testing had been conducted among 66 System Analysis and Design (SAD) course students in evaluating the usability level of the developed prototype. The results showed that majority of the students agreed that the developed MOSAD application has met the requirement of usability element. [C245]

"A CMOS image sensor with charge domain interlace scan"

This paper presents the first CMOS image sensor which implements a charge domain interlacing principle to improve the signal-to-noise ratio (SNR) under the same exposure condition (integration time and light intensity). A novel pixel is designed to fit the charge domain interlacing principle, which works in field integration and frame integration mode. This CMOS image sensor also contains a programmable universal image sensor peripheral circuit, thus this sensor can also be used in progressive scan. Comparing the performances of the sensor working in charge domain interlacing and in the progressive scan, the chip measurement results prove that under the same exposure condition, the light response of the charge domain interlacing is the twice that of the progressive scan. The SNR performance can be increased by 6 dB in low light level. [C246]

"Principles and applications of active tactile sensing strategies in the rat vibrissal system"

The importance of active sensing to animals suggests that it may confer significant advantages to engineered sensing systems. The rat vibrissal (whisker) system is an important model for studying tactile active sensing. To date, however, the small size and fast speeds of the whiskers have precluded characterization of the rat's exploratory strategies. We have developed novel optical instrumentation that has allowed one of the first quantifications of tactile sampling during rat exploratory behavior. Results reveal characteristics of vibrissal active sensing that may find application in artificial tactile sensing systems; for example, the morphology of the whisker array allows rats to sample at multiple spatial scales within a single sampling cycle. Here, we describe the design and implementation of the novel optical system and how it is helping to uncover sampling strategies in this biological system. [C247]

"Design and application of flexible stops for MEMS devices"

As part of the reliability investigation, shock tests for first generation surface micro-machined devices have been performed which showed susceptibility regarding stiction at the stopper elements and breakage of adjacent anchor points to the substrate. This paper clearly demonstrates how the application of compliant travel stops can solve these issues but it also points out limitations of this approach. A numerical model has been developed to help understand the events during a shock load and the working principle of compliant stops. Compared to the previous work of Yoon et al., this investigation gives a practical guideline regarding application and dimensioning of flexible stops and adjacent anchors at MEMS products where available design space is limited and structural deflections are restricted. Furthermore, it gives the possibility to take viscous damping and different pulse shapes as well as durations into account. [C248]

"A novel 3D optical proximity sensor panel and its readout circuit"

This study presents a novel 3D optical proximity sensor (3D OPS) array panel. The panel is capable of detecting the objectives centimeters away from the panel surface. This device is composed of light-emitting diodes and home-made polymer photo-detectors (PPDs). The novel design of the circuit is the operation principle through active pixel circuit, sampling circuit, amplifier circuit and the decision of proposed chip parameters is determined by circuit simulation. The circuit is regarded low power and low cost as the design principle. The control sequence of the aforementioned circuit module is generated by an FPGA board to realize the operation of the whole circuit. The readout circuit is able to remove background current, and to detect the corresponding output voltage of photocurrent that is received by the PPD via reflections of the measured object. A human machine interface is built by LABVIEW to create 3D vision tracing of sensed object, validating the effectiveness of the 3D OPS. [C249]

"Control loops for a Coupled Dark State Magnetometer"

The Coupled Dark State Magnetometer (CDSM) is a new type of scalar magnetometer, which is based on two-photon spectroscopy of free alkali atoms. CDSM measurements do not depend on the sensor temperature. Furthermore, it has no dead zones, no moving parts and no excitation coils at the sensor. This paper deals with the control loops which are developed for tracking the magnetic field dependent resonances and for avoiding drifts of the carrier frequency of the laser diode used as excitation light source. It is the first time that a magnetometer of this type is operated in a control loop. The implementation of several functional blocks in a Field Programmable Gate Array (FPGA) is a first step towards miniaturization for a future space application. The magnetic field magnitude is measured by a frequency. Therefore, the Direct Digital Synthesis (DDS) principle is used for accurate signal generation. A noise floor measurement has shown no $1/f$ dependence near DC and 70 pT/ $\sqrt{\text{Hz}}$ up to the corner frequency of 3 Hz for which the CDSM is designed. [C250]

"Electromechanical modeling and characterization of the electrical breakdown for the capacitive microarrayed ultrasonic transducers"

This paper presents two numerical evaluation schemes to simulate the dielectric breakdown phenomena for the capacitive micro-arrayed ultrasonic transducers (CMUT). The performance of dielectric strength was investigated using a commercial finite element method (FEM) software package of ANSYS. The electro-mechanical model was established using the ANSYS parametric design language (APDL) technique. A built in Multiphysics solver of ANSYS was employed for the simulation of the electrostatic-structural coupled-field problems. Relationships of the applied DC bias voltage versus the membrane deflection, collapse voltage, capacitance, and layer wise electric field distribution are obtained. For a verification purpose, a simple semi-analytical approach based on the classical thin plate theory and parallel-plate capacitor principle was also proposed. Reasonable matching results and less computation efforts are obtained. The proposed approach provides another efficient numerical tool for estimating the dielectric breakdown possibility of the CMUT. [C251]

"Phenomenological theory and experimental characterizations of passive wireless EM pressure micro-sensor prototype"

In this paper, the new and latest results relative to theoretical and experimental studies of an original passive electromagnetic micro-sensor for wireless pressure monitoring application are presented. This micro-sensor uses the electromagnetic transduction principle. The sensing element is a flexible high resistivity silicon membrane located above a coplanar quarter-wavelength resonator operating in Ka-band. When an external pressure acts on the membrane, it changes the electrical properties of the resonator and in turn changes the resonant frequency. The sensor design covers diverse disciplines such as microwaves, materials, microfabrication, and mechanics. A comprehensive coverage of the physical bases is beyond the scope of this paper. For the first time, theoretical results, based on the transverse analysis method, describe the physical phenomenon which intervenes in the transduction. This sensor is fabricated and on wafer RF, pressure and temperature measurements are presented. This pressure cell is not only an EM based pressure sensor but it is considered also as passive wireless pressure measurement device: proof of concept is given in this paper. [C252]

"A tactile proximity sensor"

This paper introduces a novel tactile sensor with the ability to detect objects in the sensor's near proximity. For both tasks, the same capacitive sensing principle is used. The tactile part of the sensor provides a tactile sensor array enabling the sensor to gather pressure profiles of the mechanical contact area. Several tactile sensors have been developed in the past. These sensors lack the capability of detecting objects in their near proximity before a mechanical contact occurs. Therefore, we developed a tactile proximity sensor, which is able to measure the current flowing out of or even into the sensor. Measuring these currents and the exciting voltage makes a calculation of the capacitance coupled to the sensor's surface and, using more sensors of this type, the change of capacitance between the sensors possible. The sensor's mechanical design, the analog/digital signal processing and the hardware efficient demodulator structure, implemented on a FPGA, will be discussed in detail. [C253]

"Highly sensitive tunneling accelerometer for low actuation voltage operation"

In this work an attempt has been made to develop an accelerometer based on the principle of electron tunneling. Since the tunneling current is exponentially related to the displacement of the tunneling tip attached with beam, this accelerometer consummates high resolution and especially high dynamic range. Apart from increasing the dynamic range, the actuation voltage is reduced by optimizing the design parameters so that the final device can be integrated with the CMOS circuits. [C254]

"Novel plasmonic sensor design using plasmon-induced transparency"

Summary form only given. We introduce a novel sensor concept in the field of plasmonics, namely plasmon-induced transparency sensors. These sensors combine localized particle plasmon resonances with extremely small sensing volume with excellent sharp spectral resonances that show a good response to refractive index changes of the surrounding environment. The principle is based on the plasmonic analog of electromagnetically induced transparency (EIT) between a radiative dipole and a nonradiative quadrupole antenna. This effect yields a spectrally narrow resonance within a broad localized particle plasmon resonance in the near-infrared spectral region. Using deposition of biotin and streptavidin, we demonstrate reproducibly detection of a single molecular monolayer. With aqueous glucose solution, a planar version of our detector shows sensitivity values of over 500 nm/RIU and figures of merit (sensitivity over FWHM) of more than 5. These are the highest sensitivity values and figures of merit from lithographically manufactured localized plasmon resonance sensors to our knowledge.

[C255]

"An integrated flexible implantable L-glutamate sensor"

In this work, we have developed a fully integrated implantable probe on polyimide-film substrate for sensing neurotransmitters and recording extracellular action potentials simultaneously. The flexibility of the probe helps to prevent scar forming in tissues aiming for long-term in vivo monitoring. An Ag/AgCl reference electrode was integrated in the same probe with the Au/Cr or Pt/Cr working electrodes, which presented an integrated, compact and robust system. Several electrode configurations have been designed for implantation at various locations in the central nervous system. The prototype device for proof of principle is an enzyme-based electrochemical L-glutamate sensor using L-glutamate oxidase. A comparison between Au and Pt thin films was conducted by cyclic voltammetry. The enzyme was deposited with a multiple-step process on the working electrodes followed by meta-Phenylenediamine coating for better selectivity. The self-referencing technique was also used to enhance both the limit of detection and selectivity. The assembled sensors were calibrated and tested at various concentrations of L-glutamate at the presence of interfering molecules showing good sensitivity and selectivity. [C256]

"Inverse raytracing for metamaterial design"

Fermat's principle was used in its inverse way. Needed light path can be designed according to application. So the light rays curvature is known at each point in the space. The proposed method allows to determine numerically the needed value of the index of refraction at each point in the space. Results show that only thin layers with a mixture of positive and negative gradient of the refractive index is needed in the studies applications. [C257]

"Voltage mode control of coupled inductor bidirectional DC to DC converter"

In this paper, authors propose a coupled inductor bidirectional converter, and design of classical PI controllers in voltage mode control. The proposed converter has the high voltage diversity which enables battery module of low voltage to be interfaced with the high-voltage dc bus or the micro grid for subsequent utilization. The working principles, design guidelines, and PI based voltage controller design of the proposed converter is discussed in detail. Theoretical principles of battery fed converter with voltage controller are validated through simulation in the Matlab/Simulink environment. Also, prototype coupled inductor BDC converter is developed and performances are evaluated. [C258]

"User Experience: Assessing the effectiveness of Internet booking service"

Despite the undeniable importance of usability and utility, one should not forget that people use Internet booking service for variety of reasons or in essence overlooked the vital intent. Online booking systems challenge the effectiveness of traditional way of booking process. Therefore the effectiveness of the task is crucial to support the user to complete the tasks. User Experience (UX) is basically a constant "good-bad" feeling towards any products or service to finish a task. Standard heuristics evaluation has been performed in UX to measure if the perceived usability of the online booking based on the perceived utility matched to the user's satisfaction. This paper indicates that several design features do not entirely conform to the usability standard and design principles. The finding shows that the users experience some difficulties in completing the task; however, they proceed in order to get competitive prices. They also attribute the difficulties to their incautious and negligent without realizing the design features have lead them to experience human error in the online booking system.

[C259]

"User interface design using cognitive approach: A case study of Malaysian government web"

portal"

The role of Malaysian government in realizing the Multimedia Super Corridor (MSC) goal of creating a world-class e-government web portal in Malaysia is very important as it helps citizens or customers to interact and used the services. This requires a good interface design to enhance the cognitive in human thus support human cognitive strength and weaknesses. However, MyEG as one of the Government-to-Citizens (G2C) web portal has been plagued with user interface problems. Users felt difficulties in using the web portal. Some of the users abandon the web portal because of the negative perceptions on the MyEG user interface design. This problem slowed down the growth of the MyEG web portal. This study aims to evaluate the MyEG user interface design using measures and constructs questionnaires tools and identifies the area of MyEG user interface problems. Three cognitive characteristics were used to evaluate: user cognitive characteristics, web portal characteristics and user task. Two constructs used to measures the user cognitive characteristics; Mental Model (MM) and Human Information Processing (HIP). Four constructs used to evaluate website characteristics; Cognitive principle (CP), Metaphor (ME), Fitt's Law (FL) and MAMPU guideline (MG) while the GOMS model (GO) used to evaluate the User Task. The results of the evaluation showed that in general MyEG user interface design has not fully achieved the desired level of cognitive user interface design. The weaknesses are identified and discusses. Finally, practical suggestions and recommendations for improving the user interface design of MyEG are suggested based on the findings. [C260]

"An interaction design for MEL-SindD: A basic reading courseware for Down syndrome children"

The design of an early reading courseware (MEL-SindD) for Down syndrome (DS) needs to focus particularly on the students unique learning styles. Thus, this paper reports on DS students' characteristics, shortcomings and strength which need to be integrated in the design of the courseware. Hence, this paper demonstrates how the approaches and learning principles can be translated into guidelines for the interaction design of MEL-SindD that enables to motivate the DS students to learn. [C261]

"Low-loss microdisk-based delay lines for narrowband optical filters"

Over-coupled microdisk resonators with high intrinsic Qs are proposed as compact and low insertion-loss delay lines for narrowband optical filters. Design principles and preliminary experimental results are presented. [C262]

"Adaptive Multimedia Mining on Distributed Stream Processing Systems"

We present an application for distributed semantic concept detection in multimedia streams. The streams are mined using Support Vector Machine based concept detectors (classifiers) deployed on a distributed stream processing system. We organize the classifiers into a hierarchical topology based on semantic relationships between the concepts of interest, and use the system resource manager to place the topology across a set of processing nodes. We then develop distributed game theoretic optimization strategies for dynamic adaptation of individual classifier operating characteristics in order to maximize end-to-end application utility under varying resource availability. As part of this paper, we will demonstrate the principles behind large-scale multimedia stream mining, and showcase the design, development, deployment, and distributed adaptation of such applications on a large scale cluster. A video demonstration of the system can be found at: <http://childman.bol.ucla.edu/ICDM/demovideoicdm2009.swf>. [C263]

"Autonomic mobility and resource management over an integrated wireless environment-A GANA oriented architecture"

This paper presents the key designing principles and attributes of a novel autonomic architecture for enabling efficient mobility and QoS-aware resource management over an integrated IPv6-enabled heterogeneous wireless environment (CDMA cellular/WLAN). The proposed architecture is founded on Generic Autonomic Network Architecture (GANA), a generic framework for realizing autonomic networks introduced in EFIPSANS EC FP7 project. Emphasis is placed on describing the autonomic components of the architecture, illustrating their interactions and justifying their designing properties towards creating a concrete autonomic paradigm that aims at fulfilling 3GPP/LTE self-optimization vision. [C264]

"Design and C# implementation of fingerprint-based authentication system in networking environment"

In this paper, we introduce the feasibility of using fingerprint as media in authentication; then describe the design and C# implementation of a highly reliable authentication system in networking environment, combining principles of identity authentication protocol, Diffie-Hellman key agreement protocol, encryption-decryption and digital signature algorithm. [C265]

"A new single electron tunneling cell based on linear threshold gate"

The continuing scaling down and miniaturization of CMOS devices has led researchers now to build new devices with very small dimensions (nanotechnology), whose behavior will be interpreted based on quantum mechanics. Single electron devices (SEDs) promise excellent potential for future ultra large scale integrated (ULSI) circuits due to their potential for low power consumption and their small size. Considerable effort has been expended over the past decade, or so, in the understanding of the physical principles of SED operation and then different structures and topologies are proposed for implementing logic gates as applications of them. One of these structures is the linear threshold gate (LTG). The presented threshold gate, however, does not operate correctly in a complex network due to the passive nature of the circuit. For solving this problem the output of the threshold gate should be augmented with a SET buffer/inverter. The purpose of this paper is to introduce a single electron tunneling (SET) cell based on LTG for applications in complex circuit designs. The proposed cell accepts three signals as its inputs and produces three-input NAND, NOR, XOR and Majority function as its output. In this paper also a new method for implementing a three-input XOR function is introduced. [C266]

"A interturn fault protection method of HV shunt reactors based on unbalanced parameter detection"

An interturn fault protection method of the HV shunt reactor is put forward in this paper, which is based on the unbalanced parameter detection. This method is established on the basis of the time-domain parameter model, and uses the electrical quantities at two terminals of the HV reactor to calculate the electrical parameters of each phase by mean of least squares algorithm. Suppose that the interturn short-circuit faults of the HV phase-separated shunt reactors impossibly occur at three phases at the same time, we could identify whether the interturn short-circuit fault of the HV reactor occurs by designing the comprehensive detection criterion which could reflect three-phase unbalanced parameters and parameter mutation. The interturn protection of HV reactors could avoid the impact from power swings and frequency deviation. This method is based on the measurement and the comparison of per-phase equivalent inductance parameters of the reactor. The setting of the protection is simple and convenient to implement. Furthermore, the protection has high sensitivity. Because this interturn protection detects the variation of per-phase inductance parameters, it could avoid the influence from the system operating mode and the fault while those based on the principle of sequence components cannot. It is also adaptive to the installation location of the voltage transformer (PT), and could be easily applied to HV reactors of both transmission lines and busbars. [C267]

"Scaling information technology on the silicon platform"

Silicon Microphotonics provides performance attributes for generational scaling of cost, energy and bandwidth density: small footprint, waveguide integration and highly parallel architectures through large-scale electronic-photonics integration. This tutorial presents design principles for monolithically integrated, silicon-based optical components, circuits and architectures. [C268]

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"An anti-jamming counting approach for pulse signal of displacement sensor"

This paper analyzes the variation of A-phase and B-phase pulse signals that displacement sensor outputs. A new anti-jamming counting approach is designed according to Gray code. This counting approach does not cause error count and counting precision is improved by four times frequency count. The principle of hardware and software is introduced in two application examples. In the first example, the input ports of AT89C52 MCU are connected to the outputs of hand rotary encoder. The MCU constantly checks the state of inputs in the timer interrupt and counts with this counting approach, then the count value is transferred to host computer through the RS422 interface. In the other example, the outputs of optical encoder are connected to the I/O ports of CPLD/FPGA chip which can count with this counting approach. Then the count value is transferred to host MCU/DSP through data lines. The applications resulted that the approach is good and the hardware circuit is simple, stable and reliable. The method has a certain practical value and can be applied to the anti-jamming counting for the other sensors which have the same output waveform. [C270]

"Design of dynamic testing system for airscrew electric propulsion systems of stratosphere airship"

For the effective function verifying problem of airscrew electric propulsion systems in the state of flight, based on the structural characteristics and operational principles of the propulsion systems, a design of dynamic testing system is proposed in this paper by analyzing the principle of testing method. The technological scheme, hardware structure and software structure of the testing system are introduced, which provide effective research route and foundation for propulsion systems testing. [C271]

"Design of access control system based on stereo face recognition"

In this paper, we proposed a stereo face recognition approach to facilitate some applications such as access control. Because this algorithm is closer to the human eye recognition principle, it can obtain a lot of spatial information, which a 2-D image cannot provide. In this system, ARM Xscale PXA270 processor is used as the core unit to capture stereo images and, with the help of identification analysis, obtain features of them. Compared with the traditional method, the experiment shows, this one has a high recognition rate and a reasonable recognition time. Moreover, the design has the advantage of lower costs and good prospects. [C272]

"A design of attitude indicator based on mems technology"

This paper introduces a new design of attitude indicator based on MEMS technology. It analyzes the principle of testing attitude by acceleration sensor, the conditioning circuit, calculation and scale transform. It also gives a method which can realize by MMA7260 to measure the biaxial acceleration signal. Using inner ADC of ATmega16, collecting and converting conditioned signals, as well as the precision of the system improved from 10 bits to 14 bits based on the technique of oversampling. The experimental results show that the attitude indicator has the measuring range of dual spindle: $\pm 90^\circ$, precision: $\pm 1^\circ$, meets design requirements. [C273]

"Miniaturize photoelectric stable platform"

In order to reduce the size and weight of the gimbal in a traditional stable platform and correct the disadvantage in size of the payload, the paper first improves the gimbal which is an important component of a stable photoelectric platform, that also is an important factor in affecting the size and weight of a stability platform. In this paper, a closed-form solution of 3-DOF manipulator is designed according mechanical arm design principles. This manipulator is formed by a three joint axes whose extended line is intersected at one point. A standard orthogonal coordinate system is set up for each rod in the manipulator. And then, rotation transformation matrix expression is obtained. At last in this paper, the manipulator arm-shaped method for solving solutions is description, and also, each parameter of the gimbal is calculated when the photoelectric detection devices at bottom reach the expected position. Test results show that the photoelectric stability platform with gimbal we designed is smaller, lighter and simpler than that traditional. Also, the packaging and size of the photoelectric will not be affected with this open structure. [C274]

"Research on power spectrum estimation based on periodogram and burg algorithm"

With rapid development of modern intelligent traffic management, the measuring speed radar becomes an important device. Using Doppler principle, speed can be measured by obtaining frequency deviation signal of moving target. Traditional measuring speed method uses analog filter whose measuring accuracy is low and measuring speed is slow, so it's difficult to meet the requirements of modern intelligent traffic management. Signal processing of speed radar generally use power spectrum estimation method. This paper focuses on classical period spectral estimation and modern spectral estimation based on Burg algorithm. By comparing various algorithms in computational complexity and resolution, Burg algorithm was used to signal processing finally. Experimental and simulation results indicated that digital signal processing system would meet system requirements for measurement accuracy. [C275]

"Hardware circuit design of copying manufacturing oriented complete software type CNC system"

A function module composition for copying manufacturing oriented complete software type CNC system is proposed through analyzing basic features and present research technologies of digital copying manufacturing control system. Based on the hardware platform of IPC, a complete software type digital copying CNC system is designed. Components selection and control principles of the control system's hardware platform are introduced, among them the design and connection of the hardware platform's control circuit, the link between the system and its servo driver and the link connected the system with a profiling probe and a handheld pulse generator are described in detail. Design ideas of development process and key technology are given as well. Finally, a bicycle saddle model intersection's self-learning control process is simulated with Matlab. Simulation results demonstrate the workability and the effectiveness of the hardware circuit. [C276]

"A method of the untouched ultrasonic liquid level measurement with high precision"

In order to improve the precision of the ultrasonic liquid level measurement in the airtight container, the principle of ultrasonic distance measurement is described and the main error sources are analyzed. In views of the error sources, the ultrasonic emission circuit which is propitious to reduce the blind distance, the temperature measured circuit which amends the ultrasonic velocity, the automatic gain regulated circuit which compensates the ultrasonic attenuation are designed and the method which checks up the preceding edge of echo by setting up the double compared values was used in the software, which contribute to enhance the measurement precision. Experiment shows that the ultrasonic liquid level apparatuses which adopt these methods have the higher precision, its circuits is simpler, easier implement than the others. [C277]

"Switch-level design of ternary adiabatic counter based on T-operation"

By studying the design principles of multi-valued logic and characteristics of adiabatic circuits, a novel design scheme of ternary adiabatic counter was proposed in this paper. Guided by switch-signal theory, the scheme derives the switch-level structures of ternary adiabatic T-operation circuit, and using bootstrapped NMOS to realize energy input and recovery, then the ternary adiabatic counter is realized by the optimum ternary adiabatic T-operation network which adopting the method of splitting the truth table. Finally, the PSPICE simulation using TSMC 0.25 μ m CMOS technology validated that the designed circuits have correct logic function and the character of clearly low power. [C278]

"Research on simulation of sound propagation system"

The basic design idea of sound propagation system simulation is introduced, and the sound propagation characteristics in enclosure are analyzed. Establish a two-dimension space mathematic model of sound propagation system. Present the general process and methods of sound propagation system simulation, based on which the system simulation was realized. According to the similar principle, simulation can be extended to three-dimensional space and by using higher-order central difference equation error of simulation can be greatly reduced. [C279]

"Design and implementation of data access layer based on design pattern"

The web system exists different data sources to access, and each data source has specific access ways. According to design patterns and Open-Closed Principle, data access layer is designed that connects business layer to access data layer. The data access layer is realized by factory method and reflection mechanism. In the factory method, reflection mechanism is used to read key-value pairs of the configuration file, and data access class instance is dynamically generated so that the system has a better general performance, scalability and maintainability. [C280]

"Research and implementation of an intelligent traffic monitoring system based on IOCP mechanism"

According to the function of intelligent traffic monitoring system and the problem that the load of the intelligent traffic server is big, the principle, programming methods and technical difficulties of IOCP(I/O Completion Port) mechanism in Windows used in network communication program are analyzed. The design method of cooperating multi-threads and simplifying the function of the single thread is brought forward. And this is applied in designing the server of the intelligent traffic monitoring system. The performance of the server based on the IOCP mechanism is compared with the performance of the server based on the overlapped I/O mechanism. It is showed from the test that IOCP mechanism has good technical advantages in the process of the design of large-scale network communication system. [C281]

"FIR filter design based on FPGA"

The paper introduces structure characteristics and the basic principles of the finite impulse response (FIR) digital filter, and gives an efficient FIR filter design based on FPGA. Use MATLAB FDATool to determine filter coefficients, and designed a 16-order constant coefficient FIR filter by VHDL language, take use of QuartusII to simulate filters, the results meet performance requirements. [C282]

"Monitoring system about temperature, humidity and toxic gas"

On the basis of computer network theory, we have designed the underground garage's monitoring system about temperature, humidity and toxic gas. The whole system consists of hardware and software. In this paper, we first introduced the principle of fuzzy control including its characteristics and important methods of applications. The

experiment results of the system show us that the whole monitoring system has such advantages as easy structure, stable performance and high reliability. The system could be used in practical applications, such as coal mining industry. [C283]

"Development of a real-time machine vision system for detecting defeats of cord fabrics"

Automatic detection techniques based on machine vision can be used in fabric industry for quality control, which constantly pursues intelligent methods to replace human inspections of product. This work introduces the principle components of a real-time machine vision system for defeat detection of cord fabrics, which is usually a challenging task in practice. The work aims at solving some difficulties usually incurring in such kind of tasks. The design and implementation of the algorithm, software and hardware are introduced. Based on the Gabor wavelet techniques, the system can automatically detect regular texture defects. Our experiments show the proposed algorithm is favorably suited for detecting several types of cord fabric defects. The system testing has been carried in both on-line and off-line situations. The corresponding results show the system has good performance with high detection accuracy, quick response and strong robustness. [C284]

"Design of network device driver in embedded Linux"

With the widely application of ARM technique, building the embedded operating system based on ARM processor has been a hot point of research. In this paper, the design of network device driver in Linux operating system based on ARM920T processor is implemented on the S3C2410- S development platform made in Beijing universal pioneering technology. Focused on discussing implementation principle of embedded Linux network drivers and detailed to analysis of the frame structure of the program code. [C285]

"The robot remote monitoring and fault diagnosis system base on wireless network"

Aiming at the characteristic of the 6-DOF serial robot, a remote monitoring and fault diagnosis system was designed and realized. The principle of the system and its architecture were introduced first, then a server/client mode is designed to achieve remote control and intelligent fault diagnosis, the work cycle and the main functions of server and client system were given also, finally, through client operations, the remote motion control, real-time transmission and display were accomplished. [C286]

"A low-power wireless remote sensor node design based on GPRS"

For the limitation of transmission distance and power volume of sensor node, a low-power remote data acquisition node which implements long-distance data transmission by combining General Packet Radio Service network with wireless sensor network is designed to acquire data periodically and upload data to remote server through General Packet Radio Service network. This paper expatiates hardware design principles of the node, power management model and software protocol design of the test system. Test results show that nodes can reliably acquire and upload data, the average work current of sensor node is 34mA, the peak current of cluster-head is 260mA when cluster-head uploads data to server, and sleep mode current are both less than 35uA. Performance indicators of node can fulfill the needs of remote monitoring applications in industrial field. [C287]

"Positioning system for mobile terminal based on CG and GIS"

A new positioning system based on relative positioning principle for mobile terminals was introduced. It was designed and developed based CG and GIS techniques. Adapting to the characteristics of small hard disk and memory volume, slower speed of CPU and small size screen of the mobile terminals, the display of the point, line, polygon objects, an the annotation, road name, and the implement of inquiry and buffer analysis modules were well-designed. The system is suitable to PDA, mobile phones, and embedded devices. It can perform displaying, roaming and zooming in or out of the map, inquiring of spatial data and attribute data, controlling of layers, and buffer analysis. [C288]

"Velocity measurement system of projectile and fragment based on virtual instrument"

In order to measure the velocity of projectile and fragment, a velocity measurement system for projectile and fragment based on virtual instrument was designed, and systematic composition, measurement principles, hardware and software design were detailed. The function extension of this measurement system could be realized by amending the parameters of instrument panel, and the data processing could be simplified and improved by this measurement system, which made the whole testing process very flexible and convenient. [C289]

"Design and optimization of radio frequency stealth signal based on SAGA"

A good stealth performance of radio frequency (RF) signals is very important for fighters in order to have high penetration capacity, survivance capacity and combat effectiveness in an electronic warfare. Some design principles of RF stealth signals are proposed in this paper. In the light of design principles, hopping-frequency signals were proved to having the good RF stealth performance. The simulated annealing genetic algorithm (SAGA) was used to design hopping codes based on the maximal sidelobe level criterion. The performance of frequency-hopping signals was verified by experimental simulations. [C290]

"A miniaturized FSK IF signal transceiver module"

Software defined radio is the radio system to implement flexible communication system and communication function by using fixed hardware platform and software reconstruction, which is characterized to be universal, standardized, modularization, open and flexible. Due to the IF signal processing requirements, the small IF signal transceiver module with the structure of "FPGA+ADC+DAC" is designed based on bandpass sampling theory in this paper. This module generates FSK IF signal by the principle of DDS, performs digital down conversion(DDC) of the IF signal based on bandpass sampling and polyphase filtering, and realizes the synchronous demodulation of FSK signal within the FPGA. This module also provides a host extended interface to communicate with upper computers. According to the practical test, the bit rate is 1Mb/s, bit error rate is better than 10^{-6} . This module consists of signal-chip FPGA, ADC and DAC, which has broad application prospects with the small size, low power, configurable and programmable feathers. [C291]

"Research on middleware technology for pervasive computing"

Pervasive computing as a new computing paradigm adds more requirements to middleware. Problems that challenge pervasive computing middleware are summarized based on the analysis of characteristics of pervasive computing. Four design principles are proposed. This paper studies the middleware Technology for pervasive computing. At last, according to the requirement of pervasive computing application, a pervasive computing middleware infrastructure based on agent and context-aware was presented. [C292]

"Research of industrial furnace fault diagnosis expert system"

In order to realize fast location and detection of abnormal status during running of industrial furnace, especially abnormal status of firing, this article studies and designs a fault diagnosis expert system based on fault tree theory. Firstly, formalized definition of industrial furnace fault diagnosis expert system is given in the paper, then all component elements of the expert system are analyzed and designed in detail, finally the principles and methods of design knowledge base are introduced to us by using the fault tree theory, and also reasoning algorithm is put forward, which is used to reason the fault by way of fault tree. The project practice indicates that this system knowledge model has good suitability, and what's more it is used simply and conveniently, also the outcome of fault diagnosis is reliable and steady. [C293]

"The application of ICP accelerometer sensor signal in a data recorder"

This introduces a conditioning circuit design base the data recorder about ICP accelerometer sensor signal. For the characteristics of ICP type of sensor, show the composition of the conditioning circuit, Anti-aliasing low-pass filtering principle and specific design ideas of hardware, implement the conditioning of ICP accelerometer sensor signal which can be collected. Study the means of the frequency response of the circuit by the experiments, show the frequency response data list and the amplitude-frequency characteristic curve finally, and using linear regression approach to estimate the attenuation slope of the circuit. [C294]

"Development of a residual current device based on analytical and numerical analysis of the sensitivity and unbalance of current transformer"

Based on the analysis of the principle of residual current device (RCD), the impact of sensitivity and unbalance response on the characteristics of residual current transformer (RCT) are discussed in detail. And a kind of RCT is designed by using analytical calculation and numerical simulation methods. Finally, a kind of RCD is developed in this paper. Experimental results show that the designed RCD is of good performance, thus the feasibility of the design is verified. [C295]

"Communication design of automatic test system based on VC++"

The design of automatic test system based on VC++ implemented the communications between the spectrum analyzer and PC. USB-GPIB Interface board is used, USB with its unique advantages of strong anti-interference,

high speed and easy to use make the application of automated test system based on GPIB more extensive and flexible. This paper describes the working principle of the test system and the design of hardware as well as software. And complete the procedures of host computer for spectrum analyzer automated test system in VC++6.0 environments. [C296]

"Structure and composition of lattice-mismatched III-V epilayers for high-efficiency photovoltaics"

Lattice mis-matched (LMM) multilayered structures were grown using metalorganic chemical vapor deposition (MOCVD) at NREL. Energy dispersive x-ray (EDX) spectrometric mapping was conducted on transmission electron microscope (TEM) sample cross-sections of GaAs_{1-y}Pygrades on GaAs substrates, with known layer compositions. The compositions were determined by x-ray diffraction, which serve as standards for EDX. Data were acquired by both TEM spot analysis and 2-D maps in scanning TEM mode. The IP/IASintensity ratio obtained from EDX, plotted against $y/(1-y)$ obtained from XRD shows a linear slope. We seek to parameterize the variations from these standard samples for accurate composition determination of unknown samples. The quantitative method we are developing is based on principle component analysis (PCA). We anticipate our PCA algorithm will have applications in future growth designs, including heterostructures with multiple quaternary steps, or even continuous grades. [C297]

"Design optimization of series-parallel triple-junction solar cells"

The most explored approaches to high-efficiency solar cells have been the stacking of multiple p-n junctions and the concept of intermediate-band solar cell (IBSC). However, both approaches suffer from various material and epitaxial limitations which restrict the power conversion efficiencies from reaching the Shockley-Queisser limit. On the other hand, the series-parallel solar cell tandems have been proposed to effectively use the solar spectrum, while reducing the issues of lattice mismatch and current mismatch. However, the structure optimization has yet been conducted, taking into account the restrictions of current match and voltage match in operation. In this work, we optimize the band-gaps with different spectrums and concentrators by the detailed principles to observe the characteristics of this cell. Compared to the conventional triple junction tandem cells, the series-parallel solar cells significantly improve the current-matching restrictions. [C298]

"Design of intelligent real-time hierarchical control architecture for combat vehicle fire control system"

According to intelligence development requirement of combat vehicle fire control system, it is important to research the intelligent control architecture. The design principles of intelligent real-time hierarchical control architecture are put forward first, and then the architecture of the entire system and the architecture of each control layer are designed and illustrated in detail, at last the main characters of the new architecture are elucidated. This new architecture can finish the combat missions autonomously, ensure control period in real-time and control precision, have high reliability and can supply basic conditions for the manufacture of the intelligent combat vehicle fire control system. [C299]

"Simulation of cloth multi-drape-pattern deformation"

Cloth is extremely weak in bending and its deformation is generally a small-strain-large-displacement post-buckling process. Cloth has multi-pattern deformation characteristics, which means it can form different shapes under the same boundary and loading conditions. The present paper aims to simulate cloth multi-pattern phenomenon by the minimum potential energy principle and the conjugate gradient method. Numerical examples are given and the predicted results conform well to our daily perception of cloth multi-pattern deformation. [C300]

"Wave energy supplying for wireless sensor nodes"

With the purpose of solving the continuous supply of energy of wireless sensor network in the water environment, wave power is utilized for wireless sensor nodes. Based on mechanical movement principle and electromagnetic induction. This paper has designed two mini generator, namely gear device and pulley device. The electrical energy which mini generator generates puts aside the battery via AC-DC conversion circuit, then DC-DC conversion circuit is designed to attain supply voltage in demand for wireless sensor nodes. Experiment result shows that the mini power supply system can satisfy normal nodes, which provides one new method for supplying continuous supply of energy of wireless sensor network. [C301]

"Dynamic task studying of Multi-intelligence Agents based on dynamical node model in cold forming"

Based on the basic principle of cold forming, a dynamical node calculation model is established by spline finite

strip method. Uncertain factors and specialist experiences in roll forming process are informationized highly to establish Multi-intelligence Agents. Then the dynamic task can be solved by intelligent Agent, which is more reasonable for dynamical node deformation. This work can provide theoretical guidance for pass design. [C302]

"Efficient design of QCA optimal universal logic gate ULG.2 and its application"

Quantum-dot cellular automata (QCA) is a promising nanotechnology which has potential applications in future computers. Its advantages such as faster speed, smaller size and lower power consumption than CMOS are very attractive. Universal logic gates have stronger function than traditional logic gates. This paper begins with a review of QCA, i.e. basic principles of QCA, QCA logic devices and modular design methodology. Then an efficient modular based QCA optimal universal logic gate ULG.2 is obtained using a new algorithm and modular design methodology. Finally three examples of 4-to-1 multiplexer, full adder/subtraction and full comparator are implemented with the ULG.2. Simulation results are obtained by using the QCADesigner tool for the proposed QCA circuits. The results confirm that all the proposed circuits hold correct logic function and achieve a considerable wire-crossing count reduction. Compared to the existing ULG and MI based design, proposed 4-to-1 multiplexer can respectively reduce 50%, 62.5% number of wire-crossings apart from 26.7%, 30.3% QCA cell reduction. [C303]

"Parametric design and dynamic simulation of the pin-cycloid-gear planetary reducer used by fast moving switch machine"

This paper introduces operating principle of the pin-cycloid-gear planetary reducer used by fast moving switch machine. The assembly model is built by Pro/E software. In order to realize parameterization and serialization of cycloid gears, the parameter group is established and described in detail. The working process is simulated in ADAMS system in the condition of full-load. Compared with theoretical calculation, the results of dynamic simulation is correct. This is the key to the further research. [C304]

"Qt-based embedded control system design"

Qt-based embedded software development platform analyzes the part needs of embedded application development, expounds the principle and structure of the ventilated energy-saving system and the features of some circuit chips. The implementation of the ventilated energy-saving system in software and hardware is carried out a detailed inquiry; serial programming, temperature analysis, humidity analysis and dew-point formula are included mainly. At last, the strengths and weaknesses of Qt-based embedded development are concluded; the proposal for future is brought out. [C305]

"A Hyperlipemia Information Analysis System based on immune algorithm"

This paper designs a Hyperlipemia Information Analysis System, which can realize hyperlipemia document classification and information analysis. In document indexing, we propose an improved approach, called Term Frequency, Inverted Document Frequency and Inverted Entropy (TFIDFIE), to compute term weights in document indexing. In addition, an improved immune algorithm proposed by us is used in this system, which called Clonal Selection Algorithm Based on Antibody Density (CSABAD). According to the clonal selection principle and density control mechanism, only those cells that have higher affinity and lower density are selected to proliferate. The system obtains better classification performance. In further work, we will research the feature selection and data mining for hyperlipemia. [C306]

"Modeling and simulation of multilevel current source inverter based on SIMetrix/SIMPLIS"

On the basis of SIMetrix/SIMPLIS simulation platform, the computer model of a kind of three-phase multilevel current source inverter (MCSI) was developed by using hierarchy design. In the control system, the multi-carrier PWM modulation strategy was adopted and tested, the current-balance control for intermediate DC-link inductor was implemented on the principle of redundant switching combinations. The reasonability and validity were testified by the coincidence of the simulation and experimentation results and theoretical analysis. This multi-level hierarchy modeling method is also suitable for the other power electronics converters and offers a new thinking for designing actual power electronics circuits. [C307]

"Research on the condensation and feedwater control system for nuclear power plant"

In order to study the mechanism of the condensation and feedwater system of nuclear power plant, some simplified mathematic models are presented. The controlling principle of condensation and feedwater control system is explained, and their controllers are designed. Matlab/Simulink module is used for the simulation, result shows that the water level control system of steam generator could make the feedwater flow rate well track the

change of the steam flow rate, reduce the false action of the feedwater valve and make the water level keep invariant. The control system of the vacuum and condensate subcooling degree of the condenser could timely regulate the flow rate of cooling water. Thereby, the vacuum and condensate subcooling degree could be limited in certain range. The validity of the control system is proved which could provide reference for the design of the condensation and feedwater control system of nuclear power plant. [C308]

"A Simple and practical Sorting Tableau Mark-Method"

In various competitive activities, a reasonable design of match procedure is very important. This article makes a unified planning to issue that n numbers of participators play in the same playing area. Under the principle of striving for fairness, it firstly makes the analysis in theory to induce the valuing scope of competition interval times of n participators; then, this article also introduces a very intuitive, simple and effective method of searching the fairest match process, namely the Sorting Tableau Mark-Method. [C309]

"Pressure sensor's application in vehicle inspection system"

Oil pressure and air inlet manifold absolute pressure are the important parameters which represent the vehicle's run state. In this paper, we have studied the principle and maintenance method about the vehicle's oil pressure sensor and air inlet manifold absolute pressure sensor from the standpoint of pressure sensor. And we have designed a kind of new integrated bus; it can reflect the vehicle's operation by connecting with computer. [C310]

"Design and development of a Resource Management System for Cable TV network"

With the popularizing of digital TV, Cable TV (CATV) network develops rapidly in the recent years. More large scale resource involved in the CATV network makes demands of the more effective management system. This paper analyses the characteristics of CATV network resources, offers a hierarchical model and gives the architecture, development principles, and implementation of a comprehensive CATV Network Resource Management System (CATV NRMS) based on Geographical Information System (GIS) and database technologies. [C311]

"Design of Ternary clocked adiabatic shift register"

Through the study of the ternary shift register and adiabatic circuit working principle and structure, a new design of ternary adiabatic shift register is proposed in this paper. By using the theory of three essential circuit elements, combining with the adiabatic computing principle, the structure expressions and the corresponding circuit structures of ternary adiabatic flip-flop with the reset port and ternary adiabatic 3 to 1 multiplexer are derived firstly, and then the further design of 4-bit ternary adiabatic shift register is presented. Finally, computer simulations verify the circuits designed have the correct logic function and energy recovery characteristics. [C312]

"Robust loop-shaping H^∞ control of LCL-connected grid converters"

This paper proposes the use of a robust loop-shaping H^∞ procedure for the current control loop of VSCs connected to the grid through LCL filters. The proposed method yields robust controllers for systems connected to grids whose equivalent impedance is only known in a predefined range. The design procedure is based on simplified classical loop-shaping principles. The result is a discrete-time controller, suitable for being executed on a Digital Signal Processor and executable in real-time that is robust for the considered conditions. The procedure has been verified by simulation and experimental testing. [C313]

"Service-oriented Architecture at device level to support Evolvable Production Systems"

The Evolvable Production System (EPS) paradigm identifies guidelines and solutions to support the design, maintenance and evolution of complete industrial infrastructures. At the same time, Service-oriented Architecture (SOA) approach is becoming a broadly deployed standard for business and enterprise integration, while spreading across all layers of an enterprise infrastructure and disparate domains of application envisioning a unified solution. The application of SOA-compliant technology based upon open web standards can significantly enhance the interoperability and openness at device level. The crescent ubiquity of smart devices across several domains of application can raise important lifecycle issues concerning control, management, supervision and diagnosis. The merge of the previous two approaches can allow the creation of a complete ecosystem able to support this new methodology. From initial setup and deployment to lifecycle monitoring and diagnosis, each device needs to be taken in account and easily reachable. This document extols the association of both approaches in the pursuit of a common goal at device level for the domain of industrial automation outlining fundamental architectural principles and a device model to support it. Also, a proof-of-concept prototype is

presented to confirm its expected applicability in a industrial automation use-case scenario. [C314]

"MRAS-based sensorless control of a five-phase induction motor drive with a predictive adaptive model"

Multi-phase ac motor drives are nowadays considered for various applications, due to numerous advantages that they offer when compared to their three-phase counterparts. Variable speed induction motor drives without mechanical speed sensors at the motor shaft have the attractions of low cost and high reliability. This paper analyses operation of a Model Reference Adaptive System (MRAS)-based sensorless control of vector controlled five-phase induction machine. A linear neural network is designed and trained online by means of back propagation network (BPN) algorithm. Moreover, the neural adaptive model is employed here in prediction mode and in simulation mode. The ANN-MRAS-based sensorless operation of a three-phase induction machine is well established and the same principle is extended in this paper for a five-phase induction machine. Performance, obtainable with hysteresis current control, is illustrated for a number of operating conditions on the basis of simulation results. The results obtained with prediction and simulation mode are compared on the basis of various parameters. Full decoupling of rotor flux control and torque control is realised in both predictive and simulation mode. However, predictive method is shown to provide better dynamics. [C315]

"3D laser scanning vision system for autonomous robot navigation"

The presented Technical Vision System realizes the principle of dynamic triangulation. This technique is able to resolve in real time a triple task: to detect a presence of significant obstacle in a robot's neighborhood; locate its position in a robot's field-of-view; obtain in a short time a digital map of the obstacle visible surface with metrological accuracy of coordinates and adjustable step of discretization. Some aspects of theoretical backgrounds, technical design, optical principle, mathematical framework, signal processing, prototype design and experimentation are presented in this paper. [C316]

"Design of multi-dimensional magnetic position sensor systems based on HallinOne® technology"

Systems for measurement of relative displacements or rotations in a single dimension by means of Hall sensors are state of the art. Fraunhofer HallinOne®Technology delivers 3D Hall sensors which can measure the complete spatial magnetic field vector as well as its change in all spatial directions at once. This allows in principle the design of position sensor systems which can detect all six degrees of freedom (positions and angles) of any device with a single magnet and a single magnetic field sensor. Unfortunately, complexity of the design increases significantly with the number of DOF in question. In this paper, after giving an overview on Fraunhofer IIS' HallinOne®technology, we present a software environment for the design of 3D magnetic position sensor systems, which supports the design process from feasibility studies unto preliminary testing of virtual prototypes. An application in the automotive domain is shown as an example. [C317]

"Educational software for the numerical correction of experimental magnetization curves"

The proposed software allows students to get aware of the importance of the experimental data accuracy in magnetism. A common error source for the magnetization curves (including hysteresis cycles) is the demagnetization effect and the influence of the magnetic sensor position. Our software helps the user to understand the principle and the effect of each correction method. The Graphical User Interface (GUI) is designed as a wizard, assisting students to decide which the best correction procedure could be and to obtain the intrinsic magnetic material characteristic to be used in electromagnetic field computation. [C318]

"Underactuated versatile gripper for the cleaning of nuclear sites"

This paper presents a ten-degree-of-freedom robotic gripper developed for the cleaning of nuclear sites. First, the principle of underactuation is briefly recalled. The contingencies of the application are exposed and the possible geometric arrangements of the fingers are investigated. The design of the underactuated 3-phalanx fingers is then presented. The mechanisms and transmissions used to drive the fingers are also discussed. Finally, a prototype and a functional gripper are shown and test results clearly demonstrate the capabilities of the robotic gripper. [C319]

"An innovative monitoring system for sustainable management of groundwater resources: Objectives, stakeholder acceptability and implementation strategy"

The paper presents the preliminary results of a scientific initiative aiming at the definition and implementation of innovative management options to mitigate the environmental impacts of groundwater pumping in coastal aquifers. In fact seawater intrusion in such aquifers is very often caused by the over-exploitation of groundwater

mainly due to the increasing water demand in the agricultural sector in the last decades in most semiarid or arid countries of the world. Consequently, the sustainable management of groundwater under the principles of transparent and efficient water use has highlighted the issue of measuring and accounting the water volumes withdrawn from the groundwater. The objective of the research activity is the design of an innovative monitoring system for sustainable groundwater exploitation. Such an ambitious target requires an accurate analysis of existent and potential stakeholders' conflicts. These conflicts are crucial for the implementation of strategies and activities by the different institutions that are involved in the management of water resources. Therefore, a central role in the development of the project is the stakeholder involvement, with particular emphasis on conflict assessment. In this work, conflicts analysis has concerned both the acceptability of groundwater protection measures and the feasibility of groundwater monitoring strategies. [C320]

"Impact of control strategies on the rating of electric power take off for Wave Energy conversion"

In Wave Energy Converters (WECs) the maximum power extraction would be achievable at the expense of a very high rating of the electric and power electronics equipment. The goal of this paper is to show how a convenient trade-off between high power extraction and viable electrical device ratings can be achieved by a proper choice of the WEC control strategy. The case of a direct coupled point absorber in heave is considered, in order to show the impact of the most common control strategies on the power performance. Consequently a revised approach to WEC control is proposed, which is simple and takes into account these potentially conflicting requirements. The targeted application of the presented tool is at the design stage of the power take off, but it also offers a reference-case control principle that can be conveniently adapted to improve the device exploitation when working in real sea conditions. Theoretical analysis and computer simulations are used to show the validity of the proposed approach. [C321]

"High-efficiency and low-cost tightly-regulated dual-output LLC resonant converter"

A new high-efficiency and cost-effective dual-output LLC resonant converter is proposed in this paper. The proposed converter can get tightly regulated dual-output voltages by adding only one auxiliary switch and PWM IC to conventional LLC resonant converter. Therefore, it features a simpler structure, less mass, and lower cost of production. Furthermore, since all power switches are turned on or off under zero-voltage switching (ZVS) or zero-current switching (ZCS), it has several favorable advantages such as high-efficiency, low switching loss, improved electromagnetic interference (EMI), and reduced burden on the cooling system. This paper presents a dual-output LLC resonant converter applicable to the PDP TV power supply. The proposed converter achieves maximum power conversion efficiency of 96.5% at full load condition. The operational principle, theoretical analysis, and design considerations are presented. Also, to confirm the operation, validity and features of the proposed converter, experimental results from a 420W, 200Vdc/50Vdc prototype are presented. [C322]

"Algorithms of real-time correction of the fuel map and the ignition map of a race combustion engine with spark ignition"

In this paper we have presented the design and the functioning of a programmable controller for combustion engines with spark ignition, designed for the tuning of sports cars. We have presented the method of connection of the computer with the target system, a draft of the algorithm of engine's work and the structure of used data. The second part has been dedicated to the tested methods of the adaptive correction of the fuel map and ignition map contents. We have presented two of the designed and used algorithms, as well as the principles and effects of their work. We have also compared their performances and utility during tuning and use of a race car engine. [C323]

"An improved SIFT algorithm for feature points matching of dairy cow images"

The conformation is the main parameter in dairy cow appraisal; hence, it is necessary for the measuring and evaluating of dairy conformation to use machine vision technology in 3D reconstruction. The feature points detecting and matching are the pivotal steps in 3D reconstruction. The conventional SIFT feature points matching algorithm has shortcomings of too large search area and low efficiency, An improved SIFT feature points matching algorithm is proposed to reduce the search range from both row and column directions based on binocular vision principle. 2.7 times of in speed by the improved algorithm has been shown in the experiments compared with that of the conventional algorithm with the same matching precision. [C324]

"Study and application of AHP based dynamic evaluation indicator management system"

AHP (Analytic Hierarchy Process) is a typical method used in systematic engineering area, which can turn qualitative analysis into quantitative analysis or combines these two analytic methods together. A dynamic evaluation indicator management system designed with the principle of AHP was introduced in the paper, a case

study based on the system, the Agricultural Modernization Evaluation Indicators System is also introduced, which implements all the steps of AHP, includes original data management, Indicator sorting, weight calculation, result calculation and graphical output etc., and the details of the construction, calculation and output process of the computer system are also introduced. [C325]

"Development of fast analyzer on biological waste's nutrient contents"

With the development of poultry husbandry, a volume of excreta from a large number of livestock has caused serious environmental pollution problems because of the inappropriate disposal. Therefore an efficient and economical solution to the disposal of excreta from poultry is necessary with the intensification of consciousness in protecting environment. One important method is to properly use the excreta as manure in the farmland, and then estimating the nutrient contents in manure before the disposal is essential with the development of modern precision agriculture. It is studied that the nutrient contents (Nitrogen, Phosphorus, Potassium) in the excreta of animals have a correlation with the physical and chemical indexes including conductivity, specific gravity and so on. The goal of this study lays in the development of an instrument of fast measuring the biological waste's conductivity based on the method of two-electrode passed by the constant AC current to satisfy the demand of acquiring the nutrient contents in manure. This analyzer system is mainly made up of two parts: the electrode sensor and the control circuit. The electrode sensor adopts DJS-10D to detect the variation of the excreta conductivity based on two-electrode measurement principle. The control circuit adopts the PHILIPS ARM7 chip LPC2114. The designed ARM system can perform the acquisition and processing of the conductivity-relative data, display and store. The constant AC current as the supply oscillator is added to the two-electrode sensor, and then acquire the AC voltage signal related to the excreta conductivity. Finally the conductivity data is displayed in the LCD and stored into the USB disk. Calibration test shows that the analyzer is practical. [C326]

"Operational tests on thyristor valves for Ningdong-Shandong $\pm 660\text{kV}$ UHVDC project"

For purchasing more efficiency, more power transmission capacity, UHVDC projects are employed in the grid of China. Thyristor valves, as one of the key equipments, must pass the operational tests in order to make sure the valve design is proper. In coordinate with IEC60700-1 standards and based on thorough investigation and comparison of exiting operational test circuits, a new operational tests circuit is developed and applied in the Ningdong-Shandong $\pm 660\text{kV}$ UHVDC project. In this paper, the topology and working principle of the test circuit are introduced. Then test parameters and results are presented, showing that development of thyristor valves for Ningdong-Shandong UHVDC project is successful. [C327]

"Intelligent testing systems"

In this paper, we analyze features and functions of automated intelligent testers and suggest approaches, methodology and structures for their realization. Our approach is based on principles of life-long continuous testing as the most efficient and, may be, only possible way to achieve reliable software functioning. In addition, a typology of testers and testing approaches is developed to provide possibilities for finding AI methods correlated with each type. Stages of the life-long continuous software testing are described and the role of AI on each of these stages is analyzed. To understand advantages of the intelligent approach, testing abilities of different types of testers are estimated by means of the theory of algorithms. [C328]

"Photonic-crystal surface-emitting laser"

Recently, there has been growing interest in photonic-crystal surface-emitting lasers (PC-SELs) (1-4). The lasing principle exploited by the lasers is based on the band-edge effect in a two-dimensional (2D) PC, where the group velocity of light becomes zero and a 2D cavity mode is formed. The output power is coupled to the vertical direction by the PC itself, which gives rise to the surface-emitting function. Based upon this novel lasing mechanism, PC-SELs possess the following important features: first, perfect, single longitudinal, and lateral mode oscillation can be achieved even when the lasing area becomes very large (for example, devices $>300\text{ }\mu\text{m}$ in diameter) (1, 2, 4); and second, the polarization mode (2) and the beam pattern (4) can be controlled by appropriate design of the unit cell and/or lattice phase in the 2D PC (as a result, a range of vector beams (5, 6) can be directly generated); third, the on-chip controllability of the beam direction (7) can be realized using a composite photonic crystal composed of square and rectangular lattices. In this report, we will overview the lasing principle, the device structures and these important features of PC-SELs. The lasing oscillation in blue-violet regime based on GaN PC-SELs (8) will also be discussed. [C329]

"A comparative evaluation of high performance current regulation strategies for vector controlled induction motor drives"

Vector control is a most effective strategy to achieve rapid and accurate torque/speed control of AC motors. Its principle is to identify the machine rotor flux axis, and to then use this knowledge to control in-phase and quadrature current components to achieve precise torque control under varying load conditions. Accurate current regulation is essential for good vector control. However, while AC current regulation has been intensely researched over many years, designing a good current regulator still remains an uncertain mix of theory and practice. This paper presents a detailed comparison of four alternative PI and hysteresis based current regulation strategies, and compares the performance of a standard vector controller using these strategies. The results show that when properly tuned, all four strategies are essentially equivalent, and the choice between them need only be made on the basis of convenience and/or cost. [C330]

"First principles prediction of materials for spintronics: From bulk to nano"

The continued down-scaling of complementary metal-oxide-semiconductor (CMOS) devices requires replacement of the conventional Si dioxide or oxynitride dielectric by alternative high-k materials immediately. For long term consideration, electron devices may be replaced by spintronic devices which make use of both charge and spin, two fundamental properties of electron. However, to realize these, many materials issues to be addressed. Materials design based on computational methods is playing an increasingly important role in today's materials science and engineering research. Among the various approaches, the first-principles electronic structure method based on density functional theory (DFT) is ideal for designing new materials because such methods do not require experimental inputs and prior knowledge on the materials. We have been using first-principles method to study properties of materials for future advanced technologies and to design new materials. Some of our recent works are discussed. [C331]

"100+ GHz transistor electronics; present and projected capabilities"

Design principle and the present status of high-frequency transistors and integrated circuits are reviewed. Given presently-demonstrated process and material parameters, bipolar transistors having ~3 THz power-gain cutoff frequencies are feasible. Demonstration of field-effect transistors having similar bandwidth requires development of high-capacitance-density gate dielectrics of adequately low leakage current, and high-K oxide gate barriers may therefore be necessary. Transistors of such bandwidths would enable e.g. ~1.5 THz radio transmitters and receivers; classical electron device and circuit techniques are feasible over most of the sub-millimeter-wave (0.3-3 THz) spectrum. [C332]

"LOSNUM: An ultrasonic system enabling high accuracy and secure TDoA locating of numerous devices"

This paper presents an indoor positioning system called LOSNUM (LOCALization of Sensor Nodes by Ultra-Sound). It offers high accuracy of ~10 mm, a locating rate up to ~10 cycles/s and is applicable for both tracking mobile and locating static devices. LOSNUM is mainly designed to localize static devices especially in a wireless sensor network (WSN) with numerous deployed sensor/actuator devices which enables substantially improving a lot of aspects of applications, e.g. network integration of nodes, supplying node locations to application programs, supervising locations with respect to accidentally dislocating, automatic setup and detecting faking of node locations. In order to deal with the demand of locating static devices, the system is optimized for cheap implementation and on the other hand for a high resolution of locations. Concept and basic operation, realization of system components and low-cost receiver principles, improved system performance and setup of a test system will be discussed in this paper. [C333]

"Fiber array energy source used in rapid prototyping system"

A new energy featuring an addressable array of fiber-coupled laser diodes is brought forward to deal with the existing issues in rapid prototyping (RP). Under the control of computer software and hardware, the project of integrating the fiber with the pigtail power laser diode is designed to realize the addressable energy source. To from a 10 mm continuous liner light energy, multi-array of fiber-coupled laser diodes with discreet output light spots are arranged to compensate the space between the spots. The basic technique study of the array of fiber-coupled laser diodes demonstrates the principle feasibility of this project, providing the solid foundation for the application of array of high power laser diodes in RP in the near future. [C334]

"A new cleaning technology based on AFM & its industry application"

A new cleaning technology based on abrasive flow machining about removing the copper stains on the inner wall of steel tube is presented in this paper. Automatic cleaning mechanism and automatic cleaning system setup are designed, and then the principle of cleaning technology force model is analyzed in detail. The suitable technique parameters of the cleaning technology are selected. An application sample is presented. Experiments indicated

that roughness is decreasing 50 percent after cleaned by AFM and reaches the requirement of technology. [C335]

"Investigation on dioptre meter with digital display and projection"

The basic components of optical principle, optical structure and electronic measurement principle of dioptre lens meter's are introduced. Experimental results proved that the designed lens meter features advantages of simple structure, easy operation and high measurement precision. [C336]

"Design and implementation of VoIP prepaid service based on RADIUS"

The prepaid service is a valid method to assure the credit of users that is prevalent used by vendors at present, and it is a very important and applied function. Firstly, the generic AAA architecture and the work principle of RADIUS protocol used by prepaid service are introduced simply. Secondly, the system structure of VoIP authentication and accounting system based on RADIUS is described. Finally, this paper emphasizes on the implementation of the VoIP prepaid service. The results show that the prepaid service can enlarge the function of VoIP authentication and accounting system and validly control the customer credit. [C337]

"Design and implementation of image fusion system"

Image fusion is one of important image processing technologies. Multi-wavelets, Pulse Couple Neural Network (PCNN), and fractal dimension are very useful theoretical tools for image processing. We introduce the basic principles of image fusion at the level of pixel, feature, and decision. We describe the design rules and steps of Graphical User Interface (GUI). Image fusion system based on GUI is then designed and implemented. We give the framework of the overall design of the system and explain its usage method. The system has many functions: image denoising, image enhancement, image registration, image segmentation, image fusion, and fusion evaluation. Especially can the system implement image fusion based on wavelet, or multi-wavelets, or PCNN, or Match Measure of Pulse Number (MMPN). In order to show that the system is intuitive and easy to use, we apply it to visible image and IR image. [C338]

"Study and application of lateral inhibition models in image's contour enhancement"

Current methods used in image contour enhancement have the disadvantages such as distortion, replacement, great processing capacity, which restrict realtime application. To overcome the above shortcomings, a method based on lateral inhibition models was designed. The essence of lateral inhibition models and the meanings of parameters in lateral inhibition models were studied, and then the effect with parameters including size of inhibition field, distribution of inhibition modulus, and kinds of lateral inhibition models in image enhancement were analyzed. The effect of image enhancement by acyclic difference lateral inhibition model and acyclic diffuence lateral inhibition model with Gauss distribution was analyzed, and then selecting principle of parameters were designed. It can be concluded by experiment that acyclic difference lateral inhibition model with Gauss distribution can be realized easily, and it has better effect for image enhancement. [C339]

"A research of spam Identification and its disposal scheme"

This paper presents a new Bayesian trigram model for filtering and identifying spam. On the basis of the low false positive rate, its Identification rate and accuracy are largely improved compared with the general Bayesian model. The article first explains the principle and realization of Bayesian trigram model. Then points out the advantages of it by comparing with the Bayesian model. [C340]

"Design of fiber-optic high-temperature sensor based on colorimetry"

Traditional radiation thermometer is not suitable for such adverse environment like strong electromagnetic interference, strong corrosion, and confined space, etc. To overcome the defect of traditional radiation thermometer, a new colorimetric fiber-optic temperature measurement system has been proposed in the present research, and the system meets the requirements for transient-temperature measurement. On the basis of describing the working principle of colorimetric temperature measurement, a colorimetric fiber-optic high-temperature sensor has been designed, and the feasibility of the design has been proved through experiments. The design is characterized by low cost and high accuracy, and has a sound prospect with certain application value. [C341]

"Design and implementation of Smart Card COS"

This paper designs and implements a Smart Card Operation System COS which accords with national and

industry standards, possesses high security and good compatibility. Firstly, the hardware structure of Smart Card is introduced, then the architecture and work principle of Smart Card COS are explained, and the design and implementation of Smart Card COS is discussed from four function modules such as transmission management, command interpreter, security control and file management. Finally, an application instance-SIM card is given to show the application on Smart Card. [C342]

"A study on MAC sublayer of OBU in ETC system"

In order to achieve the core chip which has the advantages of low cost, low power consumption and high integration in electronic toll collection system, the implementation of medium access control (MAC) sublayer protocol of the dedicated short-range communication is studied. Based on the analysis of working principle of MAC sublayer, the MAC sublayer is divided into three modules. Finally, the working process of every modules are realized in Verilog HDL, and the simulation results show that they are in accordance with the protocol. [C343]

"A USB flash disk viruses preventing technique based on filtering access"

After analyzing the basic principles of the spread of USB flash disk viruses, this paper concludes that the spread of USB flash disk viruses need two necessary conditions, and on the basis, proposes two counter measures which can prevent the spread of USB flash disk viruses thoroughly. At last, this paper proposes two designs to prevent the spread of USB flash disk viruses. [C344]

"Phase-locked internal model control-based research on brushless DC motor variable speed control system"

According to internal model control and phase-locked loop principle, a new method of overshoot-free, high-accuracy variable speed control of brushless DC motor is proposed. Speed error integral and error signal of the speed controller are both detected by using the phase angle and frequency of the pulse signal of speed at the same time to ensure that the speed control system can lock arbitrary speed command easily in a controllable mode and achieve a high-accuracy variable speed control performance. The theoretical analysis and simulation results show that the proposed method can make the system get a good dynamic and static performance with a simple design and easy control. [C345]

"A new learning method inspired by cooperative transportation in ants: modelling and simulation"

Inspired by cooperative transport behaviors of ants, on the basis of Q-learning, a new learning method, Neighbors' Discounted Information (NDI) learning method, is present in the paper. This is a swarm-based learning method, in which principles of swarm intelligence are strictly complied with. In NDI learning, the i-interval neighbor's information, namely its discounted reward, is referenced when an individual selects the next state, so that it can make the best decision in a computable local neighborhood. In application, different policies of NDI learning are recommended by controlling the parameters according to time-relativity of concrete tasks. By applying this learning method, the cooperative transport of ants is simulated. Experiment results show that the transport process in simulation is very similar to the phenomenon in natural world, which proves the designed learning mechanism's rationality. [C346]

"Design of fuzzy PID control algorithm for series resonant inverter power supply based on DSP"

Based on properties and requirements of the series resonant inverter power supply, a Fuzzy PID control algorithm for series resonant inverter power supply is designed. The topology of the inverter main circuit with IGBTs is presented and the control principle is analyzed, the control circuit based on DSP TMS320F2406 is designed to achieve the Fuzzy PID control for inverter power supply system. In addition, the experimental results of a 5kW /10 kHz inverter power supply demonstrate the effectiveness and the feasibility of the design. [C347]

"Transmission line inspection robots: Design of the power supply system"

This work aims to develop a power supply system to use with the RIOL robot, useful for inspecting high voltage overhead power lines. The power supply operating principle is based on the harvesting of the magnetic energy around the power supply lines by clamping a transformer around the line. A switching power rectifier, controlled to emulate a resistor, is then connected to the transformer secondary to obtain the robot needed voltages ($55V \pm 2.5\%$) and power (800W). Simulation results are presented and discussed. [C348]

"Design and realization of a radar simulation system base on CPCI bus"

In this paper, design and implementation of a radar signal simulation system is introduced. It is based on standard CPCI bus and follow the design principle of standardized, modular and extendable in design process. This system is made up of standard hardware and the simulated waveform can be obtained from any algorithms. This system is flexible to extend based on complexity of the algorithms. [C349]

"Study on performance test bench of internal combustion rock drill"

Principle and structure of the performance test bench for internal combustion rock drill are introduced. A impact energy absorbing system is designed by using momentum conservation theory, energy conservation theory and damped vibration principle of mass-spring-damping system. The impact energy and frequency is tested by using the magnetic induction speed sensor to measure the vibration velocity of energy absorbing block. Adopting the test bench, many performance index, such as impact energy, impact frequency, drill rod rotation speed and torque, blowing powder capacity can be tested. The test is speedy, reliable and can improve the level of ex-factory examination for rock drill. [C350]

"Real-time analysis system based on ARM and DSP for audio-frequency stress wave"

In this paper, by introducing audio-frequency stress wave reflection detection principle, an audio-frequency stress wave analysis system is presented and designed. The design based on a high performance FPGA of EPM7128, DSP of TMSVC5509 and an ARM chip of S3C2440 are introduced. FPGA is used as the core of data acquisition, DSP is used as the core of data processing, accompanied with S3C2440 chip as the core of data display and system control, and embedded operation system Linux is adopted as software of system. And the experiment results show that the method based on FFT, Wavelet transform, and Hilbert transform achieved good performance for audio-frequency stress wave reflection detection. [C351]

"Modeling and optimum design of a rectangular piezoelectric vibrator for multi-degree-of-freedom motor"

Multi-degree-of-freedom (DOF) motors have become more and more useful in the complex electromechanical system. Multi-DOF motor composed of plate type piezoelectric vibrator is compact and easy to miniaturize. In this paper, simulation and finite element analysis of a multi-DOF motor with a rectangular piezoelectric vibrator as the stator are presented. The finite element model of the piezoelectric vibrator is established to analyze its vibration type under the B32 and B23 working modes. The main structural dimensions of the piezoelectric vibrator, including the aspect ratio and the thickness of the rectangular substrate, the width and height of the protrusion, are analyzed by computer simulation, which demonstrates the relationships between these structural parameters and the amplitude and the modal frequency of the piezoelectric vibrator. The principles to determine these structural dimensions are presented thereby. [C352]

"Beamlet: Principles, algorithms and applications"

The concept of beamlet was first introduced by Donoho and Xiaoming Huo. As an efficient tool for multi-scale image analysis, beamlet dyadically organized the collection of line segments which exhibits a certain range of lengths, positions and orientations. The role played by line segments in beamlet analysis is analogous to which points play in wavelet analysis. This paper describes a multi-scale analysis framework based on beamlet analysis, presents the structure and principle of beamlet transform, and summaries the algorithms and the related research works of beamlet. Its development history, current and future challenges are also reviewed in details. [C353]

"A method of liquid level measurement based on ultrasonic echo characteristics"

For solving level alarm of high pressure vessels or corrosive liquid vessels, a new non-contact level alarm device was designed by using ultrasonic wave. The attenuation characteristics of ultrasonic echo wave remained in the wall of vessels is analyzed when the medium in vessels is liquid or gas. A new method for measuring fixed-point liquid level was proposed by using this principle, and the system of level alarm was proposed. In this way, the transducer is only needed to touch to the outside surface of the wall of vessels. The device is very suitable for measuring fixed-point liquid level of high pressure vessels or corrosive liquid vessels, and has the merits of high sensitivity and reliability. [C354]

"Monitoring the fast neutrons in a high flux: the case for ^{242}Pu fission chambers"

Fission chambers are widely used for on-line monitoring of neutron fluxes in irradiation reactors. A selective measurement of a component of interest of the neutron flux is possible in principle thanks to a careful choice of the deposit material. However, measuring the fast component is challenging when the flux is high (up to

1015n/cm²/s) with a significant thermal component. The main problem is that the isotopic content of a material selected for its good response to fast neutrons evolves with irradiation, so that the material is more and more sensitive to thermal neutrons. Within the framework of the FNDS (Fast Neutron Detector System) project, we design tools that simulate the evolution of the isotopic composition and fission rate for several deposits under any given flux. In the case of a high flux with a significant thermal component, ²⁴²Pu is shown after a comprehensive study of all possibilities to be the best choice for measuring the fast component, as long as its purity is sufficient. If an estimate of the thermal flux is independently available, one can correct the signal for that component. This suggests a system of two detectors, one of which being used for such a correction. It is of very high interest when the detectors must be operated up to a high neutron fluence. [C355]

"Robust extended complex Kalman Filter applied to distorted power system signals for frequency estimation"

The design of an extended complex Kalman Filter for frequency estimation of distorted power system signals has been presented in this paper. The design principles and validity of the model have been outlined. In general abnormal data obtained from measurements may affect the accuracy of frequency estimation. Hence fast and accurate frequency estimation is necessary. For this reason, the proposed algorithm is employed to suppress the abnormalities. The results of frequency estimation for distorted signals using the proposed method are compared with extended complex kalman filter method and zero crossing method. Comparison of results reveals the superior performance of the former method. [C356]

"Realtime background subtraction from dynamic scenes"

This paper examines the problem of moving object detection. More precisely, it addresses the difficult scenarios where background scene textures in the video might change over time. In this paper, we formulate the problem mathematically as minimizing a constrained risk functional motivated from the large margin principle. It is a generalization of the one class support vector machines (1-SVMs) to accommodate spatial interactions, which is further incorporated into an online learning framework to track temporal changes. As a result it yields a closed-form update formula, a central component of the proposed algorithm to enable prompt adaptation to spatio-temporal changes. We also analyze the mistake bound and discuss issues such as dealing with non-stationary distributions, making use of kernels and efficient inference by a variant of dynamic programming. By exploiting the inherently concurrent structure, the proposed approach is designed to work with the highly parallel graphics processors (GPUs) to facilitate realtime analysis. Our empirical study demonstrates that the proposed approach works in realtime (over 80 frames per second) and at the same time performs competitively against state-of-the-art offline and quasi-realtime methods. [C357]

"Acoustic sensor for in-pile fuel rod fission gas release measurement"

Innovative in-pile instrumentation is crucial for advanced experimental programs in research reactors. In this field, we developed a specific acoustic sensor to improve the knowledge of fission gas release in Pressurized Water Reactor (PWR) fuel rods when irradiated in materials testing reactors. In order to perform experimental programs related to the study of the fission gas release kinetics, the CEA (French Nuclear Energy Commission) acquired the ability to equip a pre-irradiated PWR fuel rod with three sensors, allowing the simultaneous on-line measurements of the following parameters: 1. fuel temperature with a centreline thermocouple type C, 2. internal pressure with a specific counter-pressure sensor, 3. fraction of fission gas released in the fuel rod with an innovative acoustic sensor. The third detector, which has been developed and patented by CEA, SCK-CEN (Belgian Nuclear Research Center) and IES (French research laboratory of Montpellier II University and French National Research Center), is the subject of this paper. This original acoustic sensor has been designed to measure the molar mass and pressure of the gas contained in the fuel rod plenum. For in-pile instrumentation, the fraction of fission gas, such as Krypton and Xenon, in Helium, can be deduced online from this measurement. The principle of this acoustical sensor is the following: a piezoelectric transducer generates acoustic waves in a cavity connected to the fuel rod plenum. The acoustic waves are propagated and reflected in this cavity and then detected by the transducer. The data processing of the signal gives the velocity of the acoustic waves and their amplitude, which can be related respectively to the molar mass and to the pressure of the gas. The piezoelectric material of this sensor has been qualified in nuclear conditions (gamma and neutron radiations). The complete sensor has also been specifically designed to be implemented in materials testing reactors conditions. For this purpose--some technical points have been studied in details: 1. fixing of the piezoelectric sample in a reliable way with a suitable signal transmission, 2. size of the gas cavity to avoid any perturbation of the acoustic waves, 3. miniaturization of the sensor because of narrow in-pile experimental devices, 4. appropriate cables to transmit high frequency signal under nuclear conditions. Design and testing program of this innovative sensor will be discussed. [C358]

"Pressure measurement based on thermocouples"

Measuring gas pressures reliably in a harsh radiation environment was confirmed to be tricky during operation of the liquid spallation target of MEGAPIE at the Paul Scherrer Institute (PSI). Severe drift of calibration and the loss of a sensor were experienced. At the same time, the only instrumentation that worked flawlessly in the system were thermocouples. Motivated by this experience, a novel pressure sensor for application in high radiation fields has been developed, which is based on temperature measurement. The new sensor takes advantage of the fact that the thermal conductivity over a mechanical joint exhibits a strong dependence on the contact pressure. In the novel sensor heating is applied at one point and temperatures are measured at different specific locations of the pressure gage; in particular, the temperatures on the two sides of a mechanical contact are monitored. From the observed temperature distribution the gas pressure can be derived. By choosing specific mechanical details in the lay-out, it is possible to tailor the useful measurement range. In addition to yielding pressure values, the new sensor concept admits for obtaining a measure for the accuracy of the result. This is done by continuous self monitoring of the device. The health status and based thereupon the plausibility of the indicated pressure value can be deduced by comparing sensed temperatures to expectation values for any given heating power. Malfunctioning of the pressure gage is reliably detected from the diverse readings of only one device; this can be seen as providing internal redundancy while at the same time immunity to common mode failure. After some analytical and finite element studies to verify the concept in principle, a first prototype of such a novel pressure sensor has been built at PSI. Initial measurement campaigns demonstrated the correct operation of the device as anticipated. Further potential for optimization, like designing a gage for high temperature applications or the miniaturization of such sensors, has been revealed. [C359]

"Development of multilayer parallel connected piezoelectric ceramic power supply and measuring instrument for electricity generating performance"

Study the principle of a new type of multilayer parallel connected piezoelectric power supply. The output electrical energy increases and the amplitude becomes maximum when piezoelectric ceramic stack occurs resonance, the formula of natural frequency is deduced through theory method. In order to measure and study the electricity generation performance of the piezoelectric ceramic power supply, develop a measurement instrument for the electricity generation capacity of the piezoelectric ceramic power supply. In the design of this measuring instrument, use a changing polar distance capacitance micro-displacement sensor to measure the vibration amplitude of piezoelectric ceramic stack, use a charge amplifier to measure the generated quantity of electricity, and the real experimental results of measurement instrument are displayed. The measurement instrument is developed to analyze the influences of the size and structure parameters of the piezoelectric ceramic and the frequency and the amplitude of the external excitation on the electricity generation performance of piezoelectric ceramic power supply. [C360]

"Application of digital communication techniques to plastic extrusion process"

Extrusion of molten plastic onto wire and other metal shapes requires very close control of numerous variables to ensure consistent product quality at maximum production rates. To accomplish a higher extruder performance, the hardware structure and software design of a plastic extruder control system based on digital communication technique is presented. The system is constituted of an integrated control mode with Personal Computer (PC) and programmable logic controller (PLC). The working principle, hardware and software are described in detail. The virtual produce results indicate that the designed control system ensures a good plastic extruder control. [C361]

"Active disturbance rejection control for the airborne pmsm in direct drive ema application"

Compared with the general ball screw electromechanical actuators (EMAs), direct drive EMAs have several attractive advantages such as more reliable, efficient, accurate, and integrated due to the elimination of the intermediate gear boxes. However, the direct drive structure brings challenges to the servo control of the permanent magnetic synchronous motors (PMSMs) which are widely used in EMAs. Aiming at improving the performance of the PMSM servo system, such as wide speed range and outstanding load disturbance-rejection ability, a novel active disturbance rejection control (ADRC) is presented in this paper. To begin with, as a technique for estimating and compensating uncertainties, characteristics, and principles of the ADRC strategy are introduced in detail by comparing with PID and several advanced control strategies. Then, based on the PMSM model in d-q frame, an ADRC controller for the d-axis current is designed to implement the rotor flux linkage oriented vector control. Finally, ADRC controllers for the position and q-axis current are designed to complete the position servo control. Simulation results verify that the ADRC-based PMSM servo system is fast, precise, of no overshoot and strongly robust to load disturbance. Therefore, the ADRC strategy is feasible in the PMSM servo control and this provides necessary technical support to the direct drive EMA, which is one of the enabling

technologies for the all-electric aircraft (AEA). [C362]

"The design of online system for multi-rang measuring sediment concentration"

According to actual sediment testing needs, an online system is designed to measure sediment concentration. In this system, two testing ways will be selected at the different sediment range. When the water contain low sediment, the system will chose photoelectric-based detection methods to measure. It has a low measurement range, but has a high accuracy. When the water contain high sediment, the system will chose capacitive differential pressure detection methods to measure. On the contrary, it has a lower precision, but has higher measurement range. This paper particularly introduces photoelectric testing technology, principle of the capacitive differential pressure sensor, PLC hardware design, sensor inclination correction and monitoring software design. The system can overcome the effects of different environments, and work steadily. This system is more suitable to measure sediment concentration in the reservoir dredging, water quality management and slurry treatment etc. [C363]

"Design of low-power consumption ultrasonic open channel flow meter"

The measurement principle of ultrasonic sensor in an open channel flow meter is introduced. A new low-power consumption ultrasonic flow meter, which is based on the MCU of MSP430, is designed for the flowrate measurement of open channels. The measurement characteristics of the Parshall flume are analyzed. The experimental data agree with the relationship between the flowrate and the liquid level in Parshall flume. In order to reduce the power consumption, the running time of CPU is minimized. The algorithm in the program is optimized to avoid floating-point calculation. The operating mode of MSP430 is set to be reasonable. Through the flow calibration experiment, the relevant flowrate measurement model is established. The experiments indicate that electric current is 100 uA at working state and that is 10 uA at sleeping state. The results show that the error of the instantaneous flow is less than 1.654% and the error of the accumulated flow is less than 1%. [C364]

"Design of embedded multiprocessor platform with cooperating synchrony"

To meet the requirement of high-speed data processing of complicated system with multi-sensor inputs and multi-controller outputs, an embedded ARM+FPGA +DSP multiprocessor platform is designed, which is characterized by synchronous cooperation and mutual exchange of shared data. ARM completes interface expansion and task scheduling configuring peripheral interfaces including RS422, CAN and RJ45, and it loads program into the 3 DSPs via HPI bus. Shared data stored in multi FIFO core sets in FPGA can be transmitted between any two processors controlled synchronously by interrupt signal. The interrupt signal from ARM starts a new turn of operation, in which period all processors exchange necessary shared data mutually, after ARM collecting 3 DSP interrupt signals, it means the end of this turn and the beginning of next operation cycle. With characters of high-speed, synchronization and real-time, this system platform is designed for the semi-physical simulation system suitable for the on-orbit spacecraft ground test. The principle and frame have reference value for navigation computer upgrading improvement. [C365]

"Research on performance analyzing and modeling of quartzose flexible accelerometer"

The situation of the testing system of accelerometer is analyzed, testing system for accelerometer based on GPIB is designed, and the composition of the data acquisition system is ensured in terms of test principle. The performance analysis platform of accelerometer has been constructed according to the relationship between its output and coefficient of static model equation. The method of test data acquisition and processing, and how to realize the storage and calling of the data through access have been discussed in detail. Finally, with the help of MATLAB tool, the accelerometer's performance parameters model has been built, and the corresponding forecast and differential evaluation has been done. The application of this testing system in accelerometer's test and analyze indicates that it is able not only to improve the automation degree of testing job but also to decrease the labor intensity, and also increase the efficiency of accelerometer's demarcating and testing. [C366]

"Single light path quantum efficiency measurement system used for multi-junction solar cells"

A single light path quantum efficiency measurement system, which has the properties of high test speed, high precision and good repetition, has been designed and successfully developed basing the monolithic structure of the multi-junction solar cell in order to realize its spectrum responses measurement. The principle of the quantum efficiency measurement was expatiated, and the structure of the measurement system was illustrated in detail. Further more, the use of bias lights and bias voltage, and the choice of the standard cells have been discussed particularly. The control software developed by Visual Basic language was also introduced. Finally, the system was successfully used to take the measurement of GaInP/GaAs/Ge three-junction solar cell, whose

quantum efficiency curves for all sub-cells were obtained. [C367]

"Design and realization of IF digital demodulator based on software radio"

The paper introduces a design based on high speed A/D, digital down converter, large capability SDRAM and hardware platform of high speed digital signal processor using and the realization of demodulation of FSK, BPSK, QPSK, ASK in different speed by different algorithms. The intermediate frequency digital demodulator has the feature of flexibility and fast refresh. The paper introduces the structure composition and working principle of the demodulator, and theoretical derivation and application description of the algorithm involved in digital demodulation. [C368]

"Measurement of arc temperature in SF6 model circuit breaker based on CCD"

Investigation on arc shape in SF6 circuit breaker has very important significance to analyze arcs forming, moving and extinct principles, to reduce its dimensions and enhance switching capability. In order to facilitate to research arc characteristics, a set of dismountable SF6 model circuit breaker is designed in this paper. The experimental system of diagnosing arc plasma parameters is built based on charged coupled device (CCD) signals. Finally, the temperature distributions of arcs plasma are obtained through Abel inverse transformation. [C369]

"The design of an embedded intelligent monitoring and control system of the DC power supply based on internetworking"

The paper chiefly introduces the system construction and design principle of embedded intelligent monitoring and controlling system of DC power supply based on internetworking. The system is made up of main control module, assistant control module, battery monitor module and insulating resistant monitor module. It is used to monitor all necessary parameters and states of DC power supply such as bus voltages, voltages and inner resistant of battery, insulating resistant of bus and so on. And control power supply system working with the set parameters and in a high efficiency. The interface of internetworking is embedded in the monitoring and controlling system so it is a remote-controlled system. This system keeps the DC power supply system work in high stability, reliability and safety. [C370]

"Nondestructive testing of dynamic elastic modulus of wood-based panel by the method of stress wave"

Testing method by velocity of stress wave is widely used in the nondestructive testing system of strength of wood-based panel. Considering higher and higher requirement of accuracy on the testing system, the research developed testing system of stress wave velocity based on SCM in this paper. SCM is used as processing core. The research calculated dynamic elastic modulus of wood-based panel, which was based on real-time tested data, such as velocity of stress wave and density of wood-based panel. And bending strength of wood-based panel is determinate on correlation of dynamic elastic modulus and bending strength. Then the research realizes strength rating on the wood-based panel. The research discussed on the testing principle, gave out concrete circuit of hardware and design of programming, and also carried out experimental verification of testing system in this paper. [C371]

"Improved symmetrical pulse-density-modulation induction heating power based on FPGA"

This paper proposes an improved symmetrical PDM (pulse-density-modulated) method, which distributes the pulses in a work cycle more symmetrically comparing with the previous PDM approaches, to avoid the output current unstable and discontinuous in light load status. A state machine method is implemented to generate the symmetrical pulses based on FPGA. The details of improved symmetrical PDM principle, generation circuits and control circuit design are given. Some experimental results are shown to verify the validity of the method. [C372]

"Method for measuring separation multi-parameters of releasable explosive bolts"

Separation multi-parameters measurement of releasable explosive bolts can provide more information for the design and separation characters analysis of explosive bolts. In this paper, it mainly chooses a wedge-style releasable explosive bolt as measure object to explore the dynamic measure method of separation multi-parameters and designs corresponding test system in accordance with measure principles. The test results show that the method can accurately illustrate the relationship between separation characteristic parameters in the same separating process as well as reasonably evaluate separation characters of releasable explosive bolts. [C373]

"Study on the high speed measurement of laser diode self-mixing velocimeter"

Laser self-mixing interferometry is a new method proposed for measuring velocity of a moving target. When the optical beam is back-scattered into the active cavity, laser output power and frequency are modulated. By signal processing, the Doppler frequency can be acquired, and the target's velocity can be calculated. Based on these properties, a low-cost interferometry velocity sensor can be designed. In order to know whether the Laser Diode (LD) Self-Mixing (SM) velocimeter is suitable for high speed (km/s) scene, the high speed measurement by LDSM is analyzed in theory and the simulation is processed. Based on the three-mirror cavity model, relations of the laser output power's frequency fluctuations and Doppler frequency are acquired. External optical feedback is regarded as laser's small-signal modulation by the Doppler frequency. From rate equations of the carrier density and the photon density, following conclusions is acquired: LDSM velocimeter's maximum measurable velocity (MMV) is restricted by laser's relaxation resonant frequency in principle; LDSM velocimeter's MMV goes up to kilometers per second theoretically; When the LD's modulation speed satisfies request, LDSM interferometry can be used to measure high speed and the measurement precision is very high. The result is available to use the self-mixing technique to develop high performance, small overall dimensions and low cost instruments to measure high speed. [C374]

"Design of FPGA based on linear array CCD driver circuit"

Traditional CCD driver circuit is very difficult to satisfy the existing high speed CCD device application due to its complexity and poor anti-interference capability. Besides it's not easy to debug, and its speed and function are limited. In this paper, an FPGA-based on design of linear array CCD device's driver circuit using Toshiba Corporation's TCD1703C is proposed. Firstly, the principle and timing of the TCD1703C are introduced. Then the driving circuit based on Altera Corporation's Cyclone II series EP2C8T144C8 is designed with Verilog HDL. In the simulation with ModelSim SE, it shows that the design meets the timing requirements of the TCD1703C. Lastly, experiment results demonstrate that the result of the CCD outputs can satisfy the existing application request. This design method has the advantages of simplicity of the circuit, high reliability, conveniently debugging and update. All these merits will accelerate the pace of research and development. [C375]

"Study on self-sensing actuator of magnetically controlled shape memory alloy"

In this article, theoretical and experimental study are presented for positive and inverse characteristics of magnetically controlled shape memory alloy (MSMA). The experiment model of self-sensing actuator (SSA) based on MSMA is designed. And working principle of the prototype & a mathematical model are shown. The experiment model of SSA based on MSMA uses dual-coil structure with sensor coil and magnetic coil being in the same magnetic circuit. While it separates signals using space division multiplexing. SSA is applied to experiment of the active vibration control and better results is achieved. [C376]

"Study on oil detection technology based on inductive wear debris sensor"

Wear debris concentration and granularity in the lubricant oil contains the information about wear condition of machine. Based on the inductive balance principle and the detection requirement of wear debris, the off-line wear debris sensor and the on-line debris sensor are designed. And some measures of low noise design are used in the signal detection circuit of sensors. The experiments prove that the off-line sensor has satisfying accuracy and consistency for the concentration of the ferromagnetic wear debris, and the online sensor has effective detection capability for the granularity of the ferromagnetic wear debris and large unferromagnetic wear debris. [C377]

"Wireless sensor network for hydraulic system state monitoring"

Considering the subsystems and parts in hydraulic system of large weapon equipment being scattered, together with the strong pertinence among them, a state monitoring scheme based on wireless sensor network (WSN) is adopted, which can not only eliminate a large number of cables, but also make the state monitoring system simple and convenient for carrying and installing. Taking advantage of optimal sensor placement and data fusion among smart nodes, the amount of data stream is reduced, and the monitoring efficiency and accuracy is improved effectively. A typical application example is prompted, whose hardware and software is designed, and the working principle of this monitoring system is expounded. The application results show that this system can realize wireless real-time monitoring and accurate fault diagnosis for hydraulic system of large weapon equipment. Moreover, this system is small and convenient to be taken by a single soldier, which is suitable for fast repairing on battlefield. [C378]

"The design of general-purpose automatic testing and fault diagnosis system based on VXI bus"

According to the principles of generalization, modularization, and standardization, we have designed a general testing system for large-scale and complicated electronic equipment based on VXI bus. It introduces the design principle and the structure of the hardware and the software of the general testing system in the paper. It adopts Bayesian networks representation method to represent the uncertainty information in the system. The system has important meaning to improve the test and diagnostic capability for the electromechanical device. [C379]

"Characteristic research on focused acoustic field of linear phased array transducer"

Using pulse-echo method, the defects of inspected specimens, such as cracks, inclusions, porosities, can be tested with ultrasonic phased array technique. Phased array transducer can realize the conversion between sound wave and electric signal, its characteristic of acoustic field is the most important factor whether the echo information of the inspected area in a specimen can be obtained and utilized effectively, and it is the main basis of designing a phased array. In this paper a mathematical model was presented to simulate the characteristic of focused acoustic field radiated from an ultrasonic linear phased array on the basis of the Huygens' principle. Based on the model, studies on beam focusing directivity were conducted by analyzing the effects of various transducer parameters systematically. Finally, the designing principle of linear array transducer was given. [C380]

"Design a piezoelectric actuator for micro-vibration isolation plat and research on the affection of dynamic capacitance property"

For the micro-vibration isolation plate's purpose of vibrating isolation, designed a kind of third generation piezoelectric actuator, and modified the ejector rod to make sure the output displacement effective. The dynamic and static experiments on the designed piezoelectric actuator showed that the actuator had good stability and the actuating force gain did not change sharply with frequency and almost could keep at the same level. But, we also found that the curves that the actuating force augments changing with voltage was not linearity, and had irregularity fluctuation, through analyzed the theory of piezoelectric and published papers, an experiment about the character of piezoelectric actuator between current and frequent was finished. The result shows that: Because the initial condition and boundary condition was fixed. The gain of output-force has relationship with dynamic condenser, which isn't increase with the voltage and current linear. But the curve has a frequency corner, and the curves shows descending fluctuation after the certain frequent point; The frequent point value will descent when the actuating voltage increased, which is caused by the mechanism of actuator, the existent of pre-pressure, the complex couple of piezoelectric actuator, the characters of material et al. Through the research on designed actuator and dynamic condenser, the characters of actuator are hold and the accurate nonlinear principle caused by dynamic condenser is discovered. [C381]

"Research and development of an on-line instrument for measuring cooling air flow of car radiator"

A new instrument for measuring cooling air flow of car radiator is introduced after analyzing existing instruments and methods, and the measuring principle and design method of new instrument is described in detail too. On-line measurement can be realized by the new instrument, and the information of cooling air flow distribution can also be got during the measuring process. In addition, the new instrument could recognize the wind direction well. The test results demonstrated that the instrument is reliable and the measurement accuracy is high, so the instrument is worth being spread and applied. [C382]

"Development of portable integrated signal source for circuit unit test of radar"

Diversification and complication of circuit units of modern radar bring requirement of more functions for signal source used for test. Based on virtual instrument, microprocessor, DDS, CPLD and circuit share technologies, a portable integrated signal source for circuit unit test of radar is developed, which integrates DC power supplies, AC power supplies, low frequency signal source, intermediate frequency signal source and digital signal source into one instrument. The composition of the hardware and the software of the integrated signal source and their design principles are given in the paper. Testing results show that the integrated signal source provides a good test platform for circuit units of radar. [C383]

"Research on large power computer controlled constant current power source technologies"

At present, the technology of the small current, low-power and high stability constant current source is more mature. However the technology of high current, high power and high stability computer controlled constant current power source is still in the exploratory stage. After studying the principles of the constant current source and the internal working principle about switching power supply chip L4970, this paper has designed a program of computer controlled constant current source based on the L4970A. The system consists of two parts, the constant current source module as well as the single-chip computer interface control module. The specific working principle and key circuits of the two parts were introduced in detail. After a long test, the constant

current can output 0-10 A current by the computer-controlled, the accuracy of control is within 2 mA, the range of load voltage is 5.1-40 V and the efficiency of main loop conversion is up to 92.5%. The constant current source diode has been successfully applied to the heating power of test equipment, which is proved to be stable and reliable. [C384]

"The design of excitation control system based on DSP"

A new excitation control system for synchronous generator based on DSP (TMS320F28335) is introduced in this paper. This paper analyzes the principles, structure and functions of the excitation control system in detail. Hardware design contains AD conversion module, digital signal input/output module, Controller Area Network (CAN) module, frequency measurement module and FRAM module. The software design contains the main program and the interrupt service routine. The experiments show that this kind of excitation control system is feasible. [C385]

"Specification design of planar feature based on the new generation geometrical product specification and verification"

In accordance with the new generation geometrical product specification and verification (GPS), the specification design process and the measurement and verification process must satisfy with duality principle so as to avoid the ambiguous problems during the verification process. To solve the problems how to generate the specification surface model of planar feature and design and apply the corresponding specification operators. This paper firstly presents a method to generate the specification surface model of planar feature. The tolerance mathematic model of the planar factors should be established in first step. Then the influences of processing technology on the specification surface model need to be considered. The simulation points under the normal distribution are generated in the tolerance zone. By using the fitting approach of the least-squares B spline, the specification surface model is generated. Secondly, this paper makes a corresponding analysis and design on specification operators of plane feature with flatness requirement. Lastly takes the worktable of M7140 grinding machine as an example, builds its specification surface model and the specification design results by operations on specification surface model are given. [C386]

"Research on straightness evaluation of the machine guideway based on the new generation geometrical product specifications"

Most evaluation technology of the rail straightness at present is still built on the specifications based on the geometries. The principles of duality and consistency between specifications and verification stage proposed in the new generation of geometrical product specifications (GPS) have not been taken into consideration and resulted in the loss of control of the functional requirements. To solve this problem, this paper summarizes the research status of both the measurement and the functional requirements of the guideway straightness. We propose a new evaluating scheme based on duality principle of new GPS. In this scheme, B-spline method was adopted to meet the duality requirement and functional requirement in model establishment. In the measurement and certification process we adopt the same operations proposed in the new GPS both on specification surface model and verification surface model. Thus the duality principle between the specification stage and verification stage was implemented. To demonstrate the new method, an example was given in details following the steps above. Meanwhile, the results using minimum zone was given to verify the proposed method. The comparison showed that the new method can be able to meet the requirements of new GPS system, and can satisfy the design accuracy. [C387]

"Design for test-node and diagnosis strategy of the armored vehicles electrical system"

Testability analysis and fault diagnosis strategy design are important parts of testability design. Whether designing an optimum diagnostic strategy through testability analysis directly affects the improvement of fault detection and isolation ability for systems. Firstly, in the paper, the composing principle and work flow of the armored vehicles electrical system were introduced. Aiming at the shortcoming that the system's fault detection ability was insufficient and didn't has the ability of fault isolation, topological graph is used on the design of system's testability model, analysing the reliability effect of the system. At last, a reasonable and effective diagnosis strategy was presented. [C388]

"Summary on weak signal detection methods based on Chaos theory"

Definition, significance and traditional method of weak signal detection (WSD) are introduced. Content of WSD methods based on chaos theory is sorted in detail. Theory base, principle and main content of WSD method based on chaos oscillator are introduced. Its main content contains detection task, detection system, detection

condition, chaos criterion, method improvement and method realization. Detection task is to measure parameters of the various periodic signals to be detected. Duffing oscillator is usually used as a chaos detection system and would have different detection performance with different equation form. Detection condition includes noise condition and initial condition. Noise condition means noise type and SNR. Chaos criterion is about identifying and describing state of chaos system. Hardware realization includes design of chaos measurement circuit and sometimes with DSP. This WSD method can be combined with traditional WSD method for lower SNR. [C389]

"Simulation and experiment study of space vector pulse width modulation"

The basic principle of the space vector pulse width modulation (SVPWM) is introduced and the realized method is given in the Simulink environment in details. Then the SVPWM algorithms are researched in-depth by simulation analysis and verification. On this basis, the experiment results are acquired by using the advanced experimental equipment dSPACE. [C390]

"New-type ultrasonic flow meter design based on FPGA high-speed data sampling"

The measurement principle and hardware structure of a new-style time-difference method ultrasonic flow meter are presented. Software arithmetic based on FPGA high-speed data sampling technology is put forward. Sample speed is up to 80 MHz and sample depth is 1 K byte, it can fulfill the requirement of ultrasonic flow meter software arithmetic to sampling. The design can upgrade on-line. Thus, system's whole performance is improved. [C391]

"Design of MEMS electrometer for highly sensitive charge measurement"

A new scheme of MEMS vibrating reed electrometer is proposed, which has eliminated bias current leakage of preamplifiers. Its principle stays largely the same to Gunn's largescale electrometer proposed in 1932, input Charge is shared between a variable capacitor formed by the vibrating reed and a fixed capacitor, charge is measured by detecting the AC image current caused by charge redistribution. Theoretical calculation showed a charge resolution of 286 electrons in 0.3 Hz bandwidth, showing some compromise between charge resolution and bias current leakage. [C392]

"Wetness measurement theory based on microwave differential technique"

A wet steam humidity measurement method based on microwave differential technique is presented in this paper. The calculation model of equivalent dielectric constant of wet steam at different temperature and pressure is established. The measurement system is designed, which substitutes additional instrument for integrated module and uses two resonators to counteract system error. The principle of system is deduced, and the relationship of variation of steam humidity and output of system is given. System is simulated by use the S parameter of practical resonator. Data show that humidity and system output have high linear relationship. The consistency of theory and simulated data shown the validity of this theory and can be used for the online measurement of flowing wet steam. The accuracy of system in this paper can reach plusmn0.1% near the temperature 30 V. [C393]

"Measuring system for micro force based on electrostatic theory"

The micro force measuring technology is widely used in the area of micro friction test, liquid surface tension analysis, organism micro-structure force test, measurement and calibration of MEMS and NEMS, etc. In view of measurement and realization approach of micro force value, a micro measuring system is proposed. A control electrostatic force generator is adopted to reproduce micro force. The basic working principle is an exact designed cylindrical capacitor with the characteristics of long measurement range, fine linearity and faint border effect. A linear axletree with high precision and linearity is used to ensure concentricity of movement. In order to eliminate the interference from parasitical capacitance a hermetical shield is designed. By means of measuring the voltage between electrodes and capacitance change gradient, the micro force test at μN - nN degree could be realized. [C394]

"Research of modeling and simulation to control chaos in H bridge converter"

The operation principle of peak current mode control H bridge converter was analyzed. It can observe nonlinear phenomena in H bridge converter after simulating to the model, which builds by the concept of binary logic variables using Matlab/Simulink. According to the characteristics of H bridge converter, a time-delayed feedback control method was applied to suppress the chaos behavior of H bridge converter and make the system changing from chaos to stable cycle. It proved from multi-angle that the control method can broaden the stability scope of H bridge converter by anglicizing the bifurcation point impart to parameters I_{ref} , E , L and impart of

feedback gain k to H-bridge converter stability. Practice proved that the speed of simulation is fast and easy to do theoretical analysis in this method of modeling. The control method can suppress chaos with high efficiency and it can provide theoretical basis for stability design of H bridge converter. [C395]

"Research on modulation stability and compensation method of Y waveguide in fiber optic gyroscope"

Based on the study of the principle of ladder wave modulation in digital closed-loop fiber optic gyroscope, the temperature characteristics of Y waveguide half-wave voltage is analyzed and verified by experiment, then the influences of modulation stability of Y waveguide on fiber optic gyroscope is investigated, and the real-time tracking of compensation method for the modulation instability of Y waveguide is researched and designed. The stability of scale factor, the output interference signal during ladder wave reset period and the zero bias stability of fiber optic gyroscope are tested by comparison experiments whether the real-time tracking of compensation method is adopted. It obtained the conclusion that the modulation stability of Y waveguide is the main reasons affect the accuracy of high-precision fiber optic gyroscope, the accuracy and stability of fiber optic gyroscope has been greatly improved by adopting real-time tracking of compensation method for Y waveguide. [C396]

"Research on the LiBr solution concentration of electronic measurement system"

To meet the requirement of measuring the lithium bromide solution concentration in 'The Research on the heat and mass transfer process of plate falling film absorber with a film-inverting configuration', by analyzing the principle of the concentration measurement method by using the Hydrometer, and based on the principle of the electromagnetic force torque feedback balance, Data acquisition and etc. This paper designed a new kind of lithium bromide solution concentration automatic measurement system, built the corresponding experiment system and tested it. The test results of the experiment system showed that, this new system can measure the lithium bromide solution concentration accurately, conveniently and quickly. [C397]

"Design of a novel biomimetic tilt sensor based on variable reluctance transducer"

Most of the traditional tilt sensors are sensitive both to the rotation motion and to the translational motion. Their usage range is limited to static environment. Aiming that point, a kind of novel tilt sensor was presented to measure the tilt angle in dynamical environment based on bionics. The structure of the sensor is presented to illustrate its character of being sensitive to rotation motion and being insensitive to translational acceleration noise. A kind of variable reluctance sensor was designed to realize the goal of tilt angle measurement. Its working principle was analyzed. And a data sampling and data processing circuit was designed to realize the goal of non-electric transformation. The data sampling and processing program was been written to get the tilt angle from the sensor. The effect of the sensor is verified by experiments. [C398]

"The application of mixed model in dependent data analysis"

Aiming at the difficulty of dependent data analysis in data measurement field and the application limitation of traditional variance analysis for the processing of correlation data, the principle of mixed model and the corresponding design for the unequal variance data sets were discussed. The fixed effects and random effects were combined with the mixed model which realized the analysis of dependent data. Simulation experiment testified the validity of the model. However, the optimized design for data reconstruction still need further research. [C399]

"Design of loading pressure measuring circuit of highway accelerated loading test system"

Highway accelerated loading test system is an important equipment for making test and evaluation on road surface quality. Measurement of loading pressure decides loading effect and loading efficiency. The paper introduces working principle of highway accelerated loading test system and composition of the control system, and analyzes design of loading pressure measuring circuit in detail. In order to improve signal-to-noise ratio, hardware anti-interference measure and digital filtering way are used. Test proves the loading pressure measuring circuit has the features of good linearity, high stability and high accuracy. [C400]

"New impact-based method for measuring the velocity of solid granules"

A new impact-based method, which can be used to measure the real-time velocity of the granules flow, was presented in this paper. With this method, two weighting sensors were installed end to end in the designed equipment. The difference of the output signal of the two sensors which was generated by the influence of impact can be used to determine the velocity of solid granules flow. Then the mass flow rate of solid granules can also be obtained based on the measured velocity. It is found that the main factor affecting the measuring

accuracy is the length of the measuring board installed above the weighting sensors. Two type of measuring boards with different length were designed to finish the comparative experiments which can reflect the influence degree of the length of the measuring board. The two type of length are respectively 3 cm and 6 cm. Some comparative experiments with soybean as the experimental material were conducted using the designed equipment. Experimental results showed that the average relative measuring accuracy of gross mass was 96.89% when 3 cm long measuring board was employed, while 6 cm long board was employed, the average accuracy was 93.25%. [C401]

"Design and implementation of multi-channel HDLC space communication system based on SOPC"

The traditional design of space communication systems is based on DSP+FPGA architecture. The data processing ability of DSP will be fall off with the increasing of communication channel access-number. In order to meet the needs of high-speed and large amount of data transmission, a kind of space communication system with SOPC architecture design which consists of five microprocessors and 32 HDLC communication channels is introduced in this paper, which also describes the implementation and the working principle of the system. Experiments show that by integrating multiple microprocessors and communication function modules into a single FPGA, this design can enhance data processing capability with small size, light weight, low power consumption, good stability and anti-radiation characteristics. [C402]

"Research on high-speed fuzzy reasoning with CPLD for fault diagnosis expert system"

As an effective method for diagnosis reasoning, fuzzy reasoning is hard to meet the real-time challenge for its complex process and time-consuming. According to the principle of conventional fuzzy reasoning with software, a new method to design expert system fuzzy reasoning with CPLD for fault diagnosis is presented. In the new method, fuzzy operating is realized by function transform with ROM, and CPLD provides logic control and process coordination for fuzzy reasoning. After all, the whole fuzzy reasoning is finished with hardware, not software. It is validated by many experiments that the speed of fuzzy reasoning with this method is faster than traditional modes, and it can be applicable to many on-line diagnosis systems based on single-chip controller or DSP (digital signal processor). [C403]

"Research on electronic cam based on nurbs interpolation algorithm"

This paper discusses the influence of basic mathematical model, knot vector, control point, weight and basis function on the shape of curve. According to the mathematical principle of NURBS curve and using the equal time division interpolation method, a kind of interpolation algorithm based on Non-Uniform Rational B-Spline (NURBS) is applied to electronic cam under the precondition of meeting the design requirements. Meanwhile, combined with the practical, the impact of the constraint conditions including the velocity, the acceleration, the jerk and the chord error on NURBS curve interpolation has been thoroughly discussed. And a kind of optimization algorithm has been adopted to solve problems that the algorithm can not satisfy the requirement of the constraint conditions. The analysis of the algorithm and the simulation trial proves that, this algorithm can fit the profile curve accurately by decreasing the downloaded parameter number, and the gliding property of curve is decent when processing complex profile curve. [C404]

"Design of pressure test system based on wireless communication technology"

In this paper, aimed at the phenomenon that pressure test is difficult at some special occasion and some wiring and the power supply difficult region, has designed a set of pressure test system based on the wireless communication technology, and realizes the data wireless transmission through wireless receiving and sending module NRF903. It introduces the working principle, the system composition and the software design method. This system may realize pressure signal acquisition, processing and the transmission under each kind of complex environment, has solved the complex scene segment. This system has some characteristics that the cost is lower, the reliability is high, and utility is strong and so on. Compares based on the wireless communication technology's pressure test system and the traditional method, not only raised the working efficiency, reduced the personal error, moreover causes the entire pressure test more systematized, the standardization. [C405]

"Design of ultrasonic scaler based on embedded microcontroller"

Ultrasonic scale removal is a new scale prevention device, which adopts ultrasonic oscillator to carry out online scale prevention and scale removal of pipeline's water scale. This paper adopts magnetostrictive combined with embedded controller, controlling PWM generator SG3525 to generate ultrasonic signal, whose two complementary frequency and duty cycle are adjustable, furthermore, controlling large power Insulated Gate

Bipolar Transistor (IGBT)'s on-off to control magnetostrictive oscillator, so that it can generate ultrasonic oscillation. On the base of analyzing ultrasonic oscillation system's working principle, design scale removal device's hardware circuit, and finish corresponding software program. Simultaneously, establish corresponding experiment platform, make experiment analysis to ultrasonic scale removal's performance, finally, carry through site operation, and thus validate scale removal device's validity. The result indicates that scale removal device meets design performance's requirements. [C406]

"Dynamic detection system for clutch of real vehicle"

Clutch is a key component in vehicle. It ensures smooth start and shift and prevents overload of transmission system. Torque capacity and heat capacity of clutch are two important technique data. Traditional detection method is to measure on a simulated working table. But the combining process of start and shift in bad condition can bring other troubles which lead to possible damage and reduce the service life of clutch. Based on clutch principle and using wireless transmission technology, the paper has designed a dynamic real-time telemetry system which can detect torque, speed and temperature in the process of separation and combination. The software is designed by Labview, it can demonstrate torque curve, temperature characteristic curves as well as the discriminate result. The system has provided technical support for vehicle and clutch manufacturers to discriminate clutch performance in working condition. [C407]

"A new method for measuring magnetoelastic sensor resonance frequency"

This paper describes a new method of measuring magnetoelastic sensor resonance frequency. In traditional bell-ring interrogating method, the sensor response decays rapidly if placed in viscous liquid and its resonant frequency is hard to be measured. The new method using a persistent excitation makes the sensor keep vibrating during measuring. To eliminate the interference of excitation signal to output signal, we designed a figure-8 antisymmetric structure dictation coil. The paper describes the working principle and gives out the main function circuit. This new method obtained a good result in a-amylase concentration measurement. [C408]

"Research and realization of currentcollection in digital substation"

With the development of network and digitalization, the digital substation has become a hot research for people. This paper introduces the research and realization for acquisition the current signal in substation based on Rogowski coils, describes system composition and working principle, designs the hardware circuit of high voltage side, and specifies the selection of each device. The paper also gives main flow chart of low voltage side signal processing. Making a Rogowski coils, which makes a special design, and is given wiring diagram for test. Experiment results show that, the Rogowski coils have good linearity and less measurement error, can meet the current acquisition in substation. [C409]

"New approach of imagery generation and target recognition based on 3D LIDAR data"

Light Detection and Ranging (LIDAR) sensor is an advanced technology of 3D-measurement with high accuracy. The processing of 3D point cloud data collected via LIDAR sensor is of topical interest for 3D target recognition. In this paper, a new approach of imagery generation and target recognition based on 3D LIDAR data is presented. The raw 3D point cloud data are transformed and interpolated to be stored in 2D matrix. The target imagery is generated and visualized by means of height-gray mapping principle proposed in paper. For different poses of target, the affine invariable moments of target imagery are selected as features for recognition because of its invariance in rotation, scaling, translation and affine transformation. BP neural network algorithm and Support Vector Machine (SVM) algorithm are utilized as method of target classification and recognition. The recognition results by two algorithms are compared against and analyzed detailedly. The new method had been applied into target recognition in outdoor experiments. Different types of targets are classified and the rate of correct recognition is greater than 95%. Through outdoor experiments, it can be proven that this new method is applied to the field of 3D target recognition effectively and stability. [C410]

"Research and realization of signal detector in DC signal injection method"

In the distribution network fault location, because of the cement pole earth fault and the existence of the wire distribution capacitance makes the C type traveling wave method and the AC signal injection method can not work effectively. DC signal injection method solves the problem of the two methods' blind area. The advantage of it is free from to wire distributing capacitance influence, and the weakness is the signal would be difficult to detect. The paper gives the design of DC signal detector. It adopts the hall zero magnetic flux principle. The insulating rod is used in measurement operation to provide protection for the safety of the surveyor. C8051F310 MCU is used to realize A/D conversion. The detector uses the wireless technology to transfer data to the handle and then display it, which realized the separation of measure and display. [C411]

"Designation of an on-line monitoring system of transmission line's galloping"

Based on the analyses of the disadvantages and advantages of every on-line monitoring system of transmission line's galloping, an on-line monitoring system of power transmission line's galloping based on displacement sensors and acceleration sensors is developed in this paper, in which the wireless sensors network and the slave monitoring unit installed on towers are designed by wireless communication technique, by those monitoring units the galloping can be analyzed qualitatively and quantitatively. The operating principle, structure and function of the system are all analyzed at the same time. Moreover, the designation of the node of wireless sensors network based on ZigBee technique and the slave monitoring unit installed on towers are all shown in detailed in this paper. Based on the galloping mechanism as well as earlier data, the galloping is simulated in theory, and then some simulating results are shown in this paper at last. [C412]

"Software design for mini-type ground control station of UAV"

The guiding ideology and principle of GCS (Ground Control Station) software design & development were proposed by analyzing the role of CGS in UAV (Unmanned Aerial Vehicle) systems. Firstly, established an abstract GCS software structure model of bi-directional information interaction; Secondly, analyzed the hardware system constraints caused by development of portable, mini-type GCS, as well as influences on GCS software design. Also, GCS software compatibility and interoperability standards and requirements were discussed. In the process of software design, at first, made a comprehensive analysis of the content of UAV data & information; Then finished the virtual instrument application design, put forward a multi-layer architecture model of 2D flight situation. The structure model analysis, data & information analysis provides a good guidance to the procedure of GCS software design & development, so as to avoid blindness and improve development efficiency. Virtual instrument interface design reflects the basic method of GUI (Graphical User Interface) design. The proposed multi-layer structure model of 2D flight situation shows the general scheme to solve the problem of navigation information output. [C413]

"Development of in-line oil contamination sensor for lubricant of scraper conveyor reducer"

The development of in-line oil contamination sensor for N320 Lubricant used in scraper conveyor reducer is described. The sensor can detect the NAS contamination level of the lubricant and prompt the replacement of oil when the oil contamination level exceeds the indicator of the exchanging standard of L-CKC industrial closed gear oil. This paper describes the sensor's design requirements, principle of operation, selection of wavelength, mechanical structure design and test calibration. The shortcomings of the sensor and relevant solutions are also pointed out in this article. [C414]

"Research on location of single-phase earth fault based on pulse injection method in distribution network"

A method of fault location based on pulse signal injection has been promoted in this paper, which is not only independent of the following factors, such as system operating mode, topology, neutral grounding and random fault, but also the site of signal injection, the width and period of pulse are flexible and adjustable. In this paper the design scheme of software and hardware for signal source is proposed, high-pressure pulse generator is carried out by adopting C8051F310 MCU, and signal detector is designed based on the principle of electromagnetic induction. [C415]

"Quantum-enhanced phase estimation in the presence of loss"

The paper reports the proof-of-principle experimental quantum-enhanced phase estimation. The measurement is based on specifically designed two-photon states that maximize the amount of information about the detected phase in the presence of loss. [C416]

"Photonic pressure sensor in silicon on insulator"

A pressure sensor consisting of a Photonic Integrated Circuit (PIC) in Silicon-On-Insulator (SOI) technology. Sensor is based on the resonance shift principle. It contains an SOI waveguide-based ring resonator which is coupled to access waveguides by means of an MMI. The pressure under investigation acts on the locally thinned substrate, and alters the optical properties of the ring. The pressure can be retrieved by measuring the resonance wavelength of the ring structure. Using a standardized SOI layer stack, the properties of the sensor can be tuned by designing the geometry of the device. The data on our test structures is collected using Vertical Grating Couplers (VGCs) to launch and collect the optical signals. This enables us to do on-wafer testing without the need to dice the wafer, and to have a relatively large alignment tolerance. The final device will be equipped

with V-groove fibre coupling interfaces, which is a proven and robust concept for CMOS-based PICs. The output signal of the device contains information about both pressure and temperature. In order to retrieve the actual pressure, we will account for the temperature-induced deformations of the PIC as well. [C417]

"1.2 W, Tunable, continuous-wave, single-frequency, solid-state blue source"

Continuous-wave (cw) solid-state blue sources are of interest for optical data storage, laser displays, spectroscopy, and medical diagnostics. Frequency doubling of Ti:sapphire can in principle provide coverage in the 400-500 nm range, but at relatively high cost and complexity. Here, we describe a novel approach to the generation of cw blue radiation based on intracavity SHG of a cw singly-resonant OPO (SRO) with MgO:sPPLT as the nonlinear crystal. The source offers wide tuning range, watt-level output power, and single-frequency performance, in a simple, compact, all-solid-state design. [C418]

"Integrated hybrid sol-gel devices for astronomical interferometry"

Astronomical interferometry is an active area of research and an increasing number of new conceptual ideas and designs are being proposed to achieve optimum astronomical instruments. In particular, integrated optics has a lot to offer in what concerns beam combination and control. In this paper, different examples of application of hybrid sol-gel integrated optics devices for fabrication of beam combiners for astronomical applications is given. For the multiaxial beam combiners, a UV laser direct writing unit is used for mask fabrication. The operation principles of the coaxial combiners were validated using an interferometric set-up. Differential polarization and differential dispersion effects were minimized in this set-up to avoid any error in the characterization of the beam combiners. In all the devices, fringe contrasts above 90% were obtained with a source with spectral bandwidth of 50 nm. These results demonstrate that hybrid sol-gel technology can produce devices with high quality, opening the possibility of rapid prototyping of new designs and concepts for astronomical applications. [C419]

"Tunable combline bandstop filter with constant bandwidth"

A new method for the design of tunable bandstop filters is presented. It is based on a dual-band combline structure consisting of a wideband bandpass filter with integrated bandstop filter. The bandstop filter exhibits the very useful property that its bandwidth remains constant as the center frequency is tuned, without the need for coupling adjustment. A prototype design has been constructed, and measured results clearly demonstrate the principle. [C420]

"A peaceful revolution": Community planning and water system assessment in San Lucas Tolimán, Guatemala"

Students in the engineering in context program at the University of Virginia have formed a partnership in international development with the San Lucas mission in San Lucas Toliman, Guatemala. The Mission tasked the team to assist with the planning of a new community, La Puerta. Through a systems engineering framework and application of participatory design principles, the engineering team developed a project requirements analysis, performed site assessment work, created a geographical information system topographical model of La Puerta, and made recommendations for the location and size of a water distribution system. [C421]

"Divergent path random number generators"

This paper presents a class of digital true random number generators. The random number generators can be described using any digital design methodology such as HDL descriptions or logic diagrams. Hence these types of true random number generators are easily implemented in FPGAs and ASICs. Several components are presented along with implementation details and test results. These particular designs generate 32 bit random numbers but the principle is easily extended to any desired bit length. [C422]

"Arbitrary RF-waveform generator with rapid switching capabilities using the temporal Lau effect"

We propose an arbitrary radio-frequency waveform generator with high-speed switching capabilities. As a proof-of-principle demonstration, we design a two-tap filter with Gb/s transitions between triangle and square waveforms with ~12 GHz bandwidth content. [C423]

"Design of MacNeille Polarizing Beam Splitter"

MacNeille polarizing beam splitters (PBSs) has become important optical components in many optical systems. The principle of this type polarizing beam splitters was discussed in detail. It was found that the number of layers of a thin-film assembly, match of refractive index, and shift of reference wavelength are important parameters in

designing MacNeille polarizing beam splitters. With the help of numerical simulation, the effect of these parameters on the properties of MacNeille polarizing beam splitters was estimated detailedly. The results show that the transmittance rises gradually for p-polarized light whereas decreases for s-polarized light with the modest increase of the number of layers, and consequently the bandwidth and extinction ratio improves. When the number of layers is fixed, the centre wavelength is shifted to a shorter wavelength as the reference wavelength decreases. [C424]

"The Hardware System Design of Smart Color Mark Sensor"

In this paper, the principle and new structure of the smart color mark sensor is presented. Especially, the design of the smart color mark sensor's hardware system based on the photoelectric measurement is described in detail, including coaxial optical system, microcontroller system, some special hardware circuits and application of synchronous and coherent detection in the smart color mark sensor as a Intelligent optoelectronic device. In the end, the test results of sensitivity, response speed, output characteristics, stability and so on are presented. [C425]

"AKARI architecture design for new generation network"

We address new generation network architecture design. We show design principles consisting of crystal synthesis, reality connection, and sustainable & evolutionary principles. We also describe principle-oriented component technologies such as optical packet/path integrated network. [C426]

"Development of a compressive programmable array microscope"

We present a compressive programmable array microscope design, which incorporates the compressive sensing principle into the patterned illumination microscope design, so that single pixel detectors can be used to capture microscopic images without mechanical scanning. [C427]

"Optimally efficient resonance-tuned optical modulators"

Based on a first-principles, physically-intuitive design approach, a novel resonance-tuned intensity modulators is proposed with optimal modulation efficiency and extinction, even for lossy modulation mechanisms, including higher-order designs cascable on wavelength-division multiplexed (WDM) signal waveguides. [C428]

"Space qualification of solid state lasers"

General design principles for developing space based diode pumped solid state laser systems will be presented. Major issues affecting the design, development, system engineering, ground testing, operational simplicity and long term reliability will be discussed. [C429]

"Comparison of a solid and a laminated rotor for sensorless control of radial active magnetic bearings"

This paper presents a method for sensorless control of radial active magnetic bearings. Self-sensing methods are based on position estimation by electrical parameters as current and voltage signals. A novel bearing design which has only three stator coils in star connection for high economic manufacturing and permanent magnet biasing for low operational costs is used. Combining a standard three phase voltage inverter and a sensorless control method a cost-effective magnetic bearing system can be realized. For a general simplification of the system all hardware components will be optimized and therefore also the rotor of an active magnetic bearing usually constructed of laminated steel can be reduced to a solid steel rotor. Hence, the influence of the different rotor types on the presented sensorless position detection method is field of interest of this work. A finite element analyses is used to verify differences between the solid and laminated rotor. The implementation of the sensorless method is described and measurement results are presented. Statistical methods are used for comparison of both rotor types with same geometric properties. Finally a conclusion shows the capability for sensorless control of both rotors in principle. [C430]

"Some armature reaction compensation methods numerical design of experiments and optimization for a hybrid excitation machine"

This paper presents a hybrid excitation synchronous machine which combines a permanent magnet excitation with a wound field one. With two sources of flux, this kind of machines is cited more and more frequently in vehicle application for easier control of flux. After a brief description of the structure, some methods will be presented to improve the performances of this machine. Simulation results have shown that the armature

reaction has a magnetizing effect when it enters in a pole face and a demagnetizing effect when getting out from the same pole, which distorts the main field and to some extent deteriorates the performances of the machines. The methods we present here are based on the principle of armature reaction compensation which might be extended to many synchronous machines. And then, in the last section, a general optimization tool (numerical design of experiments and optimization) is used to maximize the impacts of these methods. [C431]

"Minimization of life cycle energy cost of a single-phase induction motor"

This article deals with the optimization of a single-phase permanent capacitor induction machine according to the criterion of gross energy requirement. The presented study is applied to roller shutter drives produced by SOMFY. These motors present low ratio between the operating time and the total time of use. Therefore, they are perfect candidates for an optimized eco-design method by minimizing the gross energy requirement. As the studied motors are in roller shutter's tubes whose diameter is fixed by production and distribution constraints, only two free parameters are available for our optimizations: the active length and number of turns per phase. In this paper, the size of the motors is optimized in a transient thermal regime. The optimizations are based on a typical operating cycle of roller shutter. It is noticed that the part of the energy required for production and recycling is significant in the gross energy requirement. Thus, the usual optimization focused on the only operating losses is inefficient for this typical operating cycle. This conclusion is validated when existing motors specifications are used as parameters for the optimization. The sensitivity of optimization results are evaluated with respect to both the diameter scale and operating cycle. When the solution are optimal, it appears that an increase of the diameter reduce the gross energy requirement. Another main result is that the operating cycle definition is fundamental in the design of the motor. It justifies the principle of on-cycle optimization. [C432]

"A CMOS image sensor for monochromatic spectrum imaging"

A CMOS image sensor based on standard CMOS process which can image the monochromatic spectrum image was developed. It took the advantage of the penetration depth differences of monochromatic light in silicon. Through the usage of double junctions photodiode which can sense short wavelength and long wavelength illumination simultaneously, we got the final device response which increase monotonically with the wavelength, and the wavelength can be known through this monotonicity. First we introduced the basic principle of the device, then ideas in pixel design and array readout circuitry were given, finally we measured the manufactured device, the QEs of the device and the monotonic relationship between the device and the wavelength of the monochromatic spectrum were given. [C433]

"The Design of an Infrared Sensor for the Measurement of Martian Surface Temperature and Gas Concentration"

Design considerations for a temperature sensor to be launched onboard the space mission MetNet precursor to Mars are presented. An IR multispectral sensor has been proposed to measure Martian surface temperature to an accuracy of plusmn1 K without knowing ground emissivity. Two methods for temperature retrieval have been assessed, both relying on comparative measurements at two wavelengths and/or two temperatures. Spectral calculations of surface emission and atmospheric absorption-emission have been made with a simple Martian atmosphere model, and signal to noise ratios have been estimated at transparent wavelengths for several temperatures. Temperature accuracy has been derived for the two methods, showing that bi-color pyrometry has in principle the ability to provide the desired temperature accuracy for reasonable values of sensor detectivity, field of view and spectral filter width, for $T > 200$ K. This sensor can be applied also to estimate CO₂ concentrations in the Martian atmosphere, by comparing signals measured at CO₂ absorption and transparent bands. [C434]

"Designing Software for Modular Static Average-case Analysis"

MOQA is a new domain-specific programming language to design software for which the average-case time analysis of its programs is guaranteed to be modular. Time in this context refers to a broad notion of cost, which can be used to estimate the actual running time, but also other quantitative information such as power consumption, while modularity means that the average time of a program can be easily computed from the times of its constituents-something that no programming language of this scope has been able to guarantee so far. MOQA principles can be incorporated in any standard programming language. We discuss how MOQA can support the design of software for modular static average-case analysis and sketch some of the reversible features of this language. [C435]

"High power maser based on 2D periodic structure and operating in the W-band frequency range"

Periodic structures are studied in many branches of physics including photonics, optics, electronics and physics

of condensed matter, resulting in the appearance of photonic band gap materials, lasers, passive and active devices based on such lattices. Here the concept and the results of studies of a Cherenkov maser based on a surface two-dimensional periodic lattice are presented. The basic model of the maser, its parameters and the principles of operation are presented. The cavity of the maser was designed and the eigenmodes having the highest Q-factor derived. It is shown that the coupling between surface waves also known as Localised Plasmon Polaritons and volume waves (propagating waveguide modes) takes place in the vicinity of the Bragg resonance. The single mode operation of the maser is demonstrated and discussed. [C436]

"Pulse propagation in photonic crystal Multimode Interference waveguides using time domain in beam-propagation method"

This paper presents an efficient technique for simulation of time-domain pulse propagation of Multimode Interference waveguides in two-dimensional electromagnetic band gap (EBG) structures. Photonic Band Gap (or Electromagnetic Band Gap) and frequency-selective structures will be widely applied to the various (sub) millimeter and Terahertz components such as compact and low-loss filters, directional coupler and power divider. 2D photonic crystal multimode interference devices having a square/triangular lattice pattern of periodic air holes in a planar dielectric slab are numerically considered. ADIM-based TD-BPM with Padé(1, 1) approximation will be discussed through numerical examples in (1 times N) MMI circuits with photonic crystal structures. A good equivalent model is applied to analysis the designed structures on the basis of multimode interference effect and self-imaging principle. [C437]

"A 3.4-6.2 GHz Continuously tunable electrostatic MEMS resonator with quality factor of 460-530"

In this paper we present the first MEMS electrostatically-tunable loaded-cavity resonator that simultaneously achieves a very high continuous tuning range of 6.2 GHz:3.4 GHz (1.8:1) and quality factor of 460-530 in a volume of 18 times 30 times 4 mm³ including the actuation scheme and biasing lines. The operating principle relies on tuning the capacitance of the loaded-cavity by controlling the gap between an electrostatically-actuated membrane and the cavity post underneath it. Particular attention is paid on the fabrication of the tuning mechanism in order to avoid a) quality factor degradation due to the biasing lines and b) hysteresis and creep issues. A single-crystal silicon membrane coated with a thin gold layer is the key to the success of the design. [C438]

"Rigorous computer-aided design of spherical dielectric resonators for wireless non-radiative energy transfer"

In this contribution we address the problem of computer-aided modeling of wireless energy transfer to portable/moveable devices. By using the resonant coupling principle, two (or more) resonators may exchange energy by means of their evanescent fields. We present a new rigorous formulation for studying wireless non-radiative energy links between spherical/hemispherical resonators in free-space. The high Q hemispherical dielectric resonators are fed by coaxial lines or waveguides and the electromagnetic field is expanded in terms of spherical modes. The use of spherical transmission lines provides a rigorous network representation of the problem; moreover the presented approach is numerically very efficient thus permitting parametric investigation of the devices under test. [C439]

"Isolator concept based on ferromagnetic nanowired substrates"

Microwave devices demand nowadays small sizes and broad bandwidth. Ferromagnetic nanowired membranes are ideal candidates for this purpose. Planar, tunable and nonreciprocal devices can be designed with them. Therefore we propose an isolator concept based on such a material. Its principle is based on a nonreciprocal microstrip line. [C440]

"Graphene devices, interconnect and circuits-challenges and opportunities"

Graphene has recently emerged as a serious contender for the post silicon era. Graphene nanoribbon (GNR) devices have similar performance characteristics to carbon nanotube (CNT) ones. However, lithographic patterning methods applied to graphene can avoid the degree of chirality control and alignment issues typical of CNTs, and GNR devices and GNR interconnect can in principle be seamlessly obtained by patterning single graphene sheets, thus leading to monolithically device-interconnect structures. Electrically doped GNR devices in series and in parallel can be used for creating complex GNR FET digital circuits. There are also several important challenges facing the graphene "new world," but many of the difficulties hopefully will have tractable solutions. This paper examines the topic of GNR FET circuit design from a bottom-up theoretical perspective, starting with GNR device and interconnect modeling and simulation, while trying to reconcile theory

with some recent experimental results. [C441]

"Low-order fixed denominator IIR VFD filter design"

A two-stage design method of low-order fixed denominator IIR variable fractional delay (VFD) digital filters is presented in this paper. In the first stage, a set of FIR fractional delay (FD) filters are designed first. Each FIR FD filter design problem is formulated in the peak-constrained weighted least-squares (PCWLS) sense and solved by the projected least-squares (PLS) algorithm. Then, model reduction technique is applied on a time-domain average FIR filter to obtain the fixed denominator. The remaining numerators of the IIR FD filters can be obtained by solving linear equations derived from the orthogonality principle. In the second stage of the design, these FD filter coefficients are to be approximated by polynomial functions of FD. Three sets of filter-examples are given to illustrate the effectiveness of the proposed design method. [C442]

"Convergence behaviors of the fast LMM/Newton algorithm with Gaussian inputs and contaminated Gaussian noise"

This paper studies the convergence behaviors of the fast least mean M-estimate/Newton adaptive filtering algorithm proposed in (Y. Zhou et al., 2004), which is based on the fast LMS/Newton principle and the minimization of an M-estimate function using robust statistics for robust filtering in impulsive noise. By using the Price's theorem and its extension for contaminated Gaussian (CG) noise case, the convergence behaviors of the fast LMM/Newton algorithm with Gaussian inputs and both Gaussian and CG noises are analyzed. Difference equations describing the mean and mean square behaviors of this algorithm and step size bound for ensuring stability are derived. These analytical results reveal the advantages of the fast LMM/Newton algorithm in combating impulsive noise, and they are in good agreement with computer simulation results. [C443]

"Research on detection system of ceramic tile based on image processing"

In order to realize the automatic detection of exterior wall ceramic tile and the automatic classification of the product quality, the exterior wall ceramic tile automatic detection system based on the image acquisition and processing technology is designed. Aiming at the characteristics of small volume, large quantity and random position distribution of tile, the automatic tile detection system based on image acquisition card, PC and PLC is designed, and image processing algorithm of edge enhancement, dynamic finding threshold value and edge extraction is adopted. This paper describes the algorithm of image processing and the method of error calculation, and introduces the mechanical structure and working principle of the system. Practical application shows the high accuracy and efficiency of the detection of ceramic tile of this system, which is applicable to the quality control of production process of ceramic tile. [C444]

"The application of active disturbance rejection control method to tactical missile electro-hydraulic actuator"

Nowadays, electro-hydraulic actuator plays an important role in some modern tactical missiles. High power, great robustness and high tracking precision are the most significant targets for the actuator. However, the dynamics of the electro-hydraulic position servo system are highly nonlinear and have a large extent of model uncertainties, such as tremendous changes in the rudder load and external disturbance torque. So an advanced method of active disturbance rejection control (ADRC) is presented in this paper. Firstly, the general principle and structure of the ADRC strategy are introduced in order to improve the robust performance of the system. Then, a novel ADRC controller is designed for estimating and compensating total disturbance based on the mathematical model of the system. Compared with proportional integral derivative (PID) control, various simulation results show that the ADRC control approach can give faster and accurate response, and enhance the robustness of the system. Therefore, the ADRC control strategy is much superior in dealing with dynamic uncertainties and external disturbance for the electro-hydraulic actuator position servo system. [C445]

"Adaptive control for a class of uncertain chaotic systems with saturation nonlinear input"

The tracking problem for a class of uncertain chaotic systems, with saturation nonlinearity in the input function, is considered in this paper. The proposed design is based on the principle of sliding mode control. The saturation control term of nonlinearity is adopted to minify the adverse effect caused by saturation nonlinear input. Using the extended state observer, all states and unknown nonlinear function of the system can be estimated. The saturated model proposed in the paper is without any constraint condition. From Lyapunov stability theorem, it is proved that the objective can be implemented. Simulation results demonstrate the effectiveness of the proposed method. [C446]

"Development of an embedded control system for magnetorheological fluid damper under impact load"

This research was developed and aimed at an embedded controller to achieve an active variable damping control to magnetorheological fluid damper under impact load. Its character of impact load is firstly analyzed and its working principle of MR damper applied into anti-shock engineering design is also introduced. Then, an impact test has been done by using the developed test rig in order to investigate response time of MR dampers under impact load. Based on the measuring results, some factors effecting time delay of MR damper under impact load are analyzed. And simulation results prove that current response time can be gradually reduced with its resistance increase and can be gradually increased with its equivalent inductance increase, yet its frequency of PWM wave and temperature has little influence on it. Considering its strong nonlinear and uncertainty of a MR damper under impact load, and a large of signal processing and controlling operation, in order to improve its real-time, reliability and stability of control system, an embedded measuring-controlling system based on ARM and DSP processor is designed and developed for its engineering application of semi-active vibration control system. The embedded system design scheme, its each part design and the system software design are all introduced. Finally, experimental results show that the developed embedded system can effectively reduce time delay of MR damper and achieve a good semi-active vibration control effect. [C447]

"Mechanism kinematic system of laser guiding measurement robot technology"

Laser guiding measurement robot (LGMR) technology is based on the measurement method of laser beam moving, spherical mounted retro-reflector (SMR) tracking. It is a key technology to be studied deeply how the robot surmounts the obstacles. This paper describes the research work to mechanism kinematic schemes for laser guiding measurement robot. The working principle was presented firstly and the integral structure of laser guiding measurement robot system was concretely introduced including wheel movement system, optical tracker, and obstacles-surmounted mechanism, etc. Especially the obstacles-surmounted mechanism was studied in the paper. Its motion scheme was given and analyzed deeply. Then the kinematics mathematical model for surmounting obstacle was given. Based on the model, the computer imitation was carried through and the sample robot was designed. Finally, an experiment was carried out to prove the correctness and feasibility of both the obstacles-surmounted mechanism and the measurement. It used a body and stamping parts with an obstacle. And the measurement was taken by laser tracker. The maximum profile error of the measured sheet metal is 0.05 mm. And the experimental results show that the mechanism kinematic schemes are effective to fulfill the movement tasks and the measurement for the body and stamping parts. The research is helpful and important to the optimization and improvement of the robot mechanism. [C448]

"Recognition of infrared spectrum data of coal mine gas based on multiple hyperplanes classifier method"

In light of the limitation of traditional linear searching way, which uses one hyperplane to classify in spectral recognition of coal mine gas, multiple hyperplanes of dendriform classifier method are introduced to classify in this paper, which has the good classifying effect on gas in complicated background environment. This article has introduced the principle of dendriform partition linear classifier, and used the dendriform classifier to do algorithm training and identificating classification. Applying to classify and identify complicated samples of remote sensing infrared spectrum datas of coal mine gas, the experimental results indicated that, in the same numbers of training sample, this method not only has less training iteration than linear classification, but also the weights calculated by it have better examination results than linear classification for the whole examination datas. [C449]

"Application of fuzzy pattern recognition in felting quality ultrasonic detection of composite material"

Base on the signal of composite material felting quality in ultrasonic detection, the detection principle of ultrasonic pulse reflection echo method and the transmitting process of ultrasonic in two types of medium that is made by different material are analyzed in detail. Echo signal of detection ultrasonic carries the information of interface felting quality. The fuzzy pattern recognition method is used for felting quality recognition in this paper. By analyzing the characteristic of time and frequency domain of echo signal, attenuation coefficient, signal energy and amplitudes are calculated as characteristic values, and a fuzzy pattern recognition algorithm is designed to judge felting quality by the principle of choosing the nearest. Experimental results show that the algorithm is precise for recognition of felting quality. [C450]

"Study on the magnetostrictive actuator of dual pressure common rail system"

The configuration and working principle of dual pressure common rail system (DPCRS) were introduced. In order to promote the performance of the DPCRS, a magnetostrictive actuator was designed. The finite element model of the actuator's magnetic field was built up, the influence of control rod material on the distributing of the

magnetic field was calculated, then experiment study was done. The results proved that the relative permeability of the actuator's control rod should be smaller than that of the magnetostrictive material to avoid the magnetic flux be short., The magnetostrictive actuator has the characteristics of quick response, great output force, convenient drive. [C451]

"Development of wide band AC measurement device with high accuracy"

The working principle and design method of wide range and wide band alternate current measurement device are introduced in this paper. In this device, two-stage current transformer is used as a shunt to solve the problem of large current input, non-inverting composite amplifier technology is employed to improve the accuracy of amplified audio signal, the log and anti-log amplifiers are adopted to perform true rms conversion, and ultra-linearity A/D converter LTC2400 is used to implement digital sampling. Moreover, moving average filtering technology, frequency compensation technology and photoelectric isolation technology are used to improve the reliability and stability of measurement system readings. Experimental results demonstrate that the accuracy of measured frequency is in excess to 0.02% for the frequencies from 45 Hz to 65 Hz, and the linearity of measurement can reach 0.025% for the frequencies from 50 Hz to 10 kHz based on basic range of 2 A. [C452]

"Fast optimizing parameters algorithm for least squares support vector machine based on artificial immune algorithm"

When Least Squares Support Vector Machine (LS-SVM) is used to classify on large datasets, training samples to get the optimal model parameters is a time-consuming and memory consumption process. To reduce training time and computational complexity, we develop a novel algorithm for selecting LS-SVM meta-parameter values based on ideas from principle of artificial immune. By analyzing LS-SVM parameters on the classification accuracy, we find there are many parameters combinations that make the same classification accuracy; What's more, once one of the parameters fixed and the other changes in a certain range, their combinations do not affect the classification accuracy. We regard LS-SVM parameters as antibody genes and design reasonable coding scheme for them. Then we employ artificial immune algorithm to search the optimal model parameters of LS-SVM. We provide experiments to demonstrate the performance of LS-SVM. Results show that the proposed algorithm greatly enhances parameters optimizing efficiency while keeping the approximately same classification accuracy with the some other existent methods such as multi-fold cross-validation and grid-search. [C453]

"Design of a non-contact on-line moisture measurement system"

At present, microwave technology is one of the most advanced on-line measurement methods. The mechanism between water and microwave as well as the principle of microwave moisture measurement is discussed in this paper. Besides, the hardware and software design of the system is also introduced; but more important, the microprocessor-based data processing that bases on ARM9 and the realization of network transmission function are being focused on. [C454]

"Slow switching adaptive model inversion control of helicopter"

Dealing with the deficiency in traditional adaptive model inversion control scheme of helicopter, we propose the slow switching AMIC scheme based on multiple points inversion models group and also give the asymptotic stability condition for the flight control system. In this scheme, multiple points inversion models group was constructed to replace the single point inversion model which is used in traditional scheme. The attitude error control system could be transformed into linear switched system, and then attitude adaptive control could be achieved via slow switching. Instead of compensating global inversion error caused by single point inversion model, the adaptive element used here, which was designed based on immune feedback principle, only needed to compensate local inversion error nearby current state point caused by multiple points inversion models group. Therefore, the burden of adaptive element could be greatly alleviated and controller robustness could also be promoted. Simulation results show superiorities of the proposed scheme. Good control performance and strong robustness are demonstrated. [C455]

"Research on ultrasonic phased array system for automatic defect detection of pipeline girth welds"

Traditional ultrasonic testing system has fixed focus, which is burdensome for layer inspection of welds because different layer needs different steering angle and focus ultrasonic beam to inspect. Ultrasonic phased array testing instrument can electronically steer and focus the transmission ultrasonic beams. This ability makes it very advantageous in automatic nondestructive testing in industrial field. In this article, an automatic flaw detection method on pipeline girth welds is researched and the ultrasonic phased array testing instrument is developed. Firstly, flaw detection principle of ultrasonic phased array system on girth welds and the mathematical model of the linear phased array transducer are exposed, which are basis of delay control in hardware design. Then,

multi-channel acquisition system, connected to the linear ultrasonic phased array transducer is described. The hardware of single acoustic channel and the signal processing are introduced. Precise delay control of each element in the transducer is realized. Experiment results validate the good performances of ultrasonic transmission and echo composition capabilities of the system. It can be extended to automatic flaw inspection in other relative industrial fields. [C456]

"Study on underwater navigation system based on geomagnetic match technique"

Underwater vehicle navigation technique is one of the important issues to the development and application of the long-range underwater vehicle technology. In order to meet the concealment of underwater navigation, we present a kind of independent underwater navigation system based on geomagnetic match technique in this paper. Firstly, we introduce the composition of the system, the work principles and functions of each component. In the whole system, the navigation algorithm is the core. Therefore, we study two match navigation algorithms, which are the terrain contour matching (TERCOM) and the iterated closest contour point (ICCP). Based on above researches, we design the system of underwater geomagnetic navigation. The system is tested and proved by actual experiments. The results show that the system of underwater geomagnetic matching navigation is accurate and credible. Some suggestions are also given finally. [C457]

"Study on Dynamic Collimating and Detecting Method for Code-Bar Grade Rod"

Photoelectric collimating and detecting principle to stripe edge on code-bar invar grade rod was analyzed in this paper. A "???" shape slit aperture was designed, and differential signals to collimate and detect stripe edge were constructed, which were used to dynamically generate collimating signal to stripe edge. Meanwhile, it is robust to the interference of noise. Using the collimating system with "Sj" shape slit aperture to collimate and detect grade rod stripe edge dynamically, experiment result shows that repetition error is less than 2 μm , which provides an effective method for collimating and detecting code-bar invar grade rod. [C458]

"A Measurement of Geometry Parameters in Large-Scale Pipes"

This paper presents a non-contact automatic measurement system on geometry parameters in large-scale pipes based on laser displacement sensor. It resorts to the precise laser displacement technology, inside and outside dimension measurement, servocontrol technology and accurate signal procession, designs a testing system which can measure inside and outside diameter, roundness and other shape parameters. The system composing and principle are presented. The system error calibration and measurement precision are put forward. This system is validated by experiments. The system presented in this paper is adaptive to multi-parameter test for large-scale pipes and any other kinds of pipes. [C459]

"Fiber Bragg Grating Sensor with a Simple Demodulation Method"

Principle, structure design, and experimental setup of a fiber Bragg grating (FBG) sensor with a simple signal detection method for demodulation of resonance wavelength shift of the FBG are introduced, which uses a cascade self-demodulated fiber Bragg grating pair attached respectively on the upper and lower surface of a pendulum-type cantilever element instead of a twice reflection FBG pair structure for both parameter sensing and wavelength shift signal demodulating. In addition, cross-sensitivity effect of FBG-based sensor automatically solved due to a differential signal process method. With this demodulation method, current, and vibration measurement experiments are carried out. Experimental results indicate that current measurement error of plusmn1 mA can be obtained within the whole range from 0 to 400 mA, vibration measurement are also obtained based on the present experiment setup. [C460]

"Design on Driving and Control System of Step Motor in the Laser Quality Analyzing System"

The measuring principle of laser beam quality analyzer was introduced and described in detail in the paper, which also discussed the step motor control system's action in the system. It was shown how to choose the type of motor according to the application circumstance and parameters. In order to make sure the position of sampling points for the charge couple device, the paper used AVR single-chip microcomputer whose model number is Mega16L as the central processing unit, chose high rotation torque step motor whose model number is 42BYG1.8 produced by the company called AKS as executive body to control the ball screw to make one-dimension rectilinear motion. Experiments showed that the system's locating precision satisfied the testing demand; the error caused by the step motor was less than 0.03%. System designed by the paper had characteristics such as smooth running and high reliability. [C461]

"SNP Genotyping by Gel-Immobilized RCA Product and Biolumometric Assay Coupled with Allele-

Specific Primer Extension Reaction"

A novel approach with the dual-specificity and dual-amplification for detecting the known single nucleotide variation was reported in this study. In the approach, a pair of padlock probes is specifically designed for single base variant, and the padlock probe can be circularized by the DNA ligase when its 3' end matches the variant. The circularized probe can be amplified by rolling circle amplification (RCA) with a 5'-terminal acrylamide-modified primer. Then the RCA products are immobilized on three dimension (3-D) polyacrylamide gel by copolymerizing with acrylamide monomer. Following this step, a pair of allele-specific primers, which contain different bases in 3' end, is respectively hybridized with the RCA products for conducting the extension reactions: a powerful light signal is produced if the allele-specific primer is complementary to the RCA products since a large number of bases extend in the extension reaction, but no light emitted when the allele-specific primer does not match the template. Thus, the information of the DNA sequence variants is translated into the "on-off" light signal amplification. The principle experimental results show this method is feasible with high specificity. The approach may be used for many critical researches and diagnostic applications, which focus on the high specificity and sensitivity to detect single nucleotide variations. [C462]

"Design of High-Stability Driver for White LED"

The driving technology is a very important factor influencing the output performances of white LED (WLED). This paper proposes a kind of high-stability driver for WLED based on constant-current and constant-luminance. The working characteristics of WLED and the principle of driving WLED are introduced in this paper. The newly designed driver works in a mode of constant current LDO and it is feedback controlled by the output of WLED to obtain highly stable luminance. Finally, a test circuit is set up to validate the proposed scheme and some experiments are carried out. The results show that the driving current maintains nearly constant and the luminance of WLED is of high accuracy. [C463]

"Spectrum Endoscope System"

Considered as one of the most widely used medical instrument, electronic endoscope has become a powerful tool in cancer diagnosis and treatment. However, conventional endoscope that works in direct observation mode is difficult to distinguish tissue with potential cancer from normal tissue. To solve this problem, we developed a spectrum endoscope. This system uses the principle that different wavelength of light could strengthen the differences in physiological characteristics of tissue, which could be reflected by means of images. This spectrum endoscope system has not only all features of conventional endoscope system, but also the diagnostic capacity using the specific wavelength for observation. The system can also conduct spectrum estimation using Weiner estimation method. In the design of the system, several critical means were used to accelerate the imaging processing speed. The imaging results show that this spectrum endoscope system has a better image compared to the conventional endoscope. [C464]

"Research on design and technology of ultrasonic flow measurement system"

The ultrasonic flow measurement system measures the propagation time difference in opposite directions on a fixed way to calculate the flow speed. The system uses chip C8051F020 as the core, which has powerful functions in controlling, sampling and calculating, and can accomplish the control of ultrasonic impulse receiving/sending, time difference judgment and data process. The measurement system improves the sensitivity and reliability greatly. After the principle and method of the measurement system are analyzed, the design ideas and hardware circuit of the system are provided in the paper. The measurement system can be widely used in industry, agriculture and environment observation fields. [C465]

"Fitting and reconstruction of three-dimensional curve based on orthogonal curvature"

Taking the active monitoring survey for the configuration of higher performance crafts as the research background and the flexible rod based on the fiber Bragg grating sensor Array as a model for the experiment, a fitting and reconstruction method for three dimensional space curve based on the orthogonal curvature is researched and analyzed in this paper. After giving a sketch of the curvature detection principle of the orthogonal distributed fiber Bragg grating as well as analyzing and constructing of the moving coordinate system for the space curve from the view of differential geometry, fitting and reconstruction method for three-dimensional curve is analyzed with detailed algorithm processes and implementation steps, meanwhile, approaches making discrete curvature continuous is presented and analyzed in this paper. With Visual C++ and OpenGL, a visual simulation platform for analyzing and verifying the method and processes of the algorithm is developed. In addition, effects comparison of the graphical reconstruction for the shape of space curves made up by different curvature simulation data is presented on the basis of three types of method making discrete curvature continuous. Simulation results not only verify the efficiency of the reconstruction method and the experimental

processes, but also obtain the related beneficial results about discrete curvature continuous methods. [C466]

"Design of a high-speed spectral signal processing system with a floating-point DSP for FTIR spectrometer"

A novel Spectral Signal Processing System (SSPS), which uses a high-speed floating-point digital signal processor (DSP) as its central processor, is presented in this paper. This system is used in Fourier transform infrared (FTIR) spectrometer. The basic working principle of SSPS is briefly introduced. The design solutions and the architecture of hardware platform, including signal processing block, data transmission block, and memory part, are described in the paper. The principle and implementation of each crucial device chosen for SSPS, such as DSP, dual-port RAM, Complex Programmable Logic Device (CPLD), etc, are described in detail. For software design, three steps of signal processing methods are proposed based on the characteristic of FTIR spectrometer. Then, the paper describes how to program the software in C language and assembly language, and compile it to the code that can be used by DSP. In the last part, an application of the SSPS module used in a FTIR spectrometer is shown. [C467]

"Carbon Monoxide Gas Sensor Based on Cavity Enhanced Absorption Spectroscopy and Harmonic Detection"

A fiber carbon monoxide gas sensor was reported in this paper. Due to CO has a much weaker absorption in near infrared region, the harmonic detection technique is combined with cavity enhanced absorption spectroscopy (CEAS). The basic principle of harmonic detection technique and cavity enhanced absorption spectroscopy are expatiated at first. We designed the experiment scheme and analyzed the key problem in the experiment. The second harmonic signals were extracted at different CO concentration and we fit the amplitude of the second harmonic and corresponding CO concentration. The experiment results indicated that the amplitude of second harmonic and CO concentration have a good linearity relationship. A sensitivity of about 10 ppm has been achieved with this measurement. [C468]

"Study on High Voltage Parameters Online Measurement Technology Based on Sealed Photoelectric Sensor System"

In summary, there are two main issues facing high voltage parameter online measurement: obtaining of high-voltage side working power, and signal transmission between high and low voltage. To resolve these issues, we propose and design the high voltage parameter online measurement sensor system whose light source and light signal transmission is based on a sealed space. The sensor system contains high-voltage side power supply system and signal measurement and transmission system that are sealed inside a layer insulator. The sealed light source and signal transmission makes sure the high efficiency and reliability of power source at high-voltage side signal sampling and processing circus. It also guarantees the safety, reliability and accuracy of signal transmission. This article introduces the working principle, the structure and the design of the sensor system. [C469]

"Study on Setting Depth Farming System Based on Laser Technology"

Farming is an important component of the agronomic, setting depth tillage is an important aspect of precision agriculture. In this paper, a set of deep tillage system was designed through the use of laser technology, hydraulic technology and control technology. Thesis studied about the working principle of deep farming system, the working principle, information flows of laser, hydraulic and control circuit and the relationship among them. Experiments show that the system has good consistency of deep tillage and is easy to operate. [C470]

"Research on Minitype Pulsed Power Supply Circuit of LD Based on the Target Identification"

Pointing to the laser test and target identification, a minitype high peak and narrow width pulsed power supply of LD is designed, which based on the charging-discharging principle of capacitors and triggered by CPLD. In this circuit, pulse plastic and power amplifier are made of high speed dual MOSFET driver MC33152 and VOMS. Some of parameter in the circuit emulated by PSPICE, the result of emulation coincides with the experiment. [C471]

"Notice of Violation of IEEE Publication Principles Automatic Parallel Parking of RC Car Using Distance Sensors"

Notice of Violation of IEEE Publication Principles "Automatic Parallel Parking of RC Car Using Distance Sensors" by Baoping Xiao, Chang Xu and Lijun Xu in the Proceedings of the 2009 Second International

Conference on Future Information Technology and Management Engineering, December 2009 After careful and considered review of the content and authorship of this paper by a duly constituted expert committee, this paper has been found to be in violation of IEEE's Publication Principles. This paper is a near verbatim copy of the work cited below. The original text and figures were copied without attribution (including appropriate references to the original author(s) and/or paper title) and without permission. Due to the nature of this violation, reasonable effort should be made to remove all past references to this paper, and future references should be made to the following article: "Autonomous Parking RC Car" by Arjun Nagappan and Arjun Prakash, as a Final Project: Designing with Microcontrollers, Cornell University, School of Electrical and Computing Engineering, http://courses.cit.cornell.edu/ee476/FinalProjects/s2009/asn28_asp36/FinalProjectReport/index.html, Spring 2009 A RC car that can identify a parking space and parallel park by itself is created. The RC car drives down a street searching for a parking space to its right using several distance sensors. When the car has identified a space, the car checks to see whether that space is large enough to park in. If it determines that there is sufficient space, the car will begin parallel parking into that space. It uses information from sensors placed on the front, right, and rear of the car to direct the car into the parking space. Once the car has parked, it will remain in that position until it is reset. [C472]

"Novel multimode fibre-cavity for ring-down experiments"

A novel fibre-cavity design based on highly reflective gold coatings, vapor-deposited to the two end faces of a 400 μm multimode waveguide, is presented. In contrast to common passive fibre-cavity approaches, the laser pulses are not coupled through the reflective coatings into the cavity but through a micro hole in one of the fibre end faces, which reduces the coupling losses from generally almost 100% to less than 1%. An OTDR-graph is presented as proof of principle and the influence of the cross section ratio of the remaining reflective area after milling and the overall fibre core cross section is theoretically evaluated. [C473]

"Biomimetic sensors for the heavy metal detection"

Specific interactions between heavy metal ions and biomaterials have advantages in the sensitive and selective detection of the metal ions. In this study, Cu-demetallated form of Cu/Zn-superoxide dismutase (SOD1) protein was applied as a sensing probe in order to detect Cu(II) ions selectively via surface plasmon resonance (SPR) analysis. Because demetallated metalloproteins have vacant specific metal-binding sites in their own structures, Cu-demetallated SOD1 protein can successfully form stable complex with Cu(II) ion. By applying the properties as a sensing principle, we designed the Cu(II)-selective sensor chip with Cu-demetallated SOD1 protein. When Cu(II) ions were exposed to the fabricated sensor chips, their interaction was quantitatively measured via SPR analysis, and it was proportional to the concentrations of Cu(II) ions. This result reveals successful development of biosensor for the label-free selective detection of Cu(II) ions. [C474]

"Notice of Violation of IEEE Publication Principles An Ultrasonic Positioning Control System for Snake Arm"

Notice of Violation of IEEE Publication Principles" An Ultrasonic Positioning Control System for Snake Arm "by Baoping Xiao and Chang Xu in the Proceedings of the 2009 Second International Conference on Future Information Technology and Management Engineering, December 2009 After careful and considered review of the content and authorship of this paper by a duly constituted expert committee, this paper has been found to be in violation of IEEE's Publication Principles. This paper is a near verbatim copy of the work cited below. The original text and figures were copied without attribution (including appropriate references to the original author(s) and/or paper title) and without permission. Due to the nature of this violation, reasonable effort should be made to remove all past references to this paper, and future references should be made to the following article: "Snake Arm Ultrasonic Positioning Control System "by Mitchell Kotler and John Penning, as a Final Project: Designing with Microcontrollers, Cornell University, School of Electrical and Computing Engineering, <http://courses.cit.cornell.edu/ee476/FinalProjects/s2006/mjk64jdp45/mjk64jdp45/index.html>, Spring 2006 A base and glove pair that triangulates the position of the glove in 3D space using ultrasonic pulses is put forward in order to use as a control system for the CU Snake Arm. By having three points on a base, the system calculates position by the distance from each point on the base to the glove. These distances are found by the time it takes for the ultrasonic pulse to get to each point and multiplying by the speed of sound. Then by sending position coordinates over the serial port, it is theoretically able to, and will eventually, control the arm using 3D reverse kinematics code that the CS subteam is working on. This code allows input in positions to be converted to motor commands that puts the arm into the desired position, with the "head" of the arm at the point corresponding to the glove's position. This goal was just to track position and allow the program on the computer to calculate how to get to that position. [C475]

"Electronics for the post-silicon CMOS era...challenges and opportunities"

Summary form only given: As we try to extend silicon-based CMOS devices towards end of the ITRS roadmap and beyond, we are confronted with several challenges that need to be mitigated with clever design, modeling and experimentation-challenges arising from electrostatic effects such as diminishing gate control, quantum effects such as tunneling and interfering waves, atomistic effects such as dopant fluctuations, many-body effects such as strong Coulomb blockade and temporal effects such as low frequency noise from traps and defects. I will discuss some routes towards a postCMOS switch the device and circuit-level possibilities arising from new materials such as organic molecules and graphene nanoribbons, as well as novel principles such as mechanical switching, non-equilibrium switching and spintronic switching. [C476]

"Investigation of vertical scaling on breakdown voltage and presentation of analytical model for electric field distribution in SOI RESURF LDMOSFETs"

Achieving a high breakdown voltage on relatively SOI active layers has been a major concern in the last few years. To address this issue, the reduced surface field (RESURF) principle has been extended to SOI power devices, which are designed to sustain high voltage. In this paper, the effect of vertical scaling on breakdown voltage of Silicon on Insulator Reduce Surface Field Lateral Double-diffused MOSFET (SOI RESURF LDMOSFETs) is investigated. Furthermore, a compact model is presented which is useful for understanding breakdown mechanism at limiting case of ultra-thin-film as well as ultra-thick-film SOI MOSFET's. Two-dimensional simulations verify this model. [C477]

"A Design and Implementation of High-Speed 3DES Algorithm System"

This paper introduces the principle of 3DES encryption algorithm and the detailed description of the algorithm design and implementation on FPGA. For the improvement of the S-box, it uses a single S-box to replace the original eight S-boxes. This will not only greatly reduces the size of circuit but also reduces the power consumption of the entire circuit. In the design, pipelining technology is used to improve its running speed. All the modules are using Verilog HDL hardware description language to achieve, and at last it is downloaded to the FPGA chip. [C478]

"Sensitive in plane motion detection of NEMS through semiconducting (p+) piezoresistive gauge transducers"

We present a novel design for nano-electromechanical systems (NEMS) in plane motion detection using suspended Si (p+) doped piezoresistive nanowire gauge transducers. The devices are electrostatically actuated by a lateral electrode and detected through piezoresistive transduction using a synchronous down-mixing principle. This geometry enables a first order piezoresistive detection with the suspended gauges acting as strain collectors. The two piezoresistive gauges used in balanced bridge configuration offer remarkable background reduction. Maximizing the strain on the gauges and reducing the background resulted in a highly efficient NEMS motion detection technique providing unprecedented signal to background ratio (SBR) of 60 dB with 40 dB improvement on the state of the art. These devices were fabricated using CMOS compatible processes enabling very large scale integration and mass production. [C479]

"Robust designed capacitive gas pressure sensor for harsh environment"

In this study, a gas pressure sensing device based on stainless steel diaphragm and titanium substrate for use at harsh environment is presented. To illustrate these principles, array type capacitive gas pressure sensors based on a stainless steel and titanium have been designed and fabricated. For the fabrication of the sensor, both of bulk and surface micromachined techniques are used with conventional machining fabrication. As results, characteristics of the fabricated gas pressure sensor are estimated in terms of diaphragm deflection and capacitance change by external pressure. as illustrated by the portions given in this document. [C480]

"Evaluation of microelectromechanical devices for DC and RF voltage measurements"

Novel sensors for electrical DC and RF voltage measurements employing the principle of electrostatic force are presented. Microelectromechanical devices have been developed, fabricated and optimized, which are based on multiple capacitances with a common movable electrode. By applying a voltage to one capacitance, a force is generated which is translated into mechanical motion, eventually balanced by the mechanical spring counterforce of the suspension. Operating the device at frequencies above mechanical resonance allows the RMS value of the signal to be measured, supplementing conventional methods. For DC and RF voltage excitation, the resolution has been enhanced to be better than 0.1%. The usable frequency range has been extended beyond 10 Megahertz at RMS voltage levels of less than six volts. Furthermore, a model applied for dimensioning the sensors is presented focusing on high-frequency metrology aspects. By evaluating the frequency dependence of

the design parameters, predictions of the measurement range and resolution of the final structures can be made. [C481]

"Design and fabrication of a hollow micro-disk mass sensor"

In this paper, a novel hollow micro-disk mass sensor based on mode generation and degeneration principle is presented, which has the advantages of self-compensating environmental fluctuation and eliminating viscous damping as vacuum packaged. The device configuration, including the width of support beams, the channel height and the allocation of the sensing piezoresistors are carefully analyzed and then designed to achieve better sensitivity. Using a double sacrificial layer process along with DRIE, the sensor was successfully fabricated and the preliminary test has been accomplished. [C482]

"Electromagnetic membrane-pump with an integrated magnetic yoke"

Micro fluidics is a fast developing research area and is of interest to many scientific groups. Within microfluidic systems micro pumps transport the fluid to different functional areas of a so called Lab-on-a-chip. Up to now electro-magnetically actuated microfluidic pumps make no use of an essential part of electromagnetic systems: A highly permeable core which leads the magnetic flux and lowers the magnetic resistance. Utilizing the magnetic force which tends to minimize the reluctance of a magnetic system a magnetic actuator was achieved. Another common principle for directing laminar fluid flows, nozzle and diffuser geometries, was simulated and the optimal geometry for different Reynolds numbers was evaluated. The combination of these two improvements allows for a bubble resistive magnetic-reluctance micro-pump with an integrated membrane-like magnetic yoke, which was modeled, fabricated utilizing a simple single layer thin film technology, and tested. The realized device features high pumping forces to actuate viscous fluids, high pumping frequencies (565 Hz and multiples thereof) for a continuous flow and low power consumption. In our contribution we discuss the device design, the underlying theory and first experimental results. [C483]

"A low-loss MEMS tunable capacitor with movable dielectric"

This paper reports a MEMS tunable capacitor with a new actuation principle. The new design adopts electrostatic actuation of an electrically floating movable dielectric. This enables us to achieve a high Q factor by eliminating the loss associated with springs in the RF signal path. Also, the design can achieve a high tuning range, by using additional actuation combs and thus eliminating the pull-in effect. Since no DC bias is applied on the plates of variable capacitor, the parallel plates 1/3 gap limitation does not apply. The designed devices were fabricated in a SOI MEMS process, with a 25 μm thick device layer and minimum gap of 2 μm . Measurement results show that the tunable capacitor has a 135 fF initial capacitance with a tuning range of 367% and a Q factor of 56 at 1 GHz by bidirectional actuation. [C484]

"Temperature and pressure monitoring of a whipped cream device"

This paper presents a prototype of a wireless temperature and/or pressure sensor designed for operation inside a thermal insulating double-walled steel vessel. This is achieved by means of a passive (semi-active) radio frequency identification (RFID) transponder which obtains the energy required for its operation from a super low frequency (SLF) external field. The measured temperature and/or pressure data is encoded in the frequency domain (very low frequency range) by means of a digital inverter oscillator and transmitted to a reader coil outside the vessel by load modulation of the power-supplying external field. In previous work, wireless powering and data transmission of a capacitive fill level measurement through a single steel wall had been successfully realized. As the feasibility of data transmission through two distant steel walls has been shown, passive sensors for multiple process measurands (e.g. temperature, pressure and/or fill level) in hermetically sealed vessels can be implemented using this principle. [C485]

"Synchronous Detonation Control Technique on Rocket Based on Induction Setting"

Taking the breaking obstacle warfare as background, according to the maximum delay time and the error of synchronous detonation of rocket, based on the dynamic setter system with a unified timing starting point, it is discussed the working principle of the muzzle inductive setting system, and the transmission principle of the setting data is analyzed, then coding and decoding principle of the grouping pulse are designed, furthermore the circuit of grouping pulse encoding and the scheme of decoding are given, which would improve the broken-barrier ability of the rocket. [C486]

"Research of Full Digital DC/DC Converter Based on DSP"

In order to solve the problems in phase shifting full bridge ZVS PWM DC/DC converter basic structure like

lagging bridge arm ZVS range is narrow, duty cycle losses as well as secondary rectification diode shutdown voltage peaking and oscillations and other problems, this article proposed one kind of original sideband clamp diode phase shifting full bridge ZVS DC/DC converter, has given the main circuit structure, elaborated the converter working principle and the parameter suppose principle, proposed the voltage, the electric current double shut the control plan, has studied the digitized DC/DC converter realization, and uses TMS320LF2407A to take the controller, has designed the converter numerical control system, finally has carried on the experiment, has given the experimental waveform, explained the correctness of correlation theories. [C487]

"Application of Genetic Algorithm to Design of Shock Isolator with Minimum Settling Time"

Shock isolator with minimum settling time (SIMST) is a vital device in military and civil use. At present, the design of SIMST draws a lot of attention. Because one of the indexes of SIMST is time variable other than state variable, there is no computation method given so far, and the design of SIMST mainly depends on experiments. In this paper, genetic algorithm is applied to the design. The genetic algorithm exhibits desirable properties in the complex search of Pareto set of SIMST parameters, and the solution is accurate by verification. Some important characteristics and design principles of SIMST are revealed for the first time in this paper. [C488]

"Design of Intelligent Protection Device for Mineral Motor Based on DSP"

Based on analyzing the four kinds of faults (over-load, short-circuit, open-phase and electrical leakage) with their characteristics and studying protection principle of mineral motor, the design scheme of intelligent and synthetic protection device using DSP as the chief chip is presented. According to the requirements of system operation, hardware circuits including leakage protection and voltage generation was given, the algorithm analysis for data acquisition processing was discussed in detail and the experiments of over-load, short-circuit, open-phase and leakage protection were examined. The experiment results show that the hardware circuits and software algorithm realize the design requirements of mineral motor. [C489]

"Parameters Optimization Method for Human-Simulated Intelligent Controller Based on Immune Theory"

To solve the problems of parametric optimization for human simulated intelligent controller (HSIC) in complicated controlled plant. Inspired by biology immune system, the paper presents a novel parameter optimization method for HSIC based on immune theory, which is termed as IHSIC. Firstly, the design process of HSIC controller have been discussed, secondly, antibody, antigen and affinity of the parameter optimization problem were defined, then, the process of parameter tuning based on immune principles was discussed in detail. The simulation experiments show that the control effect of IHSIC is much better than proportional-integral-derivative (PID) controller, and it is suitable to solve the puzzle of complicated controlled plant. [C490]

"A Three-dimensional Measurement System Design Based on Projection Grating"

Reverse engineering digitizes the products (physical model or prototype) and uses the CAD system to get CAD model of the product in accordance with the design and manufacture of specific binding, finally gives birth to the product or new products which are defined by the model. This paper introduces the principle of reverse engineering to design a three-dimensional measurement system based on the raster projection. The article also presents the metrical principles, hardware architecture and software of the system, and a result is provided at the end. [C491]

"Study on Stiffness Modeling and Performance of Spatial Rotation 4-SPS-S Parallel Robot Mechanism"

The paper focuses on a spatial rotation three Degree of Freedom (DOF) 4-SPS-S parallel robot mechanism, which has four SPS Active Legs and one passive constraining leg. The geometric model of the parallel robot mechanism is introduced, and then velocity mapping equation and Jacobian matrix for the robot mechanism are developed. Based on principle of virtual work and sub-structure synthesis method, taking into full consideration the compliancy of driving pairs and transferring components, flexibility of constraining chains and minute deformation of joints, stiffness matrix model is established for the mechanism. And then the square root of eigenvalues of KTK matrix is defined as stiffness performance indexes, and take it as a criteria to judge stiffness performance of the manipulator. With a case study, Simulation analysis is conducted to explore distribution rules of how stiffness changes are linked with pose changes in workspace. Results show that the proposed robot mechanism has good stiffness and significant implication in engineering application. This paper provides theoretical foundations for engineering design and application for this class of parallel robot mechanism. [C492]

"Performance monitoring on the orthogonality among the multi-subcarriers of an all-optical OFDM system"

In this paper, all-optical OFDM transmitter and receiver with 5420Gbit/s were simulated. We have analysed the principle of orthonogonal carrier generation, and obtained the optimal configuration for two, three and five orthonogonal carriers. Through designing proper system parameters, the clearly eye diagrams were obtained. The BER curves of five orthonogonal signals were detected. [C493]

"Designing new-generation network-overview of AKARI Architecture Design -"

AKARI Architecture Design Project was launched May 2006, in order to deliver blueprint of new-generation network. We address AKARI's new-generation network architecture design. We show design principles consisting of crystal synthesis, reality connection, and sustainable & evolutionary principles. We also describe principle-oriented component technologies such as optical packet/path integrated network. [C494]

"Eight-channel wavelength division demultiplexer using multimode interference"

We present a new design of wavelength division demultiplexer based on self-imaging principle in the multimode interference (MMI) structure. To the best of our knowledge, this work presented for the first time in MMI structure with almost 5nm channel spacing and 2451 average quality factor in the telecommunication range. The beam propagation method is used for simulation of this device. [C495]

"All-optical regeneration"

All-optical regeneration principles and design guidelines for building all-optical regenerators are discussed. In this paper 2R regeneration is introduced as a concept where a multitude of frequency components are generated in a nonlinear media and where subsequent proper filtering provides the desired regeneration. [C496]

"Research on Performance Optimization and Implementation of Oracle Database"

Oracle is the most widely used large-scale database in business society at present, and its performance influences the efficiency of application directly. This paper starts with basic principles of performance optimization of database, then presents some optimize technologies in two phases of database running. Experimental results show that: the database optimization can improve the disposing performance of the database and also decrease the client response time. [C497]

"Application of Design Patterns to Control System of Digital Photofinishing Machine"

In order to improve the performance and robustness of control software used in digital photo printing, we developed a software structure by using design patterns from the software engineering view. The working principle of digital photo printing is described. By analyzing the design of control software used in digital photofinishing machine, the application method of state pattern and singleton pattern in work flow management and exception handle are expounded. Testing run on a commercial photofinishing machine indicates the control system is flexible and has good performance. [C498]

"Notice of Violation of IEEE Publication PrinciplesThe Design of Multi-agent System in IDAPS Microgrid"

Notice of Violation of IEEE Publication Principles "The Design of Multi-agent System in IDAPS Microgrid" by DeJia Shi, Li Wang, Jing He. in the Proceedings of the International Asia Symposium on Intelligent Interaction and Affective Computing, 2009. ASIA '09, pp. 63-66 After careful and considered review of the content and authorship of this paper by a duly constituted expert committee, this paper has been found to be in violation of IEEE's Publication Principles. This paper contains significant portions of original text from the papers cited below. The original text was copied without attribution (including appropriate references to the original author(s) and/or paper titles) and without permission. Due to the nature of this violation, reasonable effort should be made to remove all past references to this paper, and future references should be made to the following articles: "Issues in Integrating Existing Multi-agent Systems for Power Engineering Applications", by V. M. Catterson, E. M. Davidson, S. D. J. McArthur. in the Proceedings of the 13th International Conference on Intelligent Systems Application to Power Systems, 2005. Nov. 2005 "Multi-agent Systems in a Distributed Smart Grid: Design and Implementation", by M. Pipattanasomporn, H. Feroze, and S. Rahman, in the Proceedings of the IEEE/PES Power Systems Conference and Exposition, 2009. PSCE '09., pp. 1-8, March 2009 In this paper we propose the integration of Condition Monitoring Multi-agent System and Protection Engineering Diagnostic Agents to build a multi-agent system for Intelligent Distributed Autonomous Power System. By the mean we can offer enhanced

decision support to engineers tasked with managing transformer assets. By means of offering interpreted data related to condition monitoring and IDAPS Microgrid, the proposed integrated system can provide technicians a better comprehensive for the health of the power system. The integration of Condition Monitoring Multi-agent System and Protection Engineering Diagnostic Agents as Multi-agent System in IDAPS Micro grid can solve the issues inherent to the inter-operation of existing multi-agent systems. Especially, the problems surround the use of different ontology. We think that these problems can be settled by widespread deployment of MAS technology within the power industry. This paper presents research undertaken to integrate the two MAS to build a new system to deal with ontology issues. [C499]

"Mg-IV-V chalcopyrites in thin film tandem photovoltaic cells"

Tandem cells made out II-IV-V chalcopyrites consisting of alloys and compounds of $(\text{Mg,Zn,Cd})(\text{Si,Ge,Sn})(\text{P,As})_2$ are a unique set of candidate materials, that can potentially be optimal for solar cell design. While the Zn- and Cd- based compounds have all been synthesized, little is known about the Mg compounds. We analyze the energy band structure theoretically using a recently developed Quasiparticle Self-consistent GW theory, which enables us to accurately address the electronic structure from first principles. [C500]

"The physical limits of light trapping in thin-films and photonic structures that operate at the limit"

Light-trapping is used in photovoltaic cells to increase the power conversion efficiency and lower the cost by reducing the amount of active material required to efficiently absorb sunlight. In the case of thick crystalline silicon solar cells, a well-known approach is to use geometric textures that scatter incident rays into modes that are trapped by total internal reflection in the absorbing layer leading to a maximum possible enhancement in optical path length of $4n^2$, where n is the refractive index of the absorber. This limit is applicable at near bandgap wavelengths for device structures that have an acceptance cone of full sky. If device is designed with an acceptance cone of half angle of θ then maximum possible enhancement in optical path length is $4n^2/\sin^2(\Gamma, \theta)$ under low absorption limit. This is the well known geometric optics limit of light trapping. Such textures are substantially less effective for thin-film solar cells and an extension of this approach into the wave domain is needed. Here, using principles of unitary time evolution and information theory, we show that light trapping in the wave domain is subject to the same upper limit that was derived for the geometric optics domain. Furthermore, we show that practical subwavelength structures can be designed with light-trapping performance that approaches the theoretical limit. The enhancement in optical absorption exceeds that of previously proposed structures by an order of magnitude. [C501]

"Design of quaternary chalcogenide photovoltaic absorbers through cation mutation"

Design of chalcogenide photovoltaic absorbers is carried out systematically through sequential cation mutation, from binary to ternary to quaternary compounds, using first-principles electronic structure calculations. Several universal trends are identified for two classes of quaternary chalcogenides (I2-II-IV-VI4 and I-III-II2-VI4 systems). For example, the lowest-energy structure always has larger lattice constant a , smaller tetragonal distortion parameter $\Gamma, \theta = c/2a$, and larger band gap than the metastable structures for common-row cation mutations. The band structure changes on mutation illustrate that although the band gap decreases from binary II-VI to ternary I-III-VI2 are mostly due to the p-d repulsion in the valence band, the decreases from ternary I-III-VI2 to quaternary I2-II-IV-VI4 chalcogenides are due to the downshift in the conduction band caused by the wavefunction localization on the group IV cation site. We find that I2-II-IV-VI4 compounds are more stable in the kesterite structure, whereas the widely-assumed stannite structure reported in the literature is most likely due to partial disorder in the I-II (001) layer of the kesterite phase. Ten compounds are predicted have band gaps close to the 1 to 2 eV energy window suitable for photovoltaics. [C502]

"Real-time tracking experiment of higher-order Laguerre-Gaussian beam for remote six-axis deformation sensing"

In INSS2008, we described a new principle for monitoring full-axis (three translational and three rotational) deformation of large and long structures such as bridges, roads, and railways. It is based on a combined use of an optical Laguerre-Gaussian (LG) beam and correlation image sensor (CIS). In this paper, we describe theoretically and examine experimentally several key issues of this technology. They are: 1) an optimum design of higher-order LG beam, 2) theoretical analysis on the relation between the beam profile and the deformation parameters, and 3) real-time tracking and parameter extraction algorithms of the LG beam and its parameters. [C503]

"The role of third order dispersion on pulse compression in a highly nonlinear fibre"

This paper analyzes the effect of third order dispersion on the pulse compression produced by a highly nonlinear fiber. The optical pulse train has been designed by a novel circuit using the principle of superposition of lightwaves. It is seen from the calculations that the pulsewidth of 7.5 psec can be compressed down to 4.4 psec level by the highly nonlinear fiber (HNLF) of length 10 Km. The third order dispersion of the fiber reduces the pulsewidth in the pulse compression process of the highly nonlinear fiber. [C504]

"Adiabatic computing: A contemporary review"

Adiabatic logic is also called energy recovery logic. Thermodynamic meaning no heat transfer. Instead of dissipating power reuse it. It achieves low power consumption by restricting the currents to flow across devices with low voltage drop and by recycling the energy stored in their node capacitors using an AC type power supply rather than DC. This paper focuses on principles of adiabatic logic, its classifications and comparison of various adiabatic logic circuits. An attempt has been made in this paper to modify some adiabatic logic circuits to minimize total power consumption with respect to normal CMOS logic. This paper investigates the design approaches of low power adiabatic gates in terms of energy dissipation. A computer simulation using SPICE is carried out on several inverter circuits. [C505]

"Slow light for microwave photonics applications"

This paper focuses in slow light and its application in microwave photonics. It makes a brief review of microwave photonics evolution from its inception to new emerging topics. Subsequently, the principles, techniques, and applications of slow light in microwave photonics are addressed more in depth. Finally, the photonic crystal approach is presented as a promising approach to slow-light-based microwave photonics devices. The peculiar design flexibility of this approach is demonstrated with a series of simulations. [C506]

"Ultrasound-based imaging of nanoparticles: From molecular and cellular imaging to therapy guidance"

The effectiveness of an imaging technique is often based on the ability to image quantitatively both morphological and physiological functions of the tissue. Here we present several ultrasound-based imaging techniques capable of visualizing both structural and functional properties of living tissue. Each imaging system utilizes custom-made, targeted nanoparticles developed to probe specific molecular events. Therefore, images of these nanoparticles display molecular processes in the body. Furthermore, the developed nanoparticle contrast agents can also be used for image-guided molecular therapy. For each imaging system, the basic physics and principles behind each approach are described. Experimental aspects of each imaging system including fabrication of integrated imaging probes and associated imaging hardware, and design of targeted contrast agents are discussed. Finally, biomedical and clinical applications of the developed imaging approaches ranging from microscopic to macroscopic imaging of cardiovascular diseases, cancer detection, diagnosis, therapy and therapy monitoring are demonstrated and discussed. [C507]

"Suppression of parasitic resonance in piezoresistively transduced longitudinal mode MEMS resonators"

This paper demonstrates the suppression of parasitic resonance in a piezoresistively transduced longitudinal mode MEMS resonator, wherein beams are electrostatically excited in a combined extensional mode with an associated frequency-Q product of $3.28 \text{ ГГц} \cdot 10^{12}$. The response of the beam is sensed using both capacitive and piezoresistive transduction principles. The resonator consists of six parallel beams linked to a central anchor and a pair of symmetrical parallel beams that force the beams to vibrate in-phase. The mode suppression in the resonator is compared with other structures by finite element analysis (FEA). The relative distribution of strain energies in both the resonant structure and anchors and in both primary and secondary directions of vibration are proposed as figures of merit to compare this device to previously reported longitudinal mode beam resonators. The design optimization of longitudinal mode beam resonators is also discussed. [C508]

"Method for phase sensitive measurements of surface vibrations using homodyne interferometry without stabilization"

A method for detecting phase and absolute amplitude of surface vibrations with homodyne laser interferometry is presented. An advantage of this detection scheme is that no stabilization of the optical path is required, hence allowing for a simple homodyne interferometer design. The principle of the detection concept is described and the method is implemented to an existing homodyne scanning laser interferometer, originally developed for measuring relative amplitude data of surface vibrations in microacoustic devices. Selected measurements from two different piezo-actuated micromechanical resonators are presented to demonstrate the detection method.

With current electronics, the interferometer is capable of detecting out-of-plane vibrations up to 2.5 GHz with lateral resolution of $< 1 \text{ Г, Bim}$ and with minimum detectable amplitudes of $\sim 1 \text{ pm}$. [C509]

"Notice of Violation of IEEE Publication Principles Design of ultra-low power CMOS cells for temperature sensors in VLSI"

Notice of Violation of IEEE Publication Principles "Design of Ultra-low Power CMOS Cells for Temperature Sensors in VLSI," by V. Nath, R. Kumari, B.N. Das, R.N. Gupta, K.S. Yadav, L.K. Singh, T.T. Jeong in the Proceedings of the International Conference on Emerging Trends in Electronic and Photonic Devices & Systems, 2009. ELECTRO '09, Dec. 2009, pp. 116-119 After careful and considered review of the content and authorship of this paper by a duly constituted expert committee, this paper has been found to be in violation of IEEE's Publication Principles. This paper is a duplication of the original text from the paper cited below. The original text was copied without attribution (including appropriate references to the original author(s) and/or paper title) and without permission. Due to the nature of this violation, reasonable effort should be made to remove all past references to this paper, and future references should be made to the following article: "Ultra-low Power CMOS Cells for Temperature Sensors" by C. Rossi and P. Aguirre in the Proceedings of the 18th Annual Symposium on Integrated Circuits and System Design, ACM Press, 2005, pp. 202-206. Temperature sensors and voltage references require cells that generate both PTAT (Proportional to Absolute Temperature) and NTC (Negative Temperature coefficient) voltages. We present a novel theoretical approach based on a quasi-constant current to obtain these voltages in standard CMOS technology using no resistors. These circuits are designed simulated using CADENCE analog and digital system design tools of $0.6 \text{ }\mu\text{m}$ CMOS technology. We performed measurements in a -43°C to 127°C temperature range which verify the expected results. The circuit draws under 50 nA from a 1.0 V to 1.6 V supply. [C510]

"The Coastal and Global Scale Nodes of the Ocean Observatories Initiative"

The National Science Foundation's Ocean Observatories Initiative (OOI) will enable powerful new observing approaches using sustained, controllable observations from an interdisciplinary suite of sensors connected by a robust cyberinfrastructure. The OOI will be implemented via four principle components: Regional Scale Nodes, Coastal and Global Scale Nodes (CGSN), Cyberinfrastructure, and Education and Public Engagement. This paper summarizes the current status of the CGSN infrastructure, which has been under continuous review and refinement since a Conceptual Network Design was presented in 2006. [C511]

"Efficient three-dimensional multiplatform electromagnetic simulator to analyze biological effects"

This work presents a multi-platform three-dimensional computational electromagnetic environment called SSAR-BR. It was developed using free software and applied to design devices and analyze non-ionizing radiation effects in humans. The SSAR-BR integrates a CAD interface and post-processing module developed in Java and the processing is performed by numerical methods in C++ (FDTD 3D) and Fortran (FEM 3D). This entire solution provides a sophisticated computational environment based on Software Engineering principles, which contributes with computational performance and components reuse. The evaluations tests were focused in the numerical accuracy and the human-machine interactions, providing successful results in both cases. [C512]

"Study of singular phases in laser cavity modes"

Study of singular phases is important for analyzing the wavefront deterioration of laser beams while propagating through strong atmospheric turbulence. Such study is useful to the applications involving the laser propagation and the phase detection systems. Few laser cavity modes inherently possess singular behavior. We report the study of detection of single and multiple phase singularities embedded in the fundamental laser mode. Numerically these vortices have been produced and two interferometric methods were used for the detection. Alternatively singularities could also be detected by measuring local slopes of wavefront employing Shack-Hartmann principle. Comparison of these methods was also discussed. [C513]

"Design of free-form microlens for LED general illumination"

For breaking through the restrictions of multiple LED products with irregular radiation patterns, free-form microlens optics is designed by the Snell's law and "edge-ray principle" for illumination applications. This non-imaging optics can freely redistribute LED radiations onto target surfaces for prescribed uniform illuminations without considering the specific radiation patterns of LED sources. The surface shape of the single free-form microlens is totally determined by the practical illumination requirements, and calculated by using the three dimensional ray tracing method and B-spline fitting way. Some models of free-form microlens optics were done to achieve prescribed rectangular illuminations. The simulation experiments for these models were done, and the results show that the achieved illuminations have high uniformities, precise illuminating shapes, and insensitivity

of the radiation pattern of the sources used, which means that free-form microlens optics is applicable in LED lighting with competitive advantages. [C514]

"Variable optical power splitter based on slot waveguide"

To meet the application demand of optical communication system, a new type of variable optical power splitter (VOPS) based on slot waveguide by adjusting manually is proposed in this paper. The device is designed by using the principle of optical field effect. It has an import port which provides import power, and two output ports, the power of which is divided dynamically by changing the width of the gap between two slot waveguides. This paper can specify the operation principle of the device, test its important technical indicators and analyze experimental datum. Experimental results show that the device can realize light distribution of the single wavelength and multiple wavelengths and that the power splitting ratio is dynamically tunable and the tuning range can be 1-25dB, which ensures rapid organization and deployment of communication network. [C515]

"Surface-enhanced Raman Scattering sensor based on fused biconical taper fiber"

In this paper a novel Surface-enhanced Raman Scattering (SERS) sensor combining with fused taper optical fiber (FBTF) and the film coating with silver sols is proposed. This structure is designed to obviously increase the SERS active surface when the radius is reduced and the length of the taper is increased, because the penetration depth is proportional to the taper length and inversely proportional to the taper radius according to the fiber-optic evanescent-wave theory. Based on the SERS sensing principle, the feasibility of FBTF sensor is analyzed in this paper. Actually, the Raman spectrum of R6G is obtained from the taper surface coating with the silver sols in our experiments. The detecting concentration is up to 10-7M. Moreover, this SERS sensing structure is simple and reproducible. [C516]

"Eight-channel wavelength division demultiplexer using multimode interference"

We present a new design of wavelength division demultiplexer based on self-imaging principle in the multimode interference (MMI) structure. We simulated an 8-channel wavelength demultiplexer with high quality factor in the telecommunication range. The structure has been designed with multi-stage multimode interference couplers. The principle of the design of structure can be extended to N-channel wavelength division demultiplexer. To the best of our knowledge, this work presented for the first time in MMI structure with almost 5nm channel spacing and 2451 average quality factor. Output wavelengths that are achieved from the first to the latest outputs are 1545nm, 1564.4nm, 1535nm, 1554.37nm, 1530nm, 1549.9nm, 1540nm, 1559.5nm, respectively. The beam propagation method is used for simulation of this device. [C517]

"Performance monitoring on the orthogonality among the multisubcarriers of an all-optical OFDM system"

In this paper, all-optical OFDM transmitter and receiver with 5420Gbit/s were simulated. The 100-Gbits/s signal was successfully transmitted over 40-km-SMF without dispersion companion in the simulation experiment. We have analyzed the principle of orthogonal carrier generation, and obtained the optimal configuration for two, three and five orthogonal carriers. Through designing proper system parameters, the clearly eye diagrams were obtained. The BER curves of five orthogonal signals were detected. [C518]

"Analysis and design of box-like filters based on 342 microring resonator arrays"

This paper theoretically investigates spectral characteristics of the 342 microring resonator array, with its analytical model developed firstly. Simulation results show that the case of the ring-bus coupling coefficient smaller than the ring-ring coupling coefficient is suitable for box-like filters. After design principles are given, the optimization process are carried out by evaluating the side lobe rejection ratio, the passband ripple rejection ratio and the roll-off coefficient of the passband edge. The FWHM of the designed box-like filter can be adjustable in a flexible range. [C519]

"Pole-zero diagram approach to the design of Michelson Gires-Tournois interferometer interleaver"

A novel and simple design method based on pole-zero diagram is proposed for optical interleaver based on Michelson Gires-Tournois interferometer (MGTI) with arbitrary cascaded reflectors. Digital filter model which is equivalent to the MGTI optical interleaver is derived firstly. Then on the basis of it, the transfer functions of two output ports of the interleaver are simplified and all the design parameters of the interleaver can be obtained conveniently by the use of the mature design principle of elliptic filter and pole values. The two output spectrums obtained has the wide flat passband (and stopband) width and high isolation simultaneously. Compared with other existing design methods, the proposed method is simpler and more efficient, especially for interleavers

with GTE composed of much more reflectors. Design examples of the interleaver with different cascaded G-T etalon structure are given. [C520]

"A novel optical fiber system for non-touch detecting roll wear based on neural network and software imitation"

A non-touch on-line optical fiber measurement system for roll wears is designed, based on the principle of reflective displacement fiber-optic sensor. By using a novel probe of three optical fibers in equal transverse space, the effects of fluctuations in the light source, reflective changing of target surface and the intensity losses in the fiber lines are automatically compensated. Meantime, an optical fiber sensor model of correcting static error based on BP artificial neural network (ANN) is set up. Also by using interpolation method and value filtering to process the signals, effectively reduce the influence of random noise and the vibration of the roller bearing. So enhance the accuracy and resolution remarkably. A simulation-software program is compiled with Microsoft Visual Basic 6.0 based on this detective principle. By using it, the detecting signal curve is automatically drawn. And the date of I/O signal for this system is gained in good time. [C521]

"A method for constructing simplified kernel model based on kernel-MSE"

In this paper, we derive an efficient nonlinear feature extraction method from naive Kernel Minimum Squared Error (KMSE) method. The most contribution of the derived method is its feature extraction procedure that is much more computationally efficient than naive KMSE. Differing from naive KMSE that exploits some linear combination of the total training patterns to express the discriminant vector in feature space, the derived method attempts to select out a small number of patterns (referred to as Γ_i significant nodes Γ_i in this paper) from the training set and exploits some linear combination of Γ_i significant nodes Γ_i to approximate to the discriminant vector in feature space. According to the following two principles, an algorithm for producing Γ_i significant nodes Γ_i is designed. The Γ_i significant node Γ_i set should well represent the whole training patterns, and each Γ_i significant node Γ_i should contribute much for the feature extraction result. Experimental results on several benchmark datasets illustrate our method can efficiently classify the real-world data with the high recognition accuracy. [C522]

"A synthesizable on-chip wormhole router"

Multi-core may afford the computation capacity for the computation-intensive tasks, such as machine learning. In such a chip, the inter-cores communication is one of the greatest challenges. A synthesizable wormhole router was proposed for the emerging inter-cores communication scheme, i.e. network-on-chip (NoC). The proposed router not only offers common configurable parameters including buffers, virtual-channels and routing algorithms, but also has its inner-pipeline parameterized. The pipeline may be organized as the conventional 3-stage one, 4-stage one or the in-house 5-stage one. The 5-stage pipelining scheme is a variation of the 4-stage one, but has the longest stage for virtual-channel allocation in the ancestor split into two stages. Then it may achieve higher maximum frequency. The packet latency in a wormhole-switch network was decomposed, and the impact from pipelining scheme and the number of virtual-channels was evaluated. A principle was proposed for on-chip router design, which arouses higher frequency for more performance and less packet latency. [C523]

"CMS applications in metal mines of China"

Large numbers of cavities formed by underground mining endangers the mine's safety seriously and generates much difficulty for the resource reclamation in domestic mines. Therefore, taking advanced Cavity Monitoring System (CMS) as basic mean, carrying out correlative technologies research and application to overcome these problems in the underground metal mines has become a significant task. The basic principle of CMS and the method of modeling cavities using monitoring data were introduced. The impacts to CMS probing result by temperature, humidity, target reflectivity and probing location etc were analyzed and some relevant resolved measures were brought forward. The research and application of CMS in China mine is introduced, which include cavity dynamic measure, stope collapse area dynamic monitoring, calculation of roof exposed area, cavity security management, mining index visible calculation, blast design of pillars with complicated irregular boundaries, as well as for the stope stability numerical simulation analysis based on the monitoring cavities and so on. All these techniques have been applied successfully in China mines. [C524]

"In-vivo measurement of Indocyanine green biodistribution in mammalian organs using fiber based system"

Indocyanine green (ICG) is a fluorescent probe widely used in recent years, and it is also the fluorescent dye that can be clinical used, in both imaging and treatment. So it is important to study its biodistribution and

metabolism in mammalian organs, but the accuracy and sampling speed is limited by the traditional in-vitro methods. Now we present a design of an in-vivo multi-channel fluorescence intensity measurement system and an algorithm of data processing, to achieve the accurate measurement of fluorescence intensity, continuous sampling, real time monitoring and curve fitting. This system design is based on customized fiber bundles and the principle of reflective fluorescence microscopy. We also present a mouse experiment using this system to study the Indocyanine green (ICG) biodistribution in small mammalian liver, in order to demonstrate the potential applications of this system and also present a new experiment method in the study of dye biodistribution and metabolism. [C525]

"Design of teleconference camera based on SOPC"

It is unreliable to take both full view images of a conference room and face images of speakers, in most conference room, lecture hall or auditorium of the teleconference systems. This paper, countered such special surroundings which maintained more audiences and scatted positions, analyzes the principles of mosaic camera and discusses the advantages of phase correlation methodology. Besides, the idea of mosaic teleconference camera is proposed and the implementation of the whole system is presented. Finally, we shows the evaluation results and it can substantiate the requirement. [C526]

"Analysis of the effect of atomizer spray refrigeration in high-temperated caving face by stochastic model"

The temperature field and the coupling mechanism of the airflow in transportation channel was analysed by the currency software FLUENT, based on the conservation principle, by using the single-phasic multicomponent model. The simulation result was also compared with the temperature measured in mine. Then the atomizer spray refrigeration process of two schemes were simulated, considered the turbulent diffusing effect of the droplet and combined with the gas-droplet two direction coupling stochastic model, to forecast how pulverization droplets affect the temperature field of the airflow. The oretics gist for designing the pulverization refrigeration project is supplied in the paper. [C527]

"Electrical conductivity imaging using magnetic resonance tomography"

The electrical conductivity of human tissue could be used as an additional diagnostic parameter or might be helpful for the prediction of the local SAR during MR measurements. In this study, the approach IdquoElectric Properties Tomographyrdquo (EPT) is applied, which derives the patient's electric conductivity using a standard MR system. To this goal, the spatial transmit sensitivity distribution of the applied RF coil is measured. This sensitivity distribution represents the positive circularly polarized component of the magnetic field. It can be post-processed utilizing Faraday's and Ampere's law, yielding an estimation of the spatial distribution of the patient's electric conductivity. Thus, EPT does not apply externally mounted electrodes, currents, or RF probes. In this study, phantom experiments underline the principle feasibility of EPT. Furthermore, initial conductivity measurements in the brain allow distinguishing cerebro-spinal fluid from the surrounding grey and white matter. [C528]

"Static forces variation and pressure distribution in laryngoscopy performed by straight and curved blades"

A theoretical analysis of the forces acting on the laryngoscope during the lifting of the epiglottis is carried out by applying the basic principles of statics. The static model of a laryngoscope equipped with a straight and a curved blade and the forces variation, as a function of the introduction angle and of tissue reaction application point, are described. The pharyngeal tissues and epiglottis pressure distribution on the blade is obtained, with a 1 mm2resolution, by measurements performed in-vitro on a simulation mannequin, using straight and curved blades. The straight blade requires more effort than the curved one to obtain the same visualization of vocal cords, however forces exerted by using a laryngoscope with a curved blade do not vary linearly with the application point of tissue reaction. Average intensity of the tissue reaction has been found in the order of 32 plusmn 11 N. Pressure distribution is maximally concentrated on the tip of curved blades (0.5 MPa on 5 mm axial length), whereas it is more dispersed on straight blades (0.2 MPa on 10 mm axial length). The inclination of the handle also influences the effort of the operator: for both blades, from 0 rad to 1.57 rad, the lifting force shows a total variation of about 13% of the top value, the transversal forces vary less than 6% of the top value. [C529]

"Honors Biomedical instrumentation-A course model for accelerated design"

A model for a 16-week biomedical instrumentation course is outlined. The course is modeled in such a way that

students learn about medical devices and instrumentation through lecture and laboratory sessions while also learning basic design principles. Course material covers a broad range of topics from fundamentals of sensors and instrumentation, guided laboratory design experiments, design projects, and eventual protection of intellectual property, regulatory considerations, and entry into the commercial market. Students eventually complete two design projects in the form of a 'Challenge' design project as well as an 'Honors' design project. Sample problems students solve during the Challenge project and examples of past Honors projects from the course are highlighted. [C530]

"Fluorescence biosensing in nanopores"

Hydrated nanopores offer a unique environment for studying biological molecules under controlled conditions and fabricating sensors using fluorescence. Silica nanopores for example are non-toxic, biologically and optically compatible with protein, and can be easily synthesized to entrap protein and exclude potentially interfering macromolecules, while transmitting analytes of interest. A well known problem when polymerizing orthosilicates to fabricate silica sol-gel nanopores is the release of alcohol, which denatures proteins. We will describe how using the fluorescence of PRODAN (6-propionyl-2-(N,N-dimethylamino) naphthalene) to monitor methanol generated during polymerization has helped define a protocol with enhanced biocompatibility. The improved biocompatibility of sol-gel nanopores synthesized using tetramethyl orthosilicate (TMOS) has been demonstrated by preserving the unstable native trimer form of allophycocyanin (APC) for up to 500 Hrs without the need to covalently binding the subunits together. This has enabled the observation of native APC trimer by means of its fluorescence in a pore down to the single molecule level. In this paper we demonstrate how PRODAN and another polarity sensitive dye, 9-diethylamino-5H-benzo[alpha]phenoxazine-5-one, Nile red (NR) report on pore polarity and successfully extend protein encapsulation to nano-channels of alumina (Al₂O₃). Improved biocompatibility of nanopores has potential impact in nanomedicine where the ability to study single biomolecules is a primary goal as it underpins our understanding of disease pathology and therapeutics at the most fundamental level. In sensing also the advantages of nanopore isolation of metabolite-specific protein for detecting non-fluorescent metabolites has been demonstrated. Similar approaches can in principle be developed for both single-molecules and lab-on-a-chip sensors. [C531]

"Diagnostic imaging of esophageal epithelium with clinical endoscopic polarized scanning spectroscopy instrument"

This letter reports the development of an endoscopic polarized scanning spectroscopy (EPSS) instrument compatible with existing endoscopes. This instrument uses light scattering spectroscopy (LSS). In proof-of-principle studies using a single-point instrument, LSS has successfully demonstrated the ability to identify pre-cancer in the epithelial tissues of five different organs, including Barrett's esophagus (BE). The EPSS instrument can provide real time in vivo information on the location of otherwise invisible high grade dysplasia (HGD), a predictor of adenocarcinoma, and thus can serve as a guide for biopsy. It should greatly reduce the time and labor involved in performing screening and obtaining diagnoses, cause less patient discomfort and ensure that fewer biopsies are required for the reliable location of pre-cancerous lesions. [C532]

"Interconnections of basic science research and product development in medical device design"

The relationship between basic science research and product design/development are intertwined. This paper explores the definition of basic science and design as it relates to medical device development. It is intended to serve as a reference for both researchers and device developers to assist in trans-disciplinary collaborative efforts in improving patient care as each are of equal importance. The definition of a medical device is broad and varied. This paper is aimed towards those devices which interact with tissue and are rooted in the tenets of science. Both the scientific method and the design process are compared with similarities and opposites identified. The paper concludes identifying fundamental principles of medical device development and highlights the importance of both entities. [C533]

"Potentials and limitations of ventricular torsion as indicator of cardiac function"

New non-invasive imaging techniques allow quantification of torsion of the left ventricle (LV). Presently, it is not well known what torsion can add as an indicator of left ventricular pump function. A frame work for understanding of cardiac motion has been designed that is based on general principles of mechanics. In this frame work experimental and clinical findings on torsion were related to various indices of LV function. The time courses of torsion and volume have much information in common. However, the rate of torsion during isovolumic relaxation provides important information on rate of LV pressure decay. Most importantly, assessment of the relation between torsion and the changing inner diameter during ejection renders unique information about the transmural gradient of contractile performance of the LV myocardium. [C534]

"Safety design for medical robots"

The use of robots in medicine is increasing, leading to the call for specific safety standards. This is a challenging endeavor, however, because the patient must usually be placed in the robot's workspace and the medical staff must frequently interact with the robot. Although specific safety standards for medical robots do not yet exist, there are several medical device standards and well-established principles of risk analysis and safety design that can and should be applied. This paper presents a tutorial overview of safety design for medical robots, starting with a discussion of high-level safety requirements, followed by methods for risk assessment (or hazard analysis) and a brief discussion of some sample safety strategies. [C535]

"Nano-scale resonant sensors for gas and bio detection: Expectations and challenges"

It is the purpose of this paper to show expectations, challenges and initial steps concerning the realization of resonant chemical NEMS sensors able to meet the needs of future applications. Here, we focus on the functionalization principles of the sensing Self-Assembled Monolayer (SAM), modeling and simulation of CMOS-SOI resonant NEMS sensor with electrostatic actuation and MOSFET detection, first CMOS-SOI experimental results for making Si nano wire for piezoresistive detection schemes, noise limits of the resonant nano-sensors, challenges for the design of the on-chip readout circuitry, and the specific reliability issues of resonant NEMS. Some of the simulated sensitivity results of about 5 Hz/zg at 433 MHz and MOSFET detection are close to the best state-of-the-art experimental data from literature of 0.7 Hz/zg at 127 MHz. It is our challenge to pursue at experimental level with our nanosensor concepts for making reliable nanodevices addressing the needs of integrated sensing. [C536]

"Design of the disturbance-invariant speed-controlled drive with induction motor"

This paper presents the design of digitally-controlled speed drive invariant to arbitrary class of torque disturbances. For the rejection of torque disturbance effects on the steady-state value of motor speed, the IMPACT (internal model principle and control together) regulation structure is applied, while the output drive torque is produced by using the indirect field oriented control (IFOC) of induction motor. The results of analytical design are verified by simulation and by experimental measurements on induction motor drive test setup. [C537]

"Overview of the optofluidic ring resonator: A versatile platform for label-free biological and chemical sensing"

Highly sensitive detection of biological and chemical analytes has significant importance within medical science, environmental monitoring, food quality, national security and defense. The opto-fluidic ring resonator (OFRR) is a relatively new solution for label-free optical sensing that is compatible with a versatile range of analytes. A capillary-based platform, the OFRR supports whispering gallery modes within its circular cross-section and conducts evanescent sensing within its hollow core. Herein, we provide an overview of the basic operation principles of the OFRR and some examples of its most important applications, including the detection of proteins, virus, DNA molecules, whole cells, vapors and pesticides. [C538]

"Exploiting the 1/f structure of neural signals for the design of integrated neural amplifiers"

Neural amplifiers require a large time-constant high-pass filter at ~1 Hz to reject large DC offsets while amplifying low frequency neural signals. This high pass filter is typically realized using large area capacitors and teraohm resistances which makes integration difficult. In this paper, we present a novel topology for a neural amplifier which exploits the (1/f) power spectra of local field potentials (LFP). Using a high-pass filter at ~100 Hz, we pre-filter the LFP before amplification. Post digitization, we can recover the LFP signal by building the inverse of the high pass filter in software. We built an array of neural amplifiers based on this principle and tested it on rats chronically implanted with microelectrode arrays. We found that we could recover the initial LFP signal and the power spectral information over time with correlation coefficient greater than 0.94. [C539]

"Effective brain-computer interfacing using BCI2000"

To facilitate research and development in brain-computer interface (BCI) research, we have been developing a general-purpose BCI system, called BCI2000, over the past nine years. This system has enjoyed a growing adoption in BCI and related areas and has been the basis for some of the most impressive studies reported to date. This paper gives an update on the status of this project by describing the principles of the BCI2000 system, its benefits, and impact on the field to date. [C540]

"Desirable features of a "humanoid" robot-therapist"

In relation with a recent Cochrane review, the paper discusses desirable features of a humanoid robot-therapist: 1) high mechanical compliance, 2) large range of force, 3) minimum assistance level, 4) soft haptic interaction for proprioceptive awareness, 5) adaptative assistance properties. It also proposes a framework for addressing optimal assistance and learning paradigms in view of a consensus in the community of rehabilitation engineers about shared principles and common standards. [C541]

"Simple alignment technique for molding and transfer of 3D PDMS structure using the mechanical alignment jig"

Simple alignment technique for the purpose of PDMS molding and transfer is proposed. In order to realize suggested technique, specially designed mechanical jig is devised. This jig helps the mechanical alignment and the clamping of the same-sized wafers. Silicon-on-glass wafer is used as a carrier substrate of the thin PDMS structure. 3D PDMS structure for the cap of sensor has been molded and transferred to the sensor using the jig. Though principle and procedure of alignment is very simple, relatively high alignment precision of 10 μm has been achieved. All caps of the sensor chips have survived without peeling during dicing process. [C542]

"Forced dynamics position control of the drive with linear PMSM"

Design and verification of forced dynamics position control of a drive with a linear permanent magnet synchronous motor is presented. This control method is a relatively new one and using the principles of feedback linearisation offers an accurate realisation of a dynamic speed and position response, which can be selected for a given application by the user. In addition to this, the primary part current vector and the moving part flux vector are maintained mutually perpendicular as in conventional vector control. The control system has the cascade structure with an outer position control loop and an inner speed control loop. To achieve the defined speed response, the derived control law requires estimation of an external force, which is obtained from an observer. The overall control system is verified by simulations and experimentally. Preliminary experimental results confirmed that the moving part position response follows the prescribed one fairly closely. [C543]

"High-power millimeter-wave rotary joint for radar applications"

The rotary joint is a useful microwave component that connects a fixed part to a rotatable part. This study analyzes the effect of the discontinuity on the interface of a rotary joint for several waveguide modes. Simulation results indicate that the transmission of the TE₀₁ mode is independent of the geometry of the joint, and thus is ideal for such application. A rotary joint consisting of two identical TE₀₁ mode converters, clasped each other by a bearing, is designed, fabricated, and tested. Back-to-back transmission measurements exhibit an excellent agreement to the results of computer simulations. The measured optimum transmission is 97% with a 3-dB bandwidth of 8.5 GHz, centered at 35.0 GHz. The cold measurement shows that the results are independent of the angle of rotation. In addition, a high-power experiment is conducted. The just developed rotary joint can operate up to a peak input power of 210 W with a duty of 18%. The working principle, although demonstrated in the millimeter-wave region, can be applied up to the terahertz region where the joint gap is generally critical except for the operating TE₀₁ mode. [C544]

"Research on the modern testing system in graduation inclining and image inclining of optical sighting telescope"

According to the test requirements of them, based on the traditional testing principles and methods, this paper designed a modern optical testing system which employed the CCD imaging technology, optics technology, photoelectrical automatic focus control technology. [C545]

"Coherent receivers: Principles and real-time implementation"

A collection of slides from the authors conference presentation about coherent receivers, its principles and real-time implementation including some digital circuit design basics and examples is given. [C546]

"An architecting method for distributed process-intensive systems"

This paper introduces an architecting method for distributed process-intensive systems. Traditional methods (e.g. object-orientation, structured analysis or component/service-based designs) decompose a process-intensive system into entities with attached domain-specific operations (process constituents). This results in fine-grained remote procedure calls in distributed systems which are often detrimental to quality attributes such as performance, loose-coupling, adaptability and interoperability. Our method tailors the representational state transfer (REST) principles used for hypermedia data transfer to process-intensive systems by making process constituents into resources, and attaching a set of standard operations. Distributed processes interoperate by

adhering to these operations and exchanging process information. In our method, process information exchange contains not only typical meta-information about a process, but also process fragments that indicate possible next-steps and interconnectedness for process coordination purposes. We have implemented our method in a Web environment and conducted a case study providing initial validation of its benefits. [C547]

"Design and fabrication of 980nm three-active regions high power semiconductor lasers"

Based on the principle of tunnel regeneration, three-active regions high power semiconductor lasers were designed and fabricated. Powered by pulse currents limited at 30 A, the emitting wavelength of 998 nm, the optical power output of 40.48 W, Ithof 7.95 A and the differential efficiency of 1.62 W/A were obtained. [C548]

"Wireless instantaneous neurotransmitter concentration sensing system (WINCS) for intraoperative neurochemical monitoring"

The Wireless Instantaneous Neurotransmitter Concentration Sensing System (WINCS) measures extracellular neurotransmitter concentration in vivo and displays the data graphically in nearly real time. WINCS implements two electroanalytical methods, fast-scan cyclic voltammetry (FSCV) and fixed-potential amperometry (FPA), to measure neurotransmitter concentrations at an electrochemical sensor, typically a carbon-fiber microelectrode. WINCS comprises a battery-powered patient module and a custom software application (WINCSware) running on a nearby personal computer. The patient module impresses upon the electrochemical sensor either a constant potential (for FPA) or a time-varying waveform (for FSCV). A transimpedance amplifier converts the resulting current to a signal that is digitized and transmitted to the base station via a Bluetooth radio link. WINCSware controls the operational parameters for FPA or FSCV, and records the transmitted data stream. Filtered data is displayed in various formats, including a background-subtracted plot of sequential FSCV scans—a representation that enables users to distinguish the signatures of various analytes with considerable specificity. Dopamine, glutamate, adenosine and serotonin were selected as analytes for test trials. Proof-of-principle tests included in vitro flow-injection measurements and in vivo measurements in rat and pig. Further testing demonstrated basic functionality in a 3-Tesla MRI unit. WINCS was designed in compliance with consensus standards for medical electrical device safety, and it is anticipated that its capability for real-time intraoperative monitoring of neurotransmitter release at an implanted sensor will prove useful for advancing functional neurosurgery. [C549]

"GPU accelerated fuzzy connected image segmentation by using CUDA"

Image segmentation techniques using fuzzy connectedness principles have shown their effectiveness in segmenting a variety of objects in several large applications in recent years. However, one problem of these algorithms has been their excessive computational requirements when processing large image datasets. Nowadays commodity graphics hardware provides high parallel computing power. In this paper, we present a parallel fuzzy connected image segmentation algorithm on Nvidia's Compute Unified Device Architecture (CUDA) platform for segmenting large medical image data sets. Our experiments based on three data sets with small, medium, and large data size demonstrate the efficiency of the parallel algorithm, which achieves a speed-up factor of 7.2x, 7.3x, and 14.4x, correspondingly, for the three data sets over the sequential implementation of fuzzy connected image segmentation algorithm on CPU. [C550]

"A protocol design for evaluation of wearable cuff-less blood pressure measuring devices"

This paper proposes one of the unique requirements in the validation protocol of the IEEE P1708 standard in assessing wearable cuff-less blood pressure (BP) measuring devices. Based on principles that are different from that of the conventional cuff-based devices, the cuff-less BP measurement approaches often require an individual calibration procedure. In this study, we used data from an experiment carried out on 28 subjects with a total of 139 sets of BP measurements as an example to show that breakdown of the performance evaluation of cuff-less devices according to the change of BP from the point of calibration is crucial for understanding and interpreting the overall accuracy of the device. [C551]

"Stereo 3D mouse (S3D-Mouse): Measuring ground truth for medical data in a virtual 3D space"

We introduce a novel approach of applying stereoscopy principles to simulate a virtual 3D pointing device based on two or more views of an ordinary mouse cursor. The system assists a user point to a desired location inside the virtual 3D space projected by a stereoscopic display. The technique is designed for easy perception, and thus interpretation, of depth information in a 3D context. A target application is the measuring of ground truth for 3D medical data. To illustrate how our virtual stereoscopic cursor works, we have implemented a multi-view stereo visualization software and a simple 3D editing toolset for manipulating 3D objects. Experimental results suggest the effectiveness of using the device in term of detection accuracy and user satisfaction compared to

using an ordinary mouse on a conventional 2D screen. [C552]

"Space-frequency analysis of pseudo-periodic patterns for subpixel position control"

This paper reports on visual position measurement based on space-frequency analysis of a pseudo-periodic pattern. This approach can be seen as a two-dimensional extension of the Vernier principle as used in the Vernier caliper. The pseudoperiodic pattern fixed on the target is seen as a secondary scale that is compared to the reference scale formed by the image pixel frame. By performing space-frequency analysis and phase computations, the center of the pseudo-periodic pattern is retrieved with a subpixel accuracy and the in-plane orientation is determined as well. Several configurations allow different kinds of measurement. A single camera vision system leads to in-plane pose estimation. Stroboscopic illumination can be used to quantify vibration amplitudes down to the nanometer range. A two camera setup can be used for displacement measurements along the three spatial directions while the choice of an interference objective, sensitive to out-of-plane direction, can complement the measurement to address the six degrees of freedom. An extended pseudo-periodic pattern was also designed to locate any field of observation within a wide dimension surface. [C553]

"Capacitive on-line hematocrit sensor design based on impedance spectroscopy for use in hemodialysis machines"

This paper presents a new design for an on-line and in-line hematocrit (HCT) sensor. Special feature of the sensor is the capability to measure the hematocrit of a blood sample inside standard plastic tubing widely used in medical equipment. No blood sample has to be extracted out of existing extracorporeal blood circulation systems such as hemodialysis machines or heart-lung machines. The sensor principle is based on electrical impedance spectroscopy. Dielectric properties of the blood and the plastic tubing are measured at various frequencies. In order to optimize the sensitivity, a unique electrode configuration is developed and optimized by Finite Element Simulation. The new electrode design optimizes the overall sensitivity of the sensor towards a change in dielectric properties of the blood caused by the HCT value and therefore decreases the sensitivity to side effects caused by temperature drift and component tolerances. As a result of the optimized overall sensor performance the complexity of a sensor readout circuitry can be reduced to a minimum which leads to an unmatched price-performance ratio for a complete measurement system. [C554]

"Wireless, magnetic-based sensors for biomedical applications"

Wireless magnetic sensor technologies are gaining popularity in biomedical community due to their remote query nature, which allows them to be used as long-term implantable sensors. Some of these sensors are also low cost so they are suitable for use on a disposable basis. In this paper, two wireless magnetic sensors are described: the magnetoelastic sensor and the magneto-harmonic sensor. Magnetoelastic sensors are made of magnetoelastic materials that when under an AC magnetic field excitation, vibrate and resonate at their resonant frequencies. Since the resonant frequency of a magnetoelastic sensor is proportional to the mass or viscosity of the surrounding material, it has been used to detect chemical and biological targets by incorporating coatings that change mass/elasticity in response to the parameters of interest. Conversely, magneto-harmonic sensors detect parameters of interest by monitoring the change in the pattern or amplitude of the magnetic higher-order harmonic fields. Typically, a magneto-harmonic sensor consists of a magnetically soft material (sensing element) and a permanent magnet (biasing element). When energized by an AC magnetic field, the sensing element generates higher-order magnetic fields that change with the biasing field from the biasing element. By designing the sensor so the separation distance between these two elements varies with the parameters of interest, the magneto-harmonic sensor has been used for remote measurement of pressure and stress. This paper presents the operating principles and biomedical applications of these sensors. [C555]

"Band-gap engineered hot carrier tunnel transistors"

Summary form only given. Inter-band tunnel field effect transistors (TFETs) with a gate controlled zener tunnel junction at the source are of interest because of its ability to operate with sub-kT/q sub-threshold slope device operation over a specified gate bias range. This allows TFETs to achieve, in principle, much higher Ion-Ioff ratio over a given gate voltage swing compared to conventional MOSFETs, making them attractive for ultra-low power operation. We present here a study on the strong non-equilibrium character of the tunnel injected carrier population in the channel of the TFETs through detailed energy balance (EB) simulations and its implication on TFET device design. We specifically show the following: (i) A large and highly inhomogeneous electric field at the source side tunnel junction at high gate voltages results in a non-equilibrium distribution of injected carriers in the TFET channel (ii) A novel source side heterojunction design enhances and sharpens the source side electric field amplitude and shape resulting in greater carrier heating and band-to-band tunneling (BTBT) currents even at moderate gate voltages (iii) The energy relaxation process of the injected carriers on both sides of the tunnel

barrier are studied as a function of bias conditions and is a strong function of the 2-dimensional electric field profile in the TFET channel. [C556]

"Electrically controlled magnetic memory and programmable logic based on graphene/ferromagnet hybrid structures"

In the present study we analyze a novel design for a low-power-consuming, non-volatile magnetic switch that is based on the unique properties of the graphene layers placed in the interface between ferromagnetic dielectric layers (FDLs). In particular, the structure under consideration consists of three FDLs which are coupled through monolayer graphene (MLG) and bilayer graphene (BLG) layers as shown in Fig. 1. The coupling effect is represented in terms of effective magnetic fields $H_n = \mu_B n / 2M_0$, where M_0 is a total magnetic moment of free FDL and μ_B is a thermodynamic potential for MLG ($n=1$) or BLG ($n=2$) electrons that interact with proximate FDLs. Here $\mu_B = N G \mu_B \mu_B$ where N is the total graphene primitive cells at the interface with the FDL, G is the energy of graphene electrons FDL exchange interaction, and μ_B is the electro-chemical potential shift. The crucial property of H_n lies in significant dependence of the effective fields on graphene chemical potential μ [1]. Figure 2 highlights such dependence for $|H_1| \sim \mu$ and $|H_2| \sim \mu^2$ and their sum H_{tot} assuming identical values of μ for MLG and BLG. Since the graphene doping shifts the chemical potential by the magnitude μ_0 , the charge neutrality point corresponds to $H_{tot}(\mu_0)=0$. Note that directions of H_1 and H_2 are opposite and that H_{tot} and $M_b=M_t$ are antiparallel for $\mu=\mu_0<0$ (as depicted in Fig. 1) or parallel for $\mu>0$. This effect can be utilized for magnetization M_f switching and writing an information bit through changes in μ produced by gate voltage variation. The coercivity H_c secures the stability of the magnetization. The strength of H_c is limited by the inequality $H_c < H_{tot}(|\mu| \sim 0.1)$. Consequently, there is a range of exchange bias fields that guarantees the reversal of M_f (see Fig. 3). Readout can be readily performed by measurement of the BLG conductivity that depends on the magnetization orientations of proximate FDLs. In Fig. 4, the principle of the switching operation is illustrated for memory. [C557]

"Impact and Applications of Trainable Algorithms in Exhaustive Electronic Engineering"

Many experts would agree that, had it not been for the analysis of gigabit switches, the simulation of Markov models might never have occurred. Actually, few theorists would disagree with the development of the UNIVAC computer, which embodies the robust principles of programming languages. In research, heterogeneous methodologies are used to prove that cache coherence and journaling file systems are often compatible. In conclusion, it is disconfirmed that link-level acknowledgements can be made multimodal, homogeneous, and large-scale. Analysis is also constructed of forward-error correction. [C558]

"Using cooperative writing and oral presentations as peer teaching-evaluating the effectiveness of elements of inductive teaching and social constructivism on student outcomes"

The overall teaching strategy in our basic materials engineering course has been transformed from deductive practice to an inductive teaching and learning system where most of the elements of a student-centered approach are present: cooperative learning, case-based teaching, active/inquiry learning, concept learning, problem-based learning, and constructive alignment. All these principles are supported by educational theory based in cognitive and social constructivism. Thus, this academic year aspects of social constructivism were emphasized and researched in the course. A new component this academic year was that the students' comprehensive research paper and oral presentations/posters were completed in teams using cooperative learning methods. Several research questions were posed. Did using the cooperative learning method improve the quality and technical depth of the research papers/presentations or improve specific learning outcomes? Did student retention and successful course completion improve? Overall, cooperative learning certainly did improve the overall scores and technical depth of the research papers and presentations. Substantial improvements in higher order thinking and language skills (analyzing and relating design requirements to complex materials properties such as viscoelasticity, anisotropy, specific strength/stiffness and phase changes) were also observed. Measurements of end-of-term student misconceptions showed improvements in scaffolding and reconstruction of knowledge in these same conceptual areas. [C559]

"Facilitating interpersonal communication between students and faculty in an engineering design project"

Traditional engineering education has focused on instructing students in the fundamentals of engineering and applying these principles in the solution of engineering problems. While it is important for engineering education to continue providing a strong technical background, recognition of communication skills (e.g., oral presentations, technical reports, memos) are becoming increasingly important in the current business environment. At Michigan Technological University, students complete these activities, but we have also included communication that has

traditionally been used primarily in the workplace environment: the interpersonal communication that occurs between supervisor and employee. As part of their first-year engineering classes, student teams complete design projects, which consist of a series of deliverables throughout the semester. Beginning in the fall of 2008, students in several sections met with their instructor during the design process for a progress meeting. This paper discusses the dynamic experienced between different instructors and their student design teams as this concept was implemented into the first-year program. [C560]

"Workshop-K-12 engineering education: Design challenges for pre-college students"

Engineering education interventions are increasingly commonplace throughout the K-12 experience, but are often limited to popular standbys like robotics or computers. In this workshop, we introduce an alternative approach, Engineering Teaching Kits (ETKs), and show how they can be structured to accommodate students at various educational levels. ETKs are the result of research conducted on effective outreach through the Virginia Middle School Engineering Education Initiative. Currently, ETKs are structured to provide age-appropriate engineering activities at the middle school level, but they have also been used with audiences of various ages. ETKs are popular among middle school math and science instructors for two reasons: they are standards-based, and are self-contained units built on the principles of guided inquiry and active learning. Participants will receive a review of applicable educational and cognitive developmental theories, be introduced to ETKs, work through selected activities from two ETKs, and draft designs for their own ETKs. [C561]

"Integrating Sensing and Information Processing in an Electrical and Computer Engineering undergraduate curriculum"

The Department of Electrical and Computer Engineering at Duke University has completed a full-scale redesign of its undergraduate program based on the theme of integrated sensing and information processing. This theme provides a coherent, overarching framework that links principles of ECE to each other and to real-world engineering problems. The cornerstone of the new ECE curriculum, Fundamentals of Electrical and Computer Engineering, has been designed to provide students with a holistic view of ECE and as a roadmap for the remainder of the curriculum. Each of four follow-on core courses integrates lateral and vertical connections to other courses through the use of thematic examples. Following the five core courses are seven ECE technical electives that include a theme-based culminating design course. Early and pervasive experiences with open-ended design and project-based learning are primary objectives of the curriculum redesign. Regression analyses of course/instructor evaluation data and descriptions of student design project complexity after the curriculum redesign are presented indicating a positive impact of the curriculum redesign on student learning. [C562]

"Simulation of Fault Tolerance Based on Game-Theoretic Methodologies and Lossless Algorithm"

Linear-time configurations and RAID have garnered great interest from both analysts and theorists in the last several years. Given the current status of pseudorandom models, cyberneticists obviously desire the study of DHCP, which embodies the extensive principles of machine learning. Based on the game-theoretic methodology and lossless algorithm, it is concluded that the discovered scheme can be applied to the evaluation of the Internet. [C563]

"Detection and Research on Dental Pulp Fluorescence Signal"

The technology of laser induced fluorescence was used to detect the state of dental pulp vitality. The detection device of dental pulp vitality was designed base on the principle that the teeth can be excited the fluorescence in the short wavelength light-source irradiation, and the fluorescence intension has close related with the dental pulp vitality. In this paper, the principle of detection fluorescence was introduced, the transfer fiber was designed, photomultiplier was put forward to gather the reflection fluorescence from the teeth, and the circuit of detection and gather were designed, the influence factor were analyzed; the SCM was used to design the gather system of fluorescence signal, according to the communication principle of SCM and computer, the data of dental fluorescence signal can be processed and displayed in the computer. Through the primary experimentation, the results show that the ill healthy tooth can be distinguished obviously from the healthy tooth. [C564]

"Research on Embedded Electro-hydraulic Proportional Valve Controller"

In this paper, a high-performance electro-hydraulic proportional valve controller is designed and developed by using embedded-computer technology. Based on the analysis of the work principle and control requirements, authors present a structure of the controller and its control strategy, and its design and program method are discussed in detail. This controller has advantages such as simplicity, powerful function, flexibility and high performance price ratio, has been a renewal product and affords a new choice for users in industry. [C565]

"Key Management Scheme with Bionic Optimization"

Key management is essential to the security of a cryptosystem. In the paper, we introduce bionic evolution into the designing of key management schemes, and present an improved key management scheme based on bionic optimization algorithm. In the scheme, the private keys of CA (certificate agency) and KDC (key distribution center) are generated with an adaptive optimization algorithm according to the optimization principles of bionic evolution. The optimization algorithm avoids the indefinite security problems in private key selection, and effectively prevents certificate forgery and coalition attack by dishonest users and other adversaries. And the optimization algorithm can also be applied to generate other secret parameters in advance. The algorithms of the scheme take great advantage of the superiority of ECC (elliptic curves cryptosystem), such as high efficiency, short key length and etc. The designing strategy not only reinforces the security, stability and robustness of key management scheme but also improves the application efficiency regarding software and hardware environment. [C566]

"Research on DoS Attack and Detection Programming"

The DoS attack is the most popular attack in the network security with the development of network and internet. In this paper, the DoS attack principle is discussed and some DoS attack methods are deeply analyzed. The DoS attack detection technologies which include network traffic detection and packet content detection are presented. The DDoS based on DoS is introduced and some DDoS tools are described and the important TCP flood DoS attack theory is discussed. The DoS attack program and a DoS attack detection program based on Winpcap for experiment are designed and the network packet generation and capture are implemented. The experiment expressed the key progress of DoS attack and detection in detail. [C567]

"Intelligent LED Display Technology with SCM and CPLD"

Small and medium-sized LED dot matrix display is widely used. In order to show steady large-size images, a LED dot-matrix driven method based on the combination of single chip microcomputer and CPLD is presented. An Intelligent LED display is designed. The hardware and application software of system are designed and the whole principle of various details in the system is described. AT89S52 single-chip microcomputer is used for data control and external connection of system. Altera's CPLD EPM7128 chip is used as the display hardware control circuit to display information dynamically, under the control of the single chip microcomputer. The experimental results show that this control method, compared to traditional single chip microcomputer or a single scan cpld drive, has advantages of high efficiency and good display effect. The system can be fully utilized to control a flexible single-chip, CPLD drive ability, the logic of the advantages of easy modification. Due to the versatility of this design, it can be widely used in any of the occasions the need to display information. [C568]

"Tetris Game System Design Based on AT89S52 Single Chip Microcomputer"

Tetris game is one of the most popular and interesting computer game. To reduce the cost and simply the circuit, a Tetris game system is developed base on single chip microcomputer and light-emitting diode dot matrix module. The hardware and application software of system are designed and the whole principle of various details in the system is described. The system including five parts: single chip microcomputer, address lock module, LED display module, input module and C51 program. The input module is composed of five keys through which one plays Tetris game. The address lock module uses 74ls373 chip to realize the multiplexing of P0 port. AT89S52 single chip microcomputer is used as the main control circuit for data processing. The software is developed in C language environment. The designed system is simulated with PROTEUS software. The external keys are simulated to control the movement of different form pieces when playing the game. It is indicated that this design can achieve the basic function of the game and realize the intended purpose. The system has many advantages such as small volume, very low cost, convenient usage and strong function. [C569]

"A Research on Expert Fuzzy-PID Fusion Controller Algorithm in VAV Central Air Conditioning System"

An expert fuzzy-PID fusion type controller is designed for VAV air conditioning system base on plenty of experience of practical projects. The principle of a typical VAV air conditioning system is introduced firstly. And the control characteristic curves of different VAV terminal units are given. The design thinking and course of expert fuzzy-PID controller for the VAV system is described importantly. The structure of the fusion type controller is given an the fuzzy logic rule set is shown. The simulation system for room temperature control using the designed controller is established by MATLAB. And the simulation result is given when different PID parameters are set. The simulation result proves the design is feasible. [C570]

"Teaching philosophy to engineering students"

The intention of this paper is to accompany the two special sessions on teaching philosophy in engineering courses as a vehicle for reflection on the subject matter of these sessions. In recent years there have been substantial international discussions on the subject of engineering and philosophy. The second of two international workshops on philosophy and engineering was held at the Royal Academy of Engineering in November 2008. Many of the outcomes of these deliberations have a bearing on the engineering curriculum and they coincide with a resurgent debate about content and method in the liberal education of engineers. At FIE 2007 and 2008 special sessions and a number of papers focused on engineering education and the more specific philosophy of education. These developments will be reviewed. One of the emerging issues that relate philosophy and the psychology of development has been the treatment of ethics within the context of moral development. Another emerging issue, the principle subject of this paper, is the idea that in addition to ethics philosophy should be taught to engineering students. But the proponents of this view do not, it seems, speak with one voice and this for the want of a more substantial and focused debate on the issue. The different views may be posed as questions thus: Should, philosophy be taught as a separate course or integrated into existing programmes, as for example design where there is already a relevant and high quality literature? If philosophy is taught as a separate course is its purpose to provide an understanding of the traditional disciplines of philosophy and the bearing they have on engineering, or is it to help students acquire a philosophical disposition (habit of mind)? If it is the latter how does that differ from the commonly held goal of higher education the development of skill in reflective (critical) thinking? Or, is it about training students in the use of philosophical techniques in engineering? And in respect- of the last question is that liberal education? Apart from some European studies of the attitudes of engineering teachers to the introduction of philosophy into engineering programmes and American work on moral development there has been little relevant research and development in these areas. The purpose of this paper is to review these recent discussions in the light of the questions posed above with the intention of outlining areas for research. [C571]

"Infusing industry, community, and the Coast Guard into the Civil Engineering Program at the United States Coast Guard Academy"

Educating Civil Engineers at the United States Coast Guard Academy (USCGA) presents its own unique challenges and opportunities. Given our dual mission to graduate civil engineers and officers for the United States Coast Guard, it is important that we infuse practices from industry into the Coast Guard Civil Engineering Program while ensuring that our graduates develop a sense of community and public service. In the Civil Engineering program at the USCGA, emphasis is placed on helping students make connections between theoretical fundamental principles and real engineering practice. It has been challenging to fit into our four year program of study the teaching of fundamental engineering principles, coverage of depth in four sub-fields of Civil Engineering, a large core curriculum required of all cadets, and an introduction to real-life engineering practice of industrial, community-based, and Coast Guard applications. To accomplish this, a strategy was adopted of infusing industrial and community relevance, and Coast Guard mission readiness into the curriculum through class assignments, field trips, guest speakers, capstone projects, community service, summer internships, and membership in professional organizations. Given this approach our graduates are able to most effectively serve the public as Civil Engineers, Coast Guard Officers, and community minded citizens. [C572]

"E-Learning in corporations": an elective to augment life long learning skills"

The course "E-learning in corporations" is an elective for bachelor and master students. The course invites students to take on the role of a junior consultant in the field of e-learning and develop life long learning skills. The course is designed after principles of constructivism and connectivism and has a firm basis in authentic high stakes learning tasks where students are challenged to go through all the stages of a real consultancy project. The students' learning activities in the course have a direct link with the deliverables that are connected with the consultancy project. The students start off with exploring the concept of e-learning and state their own learning goals in addition to the general learning goals of the course. Next, the students explore the assignment, write a proposal and execute the project cooperating closely with the company that assigned the project and the teacher in the role of a senior advisor. Both the process and final product are assessed during and at the end of the course. [C573]

"Aligning Computing Education with engineering workforce computational needs: New curricular directions to improve computational thinking in engineering graduates"

In this global economy, the preparation of a globally competitive U.S. workforce with knowledge and understanding of critical computing concepts is essential. Our CPACE (Collaborative Process to Align Computing Education with Engineering Workforce Needs) vision is to revitalize undergraduate computing education within the engineering and technology fields. Our objective is to design and implement a process to engage

stakeholders from multiple sectors and identify the computational tools and problem-solving skills and define how these skills-directly informed by industry needs-can be integrated across disciplinary curricula. By explicitly integrating computing concepts and disciplinary problem solving, engineering graduates will enter the workforce with improved and practice-ready computational thinking that will enhance their problem-solving and design skills. We present the analysis of the computational skills and the strategies that we are using to map the workforce problem-solving requirements onto the foundational computer science principles. We outline the framework that we are using to identify opportunities for curricular integration between computer science concepts and the disciplinary engineering curricula. By documenting, evaluating, and making the process explicit, this process can serve as a model for national efforts to strengthen undergraduate computing education in engineering. [C574]

"Designing and using an on-line game to teach engineering"

We have developed an on-line game, built around a simple simulator, as an innovative approach to mitigate the time and budget constraints that hinder the development of engineering expertise within a typical one-semester course. Students playing the game, as an alternative to calculation-based homework sets, develop a rich empirical understanding of the engineering principles of interest. A variety of gaming features such as real-life role-playing, competition, and graphically amplified results transform a Matlab-based simulator from being merely a sophisticated calculator into a learning tool that motivates exploration and provides rapid meaningful feedback to real-life engineering design challenges. As with many engineering projects, solutions are obtained by adjusting a variety of interrelated parameters within a set of physical constraints to satisfy a threshold condition. A comparison of a player's solution to an optimal solution provides a quantitative mechanism through which feedback can be easily provided, a competitive factor for either personal accomplishment or group bragging rights, and motivation to pursue the optimal solution. Decisions required during the game engage learning at the advanced level of comparisons and analyses. A digital record of the students' interaction with the game enables an innovative mechanism for learning assessment. [C575]

"Work in progress-hypermedia tool for the development of specific and generic competences in the framework of engineering education"

This work introduces a didactic framework for electronic teaching and learning based on a hypermedia tool which integrates the principles of the learning theories from a cognitive point of view. It exhibits a great deal of flexibility and easiness of adaptation for other subjects belonging to technological areas in engineering education. The proposed open learning environment has a modular design which allows a lecturer to organize subjects by grouping the different and specific resources in a simple and structured way. The main goal pursued is to improve the teaching and learning process by providing the collaborative work among lectures, joining efforts in the teaching process. It also establishes a didactic methodology based on the conceptual relations to be acquired by students, encouraging both personal work and learning self-regulation, so student acquisition of competences and skills is reinforced. [C576]

"An innovative certification program that prepares undergraduate students for engineering research"

Faculty at Jackson State University have developed an in-house certification program focused on introducing students to scientific and engineering research through hands-on learning experiences. This program is innovative as it is designed specifically for undergraduate research experiences and details a very structured and strategic plan to teach students effective research principles with a measureable incentive. This program is a result of positive results from initiatives funded through the National Science Foundation Nanotechnology for Undergraduate Education program. Students participate in learning characterization techniques, scientific principles and research methods associated with various characterization tools. The program is planned so that students will engage in an analysis technique for 3-6 week duration and then receive a certification for proficiency. Upon completion of the program students participate in mini-projects that are focused in the areas of materials research. The program is a hands-on introduction to materials research that spurs the growth of undergraduates who will continue in meaningful research projects, external internships and ultimately graduate school. [C577]

"The UWB Amplifier 3.1-10.6 GHz"

The general principle of an ultra-wideband (UWB) amplifier design in the planar structure using the common available monolithic amplifier is proposed in this paper. The structure of the amplifier is designed in order to accomplish the conditions of the transmission of UWB impulses (flat gain and constant group delay over FCC approved frequency band) with a minimum distortion. The roll-off stage is used for the compensation of the

declining gain and biasing of the monolithic amplifier. The demonstration of the distortion and the assessment criteria of distortion are also presented. The experimentally manufactured amplifier demonstrates a gain of 7.1 ± 0.6 dB and a group delay variation of 7 ps from 4 to 9.3 GHz and 25 ps over the whole band. [C578]

"Design and research of the optical gauge of a rigid pavement quality control"

Considering the work principle of measurement of Roughness of a road bed in basis which the cylindrical lens and the linear CCD ILX551A of firm SONY. Result of work is design of the optical sensing transducer of the control of flatness of a rigid pavement. [C579]

"Plasmonics-based design: combining surface-enhanced Raman and IR spectroscopies into the same structure"

Plasmonic nanostructures are useful for providing high-intensity fields at metal surfaces for surface enhanced spectroscopies. Plasmon hybridization principles are used to design substrates that enhance both Raman and infrared absorption spectroscopy on the same structure. [C580]

"Wideband VNA Design with Bandwidth 1:53 by Multisixport Principle"

Paper presents multisixport principle and its benefits above classical sixport. The novel multisixport design is presented in practical example with its parameters as obtained bandwidth and standard deviation of measurement. [C581]

"Design of VBE Referenced Bootstrap Current Source, Sensitivity, and Self-Heating Effect"

This paper presents the design of a VBEbased bootstrap (self-bias) current source and self-heating effects on its performance. The performance of this reference circuit is measured by the sensitivity of the output current with respect to the power supply voltage. The self-heating effect on the base emitter voltage and the output resistance of a device is used to clarify the design requirements. Based upon the basic principle of the VBEreferenced bootstrap current source, several combinations of current sources and current mirrors are used for the design to compensate the self-heating effect that degrades the circuit's sensitivity. Simulation and measurement results validate the design and show that the proposed current source has improved sensitivity and is less affected by self-heating over the conventional bootstrapped VBEreferenced current source. The circuits have been realized using dielectrically isolated bipolar junction technology (DIBJT) with the vertical bipolar inter-company (VBIC) model. [C582]

"Slotted Applicator for Microwave Local Hyperthermia"

The object of this work is to design a microwave applicator for local thermotherapy, which is work on the principle of a slot line. The working frequency of this applicator is 434 MHz. A 3D simulator of electromagnetic field is used for numeric simulation and consequential optimization. After that, the designed applicator is made and its reflectance and specific absorption rate is measured in phantom of biologic texture. At the end of the work results of all measurements are compared to results of simulation. [C583]

"New Methods For Treatment Of Atherosclerosis"

Vascular diseases are the most common cause of death in present time. This project describes the design of two different types of intracavitary applicators for treatment of the atherosclerosis by microwaves. Basic principle of microwave angioplastic is, that heating gained by microwave energy irradiated into artery by microwave applicator, enables safe clear out of atherosclerotic plates in the wall of vessel. [C584]

"Circular array of triangular patches as filter"

This paper proposed a microstrip circular array antenna consist of 8 triangular patches work as a filter for weak signals (noise) and undesired signals in L-band of microwave frequency. This array has been designed on YIG substrate which works on the principle of inverse dynamic nonlinearity of magnetostatic waves in ferrite substrates. The proposed antenna structure is suitable for mobile communication system. [C585]

"Characteristics of all-optical ultra-fast 3R regenerators using cascaded second-order nonlinear effect in quasi-phase matched lithium niobate devices"

We numerically show that quasi-phase matched lithium niobate devices employing the cascade of second harmonic generation and difference frequency mixing have decision gate characteristics. The decision gate

function is realized by a parabolic transmittance for a low-power input and a limiter characteristic for a high-power input. The limiter characteristic is attributed to the large group-velocity mismatch between the fundamental and second harmonic pulses. The operation principle differs from those of other all-optical 2R or 3R regenerators that have been proposed so far. By using such devices, all-optical ultra-fast 3R operation far beyond 200 Gbps can be expected. [C586]

"Tapered PIFA antenna for handsets terminals"

A new compact PIFA applicable to PCS system is described. The principle aim in design is to broaden the bandwidth within limited body thickness of mobile phones. To overcome the narrow bandwidth characteristics that is typical of a patch antenna a type of tapered patch is employed. The antenna is designed using Zeland Software Ltd and its characteristics are compared with a basic PIFA with similar volume. For WLAN lower 1.8 GHz-band, bandwidth of about 14 to 16%, and gain 2.2 dBi were achieved. [C587]

"1.5 kW S Band Transmit Module"

The paper describes S-band transmit modules designed for use in an active phased array and solid state radar transmitter. Brief principles of its operation are described and electrical and mechanical information are presented. Main parameters of transmit module are shown in the form of characteristics. Results of measurements in wide range of the ambient temperature are presented as well. Basing on the obtained results, conditions of transmit module operation are defined. [C588]

"Multi-wavelength all-optical regeneration"

Recent developments in the area of multi-wavelength all-optical regeneration will be discussed. Simulation and experimental studies related with the design of such regeneration sub-systems based on a) quantum dot semiconductor optical amplifiers and b) highly non-linear fibers will be presented. Results from the experimental proof-of-principle demonstrations of the operation of fiber based multi-wavelength regenerators will be reported. [C589]

"Model for building the data transmission system HARQ-CCC in environment simulink"

A principle of operation data transmission system HARQ-CCC (with a Hybrid Automatic Repeat Request and Convolutional Correcting Coding) at work on the discrete channel with independent errors is presented. In Simulink designed model of the considered system and some aspects of its work are described. [C590]

"The art of optoelectronic packaging"

Optoelectronic packaging is the art of turning well-performing demonstrators of working principles into real devices, so as to guarantee required performances, reliability and cost-effectiveness. To this complex aim, packaging leads many heterogeneous disciplines to convergence, spanning from optics to mechanics, to electronics and material science. Optoelectronic packaging issues and solutions strongly differ, depending on the nature of the system to be implemented and on its level of integration. Three different cases of optical systems for telecomm applications will be discussed, respectively representing on-package integration, on-board hybrid integration and on-chip integration of a monolithic silicon-optics subsystem. [C591]

"Quasi-phase matched second harmonic generation in high-Q spherical micro-resonators"

Some spherical or other kinds of circular micro-resonators exhibit high Q factors which result in very sharp resonances for the light that propagates in the so-called whispering gallery modes. In active devices one may take advantage of such high Q factors to enhance laser light generation or nonlinear interactions. In recent years, there has been some work with the goal to achieve efficient second or third harmonic generation [1,2]. In such circular configuration phase matching amounts to angular momentum conservation, which may be achieved using different radial whispering gallery modes for the fundamental and harmonic fields. In that case, however, the overall overlap of the two or three interacting waves is limited. Quasi-phase matching is an alternative route that offers, in principle, more flexibility [3]. Here we will present the design and fabrication of a nonlinear spherical resonator to experimentally measure quasi-phase matched second harmonic generation (SHG) from a low number of molecules per unit area. For such process is advantageous that molecules are placed on the surface of the micro-sphere where the inversion symmetry is broken as required for a second order nonlinear interaction in the dipole approximation. In addition, for the lowest order whispering gallery radial mode, the field is confined by the sphere surface around one equatorial plane. On such molecular monolayer, we wrote a periodical pattern on roughly one quarter of the sphere around the equator perpendicular to the stem that holds it. The pattern consists of alternated periods of nonlinear molecules 8.8 μm in width at the equator and periods

of the same width but with no nonlinear molecules. The width of each domain must be exactly one coherence length of the corresponding nonlinear interaction. Using a tunable laser as a pumping source, we saw that SHG, strongly peaks at exactly 403 nm very close to the 403.5 nm predicted from the theory in [3]. This agreement is remarkable and the --0.5 nm displacement could be attributed to a small error in measuring the diameter of the sphere. To conclude, we have demonstrated SHG in a new configuration that could have interesting applications in sensing of label-free or unmarked molecules. Sensitivity may be brought to the level of measuring SHG from single molecules since there is no fundamental physics aspect that prevents taking advantage of quality factors of up to 109 found routinely in microspheres. [C592]

"Modeling the Cellular Level of Natural Sensing with the Functional Basis for the Design of Biomimetic Sensor Technology"

After surveying biology for natural sensing solutions six main types of extraneous sensing were identified across the biological kingdoms. Natural sensing happens at the cellular level with receptor cells that respond to photo, chemo, eletro, mechano, thermo and magnetoreceptor-type stimuli. At the highest level, all natural sensing systems have the same reaction sequence to stimuli: perception, transduction, and response. This research is exploring methods for knowledge transfer between the biological and engineering domains. With the use of the Functional Basis, a well-defined modeling language, the ingenuity of natural sensing can be captured through functional models and crossed over into the engineering domain, for design or inspiration. Furthermore, a morph-matrix that lists each component in the model can easily compare and contrast the biological and engineering design components, effectively bridging the two design domains. The six main types of receptor families were modeled for the Animalia and Plantae Kingdoms, from the highest to the 4th sub-level, with emphasis on the transduction sequence. To make the biological sensing models accessible to design engineers they were placed in the Missouri University of Science & Technology Design Repository as artifacts. The models can then be utilized for concept generation and biomimetic design through searching the design repository by functional characteristics. An example of a biomimetic navigation product based on the principle of electric fish is provided to illustrate the utilization of the natural sensing models, morph-matrices and design repository. [C593]

"8ГrB—8 Wavelength Router with Transmission Channel Reallocation Capability"

We developed an 8times8 wavelength router incorporating two AWGs and multiple 4times4 matrix switches to allocate WDM channels for each route flexibly. We describe the design principles of the router and its basic transmission characteristics. [C594]

"Efficient optimization of a Ka-Band MMIC sub-harmonically pumped image rejection diode mixer"

An efficient optimization technique, support vector regression (SVR) approach, is proposed for designing of Ka-band MMIC sub-harmonically pumped image rejection diode mixer. This SVR approach comes from the support vector machine (SVM) learning theory, which is based on the structural risk minimization (SRM) principle and leads good generalization ability. With this method, a Ka-band MMIC 4th harmonic image rejection diode mixer is designed using comercial United Monolithic Semiconductors process. Details of design approach and outcome of performance simulations is presented. [C595]

"Application of perturbed multiresolution preconditioner technique combined with MLFMA for scattering problem"

A new multiresolution (MR) preconditioner is presented in this paper, and it is combined with the multilevel fast multipole algorithm (MLFMA) for the analysis of electromagnetic scatters; Furthermore, the MR preconditioner is modified to be more effective by including a perturbation which is constructed from the principle value term of the magnetic field integral equation (MFIE) operator for solving the electric field integral equation (EFIE), and the modified MR preconditioner is named perturbed MR preconditioner. The MR preconditioner is a physics-based preconditioning scheme for the Method-of- Moments (MoM) methods, which is derives from the generation of a MR basis. And the MR basis functions are constructed as linear combinations of Rao-Wilton-Glisson (RWG) basis functions. Unlike other preconditioners, the perturbed MR preconditioner requires a low memory occupation and computational cost for its generation and application. The use of the perturbed MR preconditioner combined with the MLFMA can speeds up the convergence rate of the iterative solvers effectively. [C596]

"CAD modeling for the Design and Analysis of SAW Filter"

The design of surface acoustic wave (SAW) devices are a hard work. Computer aided design is used for a huge amount of calculation quantity. The main purpose of this paper is to present a diagram of the appropriate device model design method, and analysis techniques for a SAW computer aided design system, including the design of

SAW filter, the calculation method of diffraction and it compensates, the input and output of the data and diagram. The design principle of the software is the filter consisting of one apodized and one unapodized inter digital transducer (EDT). The frequency response including diffraction effects is analyzed based on delta-function model if the Fresnel and parabolic-anisotropy approximation are allowed. [C597]

"The design of SiGe HBT balanced broadband low noise amplifier"

A balanced-broadband low noise amplifier (LNA) was designed with the FR4 substrate, using packaged SiGe HBTs BFP640 and chip type passive components. The design principle and technology features of the structure of the balanced LNA were described. The computer simulated results indicate that this SiGe balanced LNA has the advantages of the noise figure less than 0.9 dB over 0.8 GHz to 1.7 GHz range, the high gain of 37 dB, the input and output reflected coefficients are all less than -50 dB. [C598]

"The analysis of a new class of microstrip antennas based on the idea of cockroach antenna"

Insects possess garden variety of traits, but for some who lack the ability of vision, their species would have been extinct long ago. Through ingenuity of creation, these species adapted to the environment by developing antennas where they can use the basic principles of wave-propagation to feel the surrounding objects. In this paper a new design for broadband microstrip antennas was investigated. The main aim is to make the patch like a cockroach antenna. The antenna has shown to yield percentage bandwidth about 120% for a substrate with permittivity of 4.5. For using air substrate the antenna was fabricated and the percentage bandwidth was 42%. Furthermore some modifications were made to increase the bandwidth of air substrate antennas until it successfully reached 114%. [C599]

"Class E power amplifier design with a modified load network"

A subclass class E power amplifier is proposed in this paper, and the new circuit topology and the basic principles are covered too. For simplicity, the theoretical results are directly given in a table compared to the typical class E amplifier's performance. With the same resistance load, the output voltage is 24% higher. The designed shunt capacitance is about 67% more. With the same output power requirements, the voltage stress on device is about 20% less. The validity and feasibility of the new modified class E power amplifier are proved by a simulation and an experiment circuits. The design example uses an LDMOS transistor, MRF21010. The amplifier's power added efficiency (PAE) is 83.4% and output power is 33 dBm at 200 MHz. [C600]

"RF characteristics investigation of MEMS phase shifter with CPW discontinuities"

The operating principle of the RF MEMS phase shifter is described. Two improved design approaches based on the CPW discontinuities to decrease the return loss are proposed. By using network theory and CST microwave studio simulation tool, the proposed RF MEMS phase shifters are modeled. Simulation results for the two designs are compared and discussed based on the analysis. Simulation results show that less than -10 dB return loss and more than -2 dB insertion loss is achieved for over 1 GHz bandwidth range for the proposed models. At least 6 dB return loss decrease is realized compared with the conventional MEMS phase shifter design methods. [C601]

"Model-T: Rethinking the OS for terabit speeds"

This paper presents Model-T, an OS network stack designed to scale to terabit rates through pipelined execution of micro operations. Model-T parallelizes execution on multicore chips and enforces lockstep processing to maximize shared L2 data cache (d-cache) hitrate. Executing all operations without hitting main memory more than once (if at all) is the key design principle behind Model-T. We show a prototype implementation that indeed handles terabit rate network traffic when accessing only the L2 cache and processing only headers. Additionally, we present a more practical implementation of Model-T that is under development for Linux 2.6. Finally, we introduce an affordable test infrastructure based on general purpose graphics processor computation (GPGPU) that can replay network streams at PCI Express saturation rates (up to 128 Gbps), to benchmark Model-T and similar research network stacks. [C602]

"On the capacity of maximum selection in MIMO multicast network"

In the open-loop multiple input multiple output (MIMO) multicast network, space-time block coding (STBC) is a remarkable transmission scheme with an elegant mathematical solution and full diversity. However, the open-loop design has no special strategies for the worst channel-case user, whereas the multicast design need pay more attention to the worst channel- case user than the average performance with respect to all users in the multicast group. This paper is motivated by the need for certain application of limited channel state information

feedback in the MIMO multicast network. The maximum selection in the MIMO unicast network is extended to the MIMO multicast network and some relevant design principles are proposed. Specifically, we investigate some basic information theory results that promise some advantages of using the proposed schemes. Compared to the baseline, i.e., the capacity behavior of the open-loop STBC scheme, we present some scenarios for the application of the proposed schemes. [C603]

"Robust design of third level packaging in portable electronics: Solder joint reliability under dynamic mechanical loading"

Solder joint reliability issues that can be identified only at the system level are notoriously difficult to resolve in a timely manner using trial and error experimentation alone. The particular case of solder joint reliability of a side switch in a phone subjected to drop-impact is addressed. An approach employing response surface methodology (RSM) is proposed to solve reliability and robust design problems in advanced packaging. In particular, a IOx improvement in the drop test failure rate is demonstrated with a minimum of trial and error experimentation. Technical contributions are a) a novel drop life response function derived from strain energy principles, and b) an approach to address package reliability issues at the system level. [C604]

"Linear and nonlinear plasmonic effects modulated by a metalinsulator transition"

Localized and propagating plasmonic effects in noble-metal nanostructures are receiving worldwide attention as potential enabling principles for optical and electro-optic devices. A critical need in plasmonic device design is a general technique for active modulation of the plasmon response. In this paper, we describe the use of a reversible, solid-solid phase transition in VO₂ to modulate plasmonic response. Case studies are drawn from experiments on nano structured hole and particle arrays in which VO₂ acts as a modulator by altering the local dielectric constant. [C605]

"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. [C606]

"A millimeter-wave conical conformal low sidelobe microstrip antenna array"

Design of a millimeter-wave conformal low sidelobe microstrip patch antenna 1times8 elements array on a cone surface is presented. The hemline feed method (HFM) is used to design the patch element. This kind of elements and parallel feed network is used for forming the conformal low sidelobe microstrip array based on the design principle of Dolph-Chebyshev distribution and T-junction power divider. The radiation features of the array are discussed to illuminate the realization of a low sidelobe level (-30.5 dB) of the array. Simulations by the CST MICROWAVE STUDIO are given to verify this present design. [C607]

"Combination-optimization method for ultra-wide band TEM horn antenna array using micro-genetic algorithm"

Finite-difference time-domain method (FDTD) and micro-genetic algorithm (MGA) are combined to optimize time-domain ultra-wide band (UWB) transverse electromagnetic (TEM) horn antenna array. Firstly, FDTD was applied to obtain the time-domain information of elementary antenna. According to principle of superposition, the antenna array could be primarily optimized using MGA without regard to mutual coupling effect. Secondly, the whole antenna array was simulated by FDTD. The first optimal results then acted as the known knowledge to reduce the searching range of MGA and the antenna array was optimized for the second time. Hence, the optimization speed can be greatly accelerated by using combination-optimization method described above while mutual coupling effect is taken into account. As an example, a 4-element UWB planar TEM horn antenna array was optimized to show the validity. The results confirmed it and the computational time decreased by 48.6%. [C608]

"Wideband VNA design with bandwidth 1:53 by multisixport principle"

The paper presents multisixport principle and its benefits above classical sixport. The novel multisixport design is presented in practical example with its parameters as obtained bandwidth and standard deviation of measurement. [C609]

"Observation of optical gain in ultra-thin silicon resonant cavity light-emitting diode"

We have observed net optical gain by current injections to ultra-thin Si embedded in a resonant optical cavity. The cavity consists of a dielectric waveguide fabricated by CMOS and MEMS process. The photoluminescence (PL) spectra show narrow resonances peaked at the designed wavelength, and the electroluminescence (EL) intensity increases super-linearly with currents. The comparisons with first principle calculations suggest that the optical gain is originated from intrinsic material properties of ultra-thin Si due to quantum confinements. [C610]

"Optimization of GaN window layer for InGaN solar cells using polarization effect"

The III-nitride material system offers substantial potential to develop high-efficiency solar cells. Theoretical modeling of InGaN solar cells indicate strong band bending at the top surface of p-InGaN junction caused due to piezoelectric polarization-induced charge at the strained p-GaN window interface. A counterintuitive strained n-GaN window layer is proposed, modeled and experimentally verified to improve performance of InGaN solar cells. InGaN solar cells with band gap of 2.9 eV are grown using MOCVD with p-type and n-type strained GaN window layers, and fabricated using variable metallization schemes. Fabricated solar cells using n-GaN window layers yield superior VOC and FF compared to those using p-GaN window layers. The VOC's of InGaN solar cells with n-GaN window layers are further enhanced from 1.5 V to 2 V by replacing the conventional NiOx top contact metal with Ti/Al, which also verifies the tunneling principle. [C611]

"EMC design principles"

Grounding, shielding, filtering and cabling/wiring are important design criteria to achieve EMC on the equipment level. In order to avoid costly overkill solutions and to tailor individual measures in the case of contradicting requirements, they must not be understood as cookbook style recipes but their application must be based on sound theoretical principles. A sound knowledge of electromagnetic theory is essential to understand and appreciate EMC measures, and not consider them as magical spells that have to be put on machines to make them work. However emphasis is placed on conceptual understanding not on formulas and equations. So, this talk refreshes electromagnetic theory in a nutshell, but avoids the mathematical burden. The nature of electric and magnetic dipoles, estimation of current flow in ground planes, EMC characteristics of transmission lines are some of the topics that covered in this presentation. [C612]

"Semiconductor Laser Using Multimode Interference (MMI) Principle"

Multimode interference (MMI) structure is introduced in semiconductor laser to realize higher power and shorter device length. We use BPM simulation in the device design. MMI-LD was fabricated and realized in InGaAsP/InP based material and output power of up to 2.296 mW was achieved. The implemented MMI-LD exhibits stable single-mode output operating at a wavelength of 1.52 μm at 10degC. As a comparison, conventional semiconductor laser using straight waveguide is also fabricated in the same wafer and the output power is 0.534 mW. MMI-LD also shows better temperature tolerance due to the MMI wavelength selecting function. [C613]

"Design principles of injection-locked semiconductor laser structures"

Injection locking of semiconductor lasers has proven to be a versatile technique in a wide area of applications including Radio over Fiber (RoF) transmitters, optical comb generators, phase-arrayed antennas, mm-wave telescopes, etc. The injection-locked semiconductor laser acts as an optical amplifier, phase modulator, weak signal detector and optical filter. The stable locking and dynamic properties are strongly dependant on the cavity structure of these devices. A method based on semi-classical theory is presented for determining the effect of weak optical injection on the threshold gain and resonant frequency of complex-coupled DFB semiconductor lasers. This allows tailoring the locking bandwidth according to target application of the component and the establishment of design principles. The study is further complemented by large-signal time-domain simulations where structures for several applications are discussed. [C614]

"DUV interferometry for micro and nanopatterning"

In recent years, fabrication of chemical and topographical functional materials in the micrometer and nanometer scales has been drawing a great interest in the scientific community. The attention is not only due to the need for ever-increasing miniaturization of microelectronics for example, but also because of the discovery of many novel

phenomena that occur at these scale levels. Recent advances in micro- or nano-fabrication techniques have been reported in the literature. The size of the patterns is strongly dependent on the technique used and can range from micrometer to sub-10 nanometer scale. Among the suitable techniques, DUV lithography has proved its interest since it is compatible with nanoscale fabrication on large surfaces (typ. few cm²) with limited writing times. However, there is a need to develop new materials suitable with DUV lithography in terms of resolution, line edge roughness (LER) and properties (mechanical, optical, etc.). Patterns were generated by DUV irradiation using an ArF excimer laser. A phase mask grating with a binary profile especially designed to minimize the zeroth diffraction order was used. The phase masks were irradiated in normal incidence and creation of a sinusoidal distribution of light by interference between two coherent beams (Fig. 2). The plusmn1 diffraction orders generated by the phase mask recombined within the thickness films, creating a sinusoidal distribution of light that was used to induce the surface patterning of the film. Typically, the surface was irradiated with good homogeneity. In order to avoid the contact between the phase mask and the film, spacers were used (60 μm thickness). We have developed several materials based on both organic and inorganic functionalities that suitable for nanofabrication in the DUV range. We will illustrate the principle of DUV interferometry and demonstrate its interest for patterning several materials for applications in optics, photonics and biology. [C615]

"Design and analysis of low loss MMI based 4ΓB—4 optical switch using Benes architecture with SOAs"

This paper presents an overview of self-imaging principle used in MMI couplers and also explains the application of multimode waveguide as an optical switch. The application of MMI coupler to realize a 2times2 optical switch has been explained by varying the refractive indices of various regions of MMI section by only 1-2% and the switch is found to exhibit 2-10% loss for various coupling states at different power inputs. Then the basic 2times2 switch is exploited in design of 4times4 Benes switch. Benes switch is used as it is suitable for large switches requiring fewer SOAs which make it a good candidate for further use in higher order switches. Simulation results are shown. Power coupling losses occurring in 4times4 switch are compensated using minimum number of SOAs with low input injection current of the order of 10-20 mA. [C616]

"Pressure sensors based on MEMS, operating in harsh environments (touch-mode)"

In this paper, Poly-crystalline silicon carbide (poly-sic) Micro-electromechanical systems (MEMS) capacitive pressure sensor operating in harsh environment in touch mode is proposed, The principle of the paper is to design, obtain analytical solution and compare the results with the simulation for a circular diaphragm deflection before and after touch point. The sensor demonstrated a high temperature sensing capability up to 400° C, the device achieves a linear characteristic response and consists of a circular clamped-edges poly-sic diaphragm suspended over sealed cavity on a silicon carbide substrate. The sensor is operating in touch mode capacitive pressure sensor, The advantages of a touch mode are the robust structure that make the sensor to withstand harsh environment, near linear output, and large over-range protection, operating in wide range of pressure, higher sensitivity than the near linear operation in normal mode, The material is considered to be used for harsh environment is SiC (Silicon Carbide), Because of SiC owing excellent electrical stability, mechanical robustness, and chemical inertness properties and the application of pressure sensors in harsh environments are, such as automotive industries, aerospace, oil/logging equipments, nuclear station, and power station. We are simulating MEMS capacitive pressure sensor to optimize the design, improve the performance and reduce the time of fabricating process of the device. The proposed touch mode MEMS capacitive pressure sensor demonstrated diaphragm ranging from 150μm to 360μm in diameter, with the gap depth from 0.5μm to 7.5μm and the sensor exhibit a linear response with pressure from 0.05 Mpa to 10 Mpa. [C617]

"Optimizing the cleaning process through cleaning efficiency examination"

The paper explores the efficiency of cleaning methods in order to select a method and optimize cleaning as a part of assembly manufacturing process in microelectronics. To find out the advantages and potentialities of each single cleaning method it is necessary to use simple but reliable evaluation method. In this paper are under consideration two different methods for contamination evaluation, the first being the standard one using the contaminometer, and the second, new one, which is developed on an optical principle. The new method for cleaning evaluation is based on measuring the contamination in special substrate pattern using a scanning unit (programmable automated optical inspection). The special pattern was designed and realized on a glass substrate with ceramic chip models. The experimental part presents the efficiency examination and compares ultrasonic cleaning in microemulsion to other methods like spray in the air etc. The results of this study are used in optimizing and adjusting cleaning equipments as well as in their improvement and innovation. [C618]

"Adaptive integrated system optical design and modeling"

Accelerated high level phase contrast theory is established. Global design adaptive concept, integrated principle, system strategy, spatiotemporal characteristics simulation and evaluation is studied. Accelerated system integrated technique, especially on optical design and modeling, is achieved. [C619]

"Fabry-Perot temperature sensor for quasi-distributed measurement utilizing OTDR"

This paper presents a quasi-distributed Fabry-Perot fiber optic temperature sensor array using Optical Time Domain Reflectometry (OTDR) technique. The F-P sensor was made by two face to face single-mode optical fibers and their surfaces have been polished. Due to the low reflectivity of the fiber surfaces, the sensor was described as low Fresnel FPI. The working principle was analyzed using two-beam optical interference approximation. To measure the temperature, a certain temperature sensitive material was filled in the cavity. The slight changes of the reflective intensity which induced by the refractive index of the material was caught by OTDR. The length of the cavity was obtained by monitor the interference spectrum which is used for the setting of the sensor static characteristics within the quasi-linear range. Based on our design, a three point sensor array were fabricated and characterized. The experimental results show that with the temperature increasing from -30°C to 80°C , the reflectivity increased in a good linear manner. The sensitivity was approximate $0.074 \text{ dB/}^{\circ}\text{C}$. For the low transmission loss, more sensors can be integrated. [C620]

"Low power CMOS LNA design optimization techniques"

Based on the noise parameter expressions of the proposed CMOS LNA topology, the design principles, advantages, and limitations of the power-constrained simultaneous noise and input matching technique are discussed. As a demonstration for the proposed design principle, a 433 MHz low-power CMOS LNA is implemented in SMIC's 0.18 μm CMOS technology. Measured results show a good agreement with the proposed design principle and theoretical analysis. [C621]

"Pressure sensing approach based on electromagnetic transduction principle"

In this paper a new type of low cost, smart and high sensitivity pressure micro-sensor is designed based on electromagnetic transduction principle, which can be used for long distance covering measurement. As it will be shown in this paper, the resulting pressure cell presents a high sensitivity to the applied pressure, is compatible with fully passive wireless sensor unit and does not require electronic circuits for eventual signal conditioning and processing. [C622]

"Landslide monitoring based on high-resolution distributed fiber optic stress sensor"

We present a landslide monitoring application using a high-resolution distributed fiber optic stress sensor. The sensor is used to monitor the intra-stress distribution and variations in landslide bodies, and can be used for the early warning of the occurrence of the landslides. The principle of distributed fiber optic stress sensing and the intra-stress monitoring method for landslides were described in detail in this paper. By measuring the distributed polarization mode coupling in the polarization-maintaining fiber, the distributed fiber stress sensor with stress measuring range 0-15 Mpa, spatial resolution 10 cm and measuring range 0.5 km, was designed. The warning system was also investigated experimentally in the field trial. [C623]

"GaN photonic-crystal surface-emitting laser"

Summary form only given. Recently, there has been growing interest in photonic-crystal surface-emitting lasers (PC-SELs) (1-4). The lasing principle exploited by the lasers is based on the band-edge effect in a two-dimensional (2D) PC, where the group velocity of light becomes zero and a 2D cavity mode is formed. The output power is coupled to the vertical direction by the PC itself, which gives rise to the surface-emitting function. PC-SELs have the following features: first, perfect, single longitudinal, and lateral mode oscillation can be achieved even when the lasing area becomes very large (for example, devices $>300 \mu\text{m}$ in diameter) (1, 2, 4); and second, the polarization mode (2) and the beam pattern (4) can be controlled by appropriate design of the unit cell and/or lattice phase in the 2D PC. For example, unique beam patterns including doughnut shapes with radial or tangential polarizations have been successfully generated, which leads to a realization of super-high-resolution light sources that could be focused to a spot smaller than wavelengths (4, 5). Very recently, GaN PC-SELs have been realized in blue-violet wavelengths (6) by developing a unique method, named "air-holes-retained over-growth (AROG)", in order to construct a 2D GaN/air photonic crystal structure. The device has successfully oscillated with a current injection at room temperature. In this presentation, the lasing principle, the device structures, a generation of unique beam patterns, and the very recent results on current-driven blue-violet GaN PC-SELs will be described. [C624]

"The design of multimode interference couplers with arbitrary power splitting ratios on an SOI platform"

A method for obtaining variable power splitting ratios using multimode interference couplers is presented. The method relies on etching the surface on either the top of the MMI coupler or on the linking waveguides. Devices have been designed for the silicon on insulator (SOI) platform. The 3D beam propagation method (3D-BPM) and the full-vectorial finite difference method (FV-FDM) are used to verify the working principle of the devices and to evaluate performance. [C625]

"Exploration of new algorithms for airborne collision detection and avoidance to meet NextGen capabilities"

As the aviation community moves toward the next generation air transportation system (NextGen), current airborne collision avoidance technology may become inadequate. The traffic alert and collision avoidance system (TCAS) was developed some time ago, and its ability to accommodate the air-to-air applications and air traffic control (ATC) procedures that are envisioned for NextGen is limited. There is a need to analyze the role of future NextGen technologies such as automatic dependent surveillance-broadcast (ADS-B) in the overall collision avoidance concept and architecture. This paper will describe a MITRE research effort addressing the following three fundamental research questions: What are the desired NextGen operations that are incompatible with current TCAS? What new enabling technologies and design principles could meet the NextGen needs? What are the key functional needs that ensure enhancements and modifications do not detract from safety-the primary function of the collision avoidance system? In this paper we will discuss the technical approach applied to the research, and identify projected TCAS limitations in meeting future air-to-air applications and ATC procedures. [C626]

"Thermo-mechanical pre-optimisation of radar sensor design by means of FEA and microDAC measurements"

More and more dense packaging is one of the most important challenges in advanced electronics and micro technology, driven by requirements like low cost and high reliability. One way to meet these demands is to follow the so-called "chip in duomerrdquo approach, which allows an extremely dense integration and very short interconnects. Already in the very first design phase of advanced products, numerical studies by means of finite element analyses (FEA) are very efficient to check the desired properties regarding functionality as well as reliability aspects. This has been carried out with a new generation of active distance control (ADC) devices for automobiles, based on a radar principle. In order to obtain sufficiently flat modules for subsequent manufacturing steps, thermally induced deformations were measured at suitable specimens by means of the microDAC technique, developed by CWM GmbH Chemnitz and Fraunhofer IZM. Combining FE analyses and measured deformations, a methodology was developed which can be generalised and applied to many design procedures before any real parts are available [1]. It is helpful to reduce cost and time-to-market for future products by minimising real tests and an expensive redesign. [C627]

"A tunable matching network for power amplifier efficiency enhancement and distortion reduction"

Variable load technique has been proposed as a solution for improving the efficiency of power amplifiers at reduced drive levels. To provide variable load impedance to a transistor, various configurations for tunable matching networks may be used. However, many of them can introduce large AM-PM distortion. To avoid the degradation in linearity, a T-network that in principle causes no phase variation is presented in this work. A 1750-MHz medium power amplifier along with a tunable matching network using GaAs hyperabrupt varactor diodes is designed, fabricated, and tested. Experimental results for the power amplifier show that the power-added efficiency (PAE) at reduced power levels is enhanced when variable load is used. Meanwhile, lower AM-AM and AM-PM distortions are observed, demonstrating its potential for improving the efficiency as well as the linearity. [C628]

"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. [C629]

"Ku -band dielectric resonator diplexer"

The principles and results of the design of Ku-band microwave diplexers on dielectric resonators (DR) are discussed. Diplexers have insertion losses less than 2.0 dB at 1.4% passband and 60 dB isolation between channels. [C630]

"79GHz Automotive Short Range Radar Sensor based on Single-Chip SiGe-Transceivers"

Today automotive short range radar sensors are only available for the 24 GHz band. But in the EU the production of ultra-wideband sensors is limited to 2013 for the 24 GHz band, after 2013 the 79 GHz range must be used. This was the impact to develop a single-chip SiGe RF-transceiver for the 79 GHz-band on Infineon's B7HF200-Process with transition frequencies above 200 GHz. The power spectral density limit of -9 dBm/MHz for the 79 GHz-band is much higher than the -41.3 dBm/MHz limit for 24 GHz. Therefore the built prototype is a FMCW radar and no pulse radar in order to achieve a higher signal-to-noise ratio. The required frequency ramp generation according to the FMCW-principle is realized without a phase locked loop(PLL), but by controlling digitally the tuning voltage of the VCO with help of a D/A-converter. The non-linearity of the VCO tuning law is compensated by measuring the frequency of the divider signal. Two bistatic transceiver variants have been realized: ATRX2 has one transmit and three receive channels, while ATRX3 has two switchable transmitters and two receivers. An RF-board has been designed for each chip, where low-cost patch antennas have been applied, optimized for a short range system. In the following the configuration for both chips is explained and measurement results are presented in order to demonstrate the angle detection capabilities. [C631]

"Doherty amplifier design for 3.5 GHz WiMAX considering load line and loop stability"

Legacy Doherty amplifier is characterized by using a larger transistor for the peak amplifier such that this reaches saturation with a smaller excitation signal. However due to device availability and modelling considerations, this is not often feasible. In this paper, the design and measurement of a Doherty amplifier utilizing only single sized device is realized. Unlike previous research works, intrinsic load line is utilized to tune the offset lines, as well as to verify the actual dynamic load principle. Stability aspects are covered for this type of amplifier, which are not normally included in earlier works. Finally an assessment of its applicability and benefits for WiMAX at 3.5 GHz is realized using a class AB amplifier as a comparison basis. [C632]

"GaN Doherty Amplifier With Compact Harmonic Traps"

In this contribution, the design of an uneven AB-C Doherty power amplifier (DPA) in GaN technology, implementing a new approach to control the higher device harmonics, is presented. The DPA was designed to operate at 2.14 GHz and with the aim to reduce as much as possible the chip size, without losing the Doherty operating principle. The measurement results in CW conditions at 2.14 GHz had shown average drain efficiency higher than 55% at 6 dB of back-off, with a saturated output power of 37 dBm. [C633]

"Broadband One-port Material Characterization Method of Porous and Fluidic Materials"

Magnetic and electrical properties of materials are investigated by the use of a novel method inspired by the known distance-to-fault (DTF) measurement. The principles of the one-port method are detailed and it is verified by presenting measurement results. The complex relative permeability and permittivity of the samples are derived simultaneously by means of a network analyzer and control software. The coaxial sample holder designed for this measurement allows the investigation of liquid and porous materials. As a special feature, the method can be easily implemented into various applications, since it is based on using a scalar network analyzer. Precognition of the sample length is not necessary, which provides high level of flexibility when using the presented method. [C634]

"A Dual-Band MEMS Reconfigurable Filter for a Multi-Standard Radio Front-End"

A new kind of MEMS multi-standard filter has been developed and fabricated on quartz substrate. This device is optimized for dual-band operations in a radio front-end subsystem, switching between two very different standards: DCS1800 at 1.84 GHz with 4% fractional bandwidth (FBW), and WLAN at 5.2 GHz with 17% FBW. The original architecture based on hybrid lumped/distributed elements design and integrating MEMS controlled capacitor banks is first introduced. Hence, the measurement results are presented and discussed showing very good agreement with simulation results and enabling full validation of the principle. [C635]

"New frontiers in InP based quantum devices"

Recent research activities taking place at center for quantum devices (CQD) based on InP material system, especially the exploration and demonstration of the state-of-art high performance quantum cascade lasers (QCL), greatly facilitate the understanding of the underlining physical principles governing the device operation. Thanks to the endless effort putting into the semiconductor epitaxy technologies, including the Molecular Beam Epitaxy (MBE) and low pressure metal organic chemical vapor deposition (LP-MOCVD), the world has seen a close approaching to the ultimate band gap engineering. Highly sophisticated manmade heterostructure, which incorporates hundreds of alternating layers of GaInAs/AlInAs with each layer thickness and composition specifically designed, can be created within a single growth. The material quality is evidenced by the atomically abrupt interfaces. The versatility of the band gap engineering is greatly enhanced by the strain-balanced technique, which allows for growing structures with continuously tunable conduction band offset with little defects. As a result, the room temperature continuous wave (cw) wall plug efficiency (WPE) and the maximum achievable output optical power from a single device have been constantly improving. Novel waveguide incorporating the photonic crystal distributed feedback (PCDFB) mechanism is also investigated with satisfactory preliminary results. [C636]

"Minkowski Fractal Microstrip Antenna for RFID Tags"

The unique properties of fractals have been exploited to develop a new class of antenna element designs that are multi band and compact in size. These properties are very important for RFID (Radio Frequency Identification) tags where the small size, planar geometries, multi band operation and low cost are essential for many applications. This paper presents a one loop Minkowski modified antenna using a unique configuration and operating at 868 MHz and 2.45 GHz that has been realized on a Rogers Duroid substrate. Experimental results confirm the theoretical prediction. In addition, the principle applied in this design could be used to create even smaller devices by using different substrates. [C637]

"Thin Disk Lasers"

Summary form only given. The principle ideas of the thin disk laser design is illustrated in this paper. Results for cw- and q-switched operation as well as for amplification of short (ns) and ultra-short (ps, fs) pulses demonstrate the potential of the thin disk laser design. The scaling laws for this laser design show that the power limit for cw-operation is far beyond 10 kW for one single disk and the energy limit is higher than 1 J from one disk in pulsed operation. [C638]

"Advances in Organic Materials for Optical Modulation"

A new class of organic electro-optic materials, binary chromophore organic glasses, are introduced and shown to provide a route to materials exhibiting useable electro-optic coefficients of greater than 300 pm/V, optical loss of 2 dB/cm or less, and material glass transition temperatures on the order of 200degC. Design principles and device applications are discussed. [C639]

"Vertical Comb-Drive MEMS Mirror for Optical Spectrum Sensing"

We have proposed a vertical comb-drive MEMS mirror which can be applied for a spectrometer with phase-shifting method, and fabricated the mirror device using micro fabrication technology. The configuration of the MEMS mirror was designed with three vertical electrostatic comb-drive actuators and hinges at the periphery of the mirror. In the proposed spectrometer, the phase of the light which is reflected at the movable mirror is changed, and obtain the interferogram is obtained by the movable mirror which is driven precisely. We evaluated the moving characteristics of the fabricated MEMS mirror and confirmed that the MEMS mirror could be driven vertically to about 30 μm and also could be tilted. Using this MEMS mirror, we configured the spectrometer with a source of monochromatic light ($\lambda = 405 \text{ nm}$), and evaluated the spectroscopic characteristic in principle. Therefore, we have confirmed that the fabricated MEMS mirror can be applied to the spectrometer with phase-shifting method. [C640]

"An optical MEMS pressure sensor based on phase demodulation"

A novel optical fiber pressure sensor based on Fabry-Perot (FP) interferometer and phase demodulation method is described. MEMS techniques and the common communicational components are used to fabricate the sensor. The principles of pressure measurement and sensor design have been introduced. Phase demodulation method based on Fourier transformation is explored, which can reduce errors resulting from intensity variation of light source. Experimental results demonstrate that the sensor has reasonable linearity, sensitivity and a wide

pressure measurement range from 0.1MPa to 3MPa. [C641]

"Fabrication and Characterization of a Repositionable Liquid Micro Lens System"

A novel method to improve both the lateral positioning and focal length tuning accuracy of a liquid lens in a micro lens system, based on the electrowetting on dielectrics (EWOD) principle, is described. This system consists of a device, encapsulated with a packaging technique, fabricated on a transparent substrate featured with an array of electrodes and a structured surface whose periodicity is smaller than the electrode's dimension. With variable applied voltage signals, the liquid lens is actuated precisely in the lateral position and also tuned dynamically irrespective of the lens position on the substrate. The accuracy of lateral positioning is mainly dependent on the structure of the dielectric surface. Measurements of the focal length tuning range and the positioning accuracy are presented. A first design of reconfigurable micro lens system, which has diverse application as adaptive wave-front sensing, optical tweezers and etc, is demonstrated. [C642]

"Objective lens and spatial filter array in an electrooptic analog-to-digital converter"

This research presents the design and proof-of-principle experiment for an electrooptic analog-to-digital converter. An objective lens designed in order to focus the optical pulse deflected by the electrooptic deflection and bi-wedge diffraction of the near-field spatial filter array will be discussed. [C643]

"Application of a civil Integrated Modular Architecture to military transport aircraft"

An integrated modular architecture (IMA) is a modular open standard computing platform, as described in RTCA DO-297, which provides general processing capability for civil transport aircraft. Avionic systems employing an integrated modular architecture (IMA) are currently being deployed on new aircraft such as the Airbus A380 and the Boeing 787. This paper lays out the applicability of the IMA approach to military aircraft such as tankers, bombers, surveillance aircraft and cargo aircraft. The IMA principles can be applied to both new aircraft designs and to existing aircraft that are going through an Aircraft Extension Program (AEP). The modular design of an IMA provides a number of advantages such as cost savings, shorter development time, and higher growth potential. It is scalable to meet the processing needs of the aircraft and is more flexible to implement. An IMA system can offer significant savings in weight, space, power, and cooling required over a comparable federated system. These advantages are particularly important as the military services begin to implement civil communication navigation and surveillance for air traffic management (CNS/ATM) and network centric warfare concepts such as real-time information in the cockpit (RTIC) using military data links. The use of open standards in the architecture of the IMA allows third parties to implement both hardware and software modules in the IMA architecture. The general processing modules (GPMs) may host multiple software applications using an ARINC 653 standard application partitioning to make best use of the high speed commercial processors available. The use of standard application processor interface (API) software creates an open software architecture that allows third parties to independently provide software applications also referred to as hosted functions which run within the partitioned operating environment on the GPMs. The intra module communication architecture, (between modules in the IMA) is- also based on open standards like Ethernet, Personal Computer Interface (PCI) or VERSA Module Europe (VME), which are also freely available, allowing third-party, independent development of the IMA cabinet hardware modules. The remote interface units (RIUs) allow systems with other data networking interfaces to communicate with the IMA. RIUs can interface with ARINC 429, CANBUS, analog and discrete inputs and can be configured to meet specific aircraft requirements. RIUs can be extended to support military specific technologies such as MIL STD 1553 devices which are needed to support the special radios and data link equipment used by the military. Major applications that are typically implemented in the IMA architecture are communication, navigation and surveillance for air traffic management (CNS/ATM) and network centric warfare. CNS/ATM applications suitable for hosting in an IMA platform include the flight management, communication management and terrain and traffic advisories applications. In federated systems these applications are implemented as standalone systems in separate line replaceable units (LRUs). Significant cost savings and flexibility can be achieved by using an IMA approach. Network centric warfare applications can also benefit from an IMA approach. Military voice and data link radios can be managed using a function hosted in an IMA platform and controlled using multipurpose control display units (MCDUs), reducing the number of control panels necessary in the cockpit. Processing of the secure datalink messages can also be performed in the IMA, reducing the cost and LRU count on the aircraft. Information assurance issues such as data security remain an active topic in the industry, but can be addressed using separate data networks for secure and nonsecure data and data encryption for transmission and storage of secure data to deny unauthorized access. [C644]

"Airspace design process for dynamic sectorisation"

Air traffic control in core Europe reaches the limits of available airspace capacities. Therefore new roles are

introduced to shift workload away from the executive (radar) controller, who operates at the limit and is the capacity bottleneck, towards a more planning oriented but yet adaptive control function, the multi sector planner. This multi sector planner will be responsible for the expeditious flow through several sectors. The new role will execute a set of actions on both, airspace and traffic flows to reduce workload for the sector team or balance workload between sectors, so that overall centre capacity is increased. One of the central support tools is fine-grained, tactical, dynamic airspace management in conjunction with tactical flow measures. The study presents the airspace design process and tools that have been applied for the development of the future airspace of the Maastricht Upper Area Control Centre, based on the principles of dynamic airspace management. [C645]

"Quantum design of a 1.3 μm InGaPAs semiconductor laser"

Semiconductor wafer growth can now produce heterostructures of very high quality with stoichiometrically correct growth of individual monolayers. Despite significant advances in MBE and MOCVD growth technologies, a critical void has remained in predicting the performance of final packaged functional amplifier or laser devices. The lack of predictive semiconductor device design and growth monitoring capability can be traced to the extreme complexity of calculating the semiconductor optical response and radiative-nonradiative recombination rates from first principles. Considering the critical role of the above recombination processes in not only, determining gain and slope efficiency but, also all dynamic properties (modulation rates, gain switching, injection locking etc) of SOAs and SLs, it is clear that the impact of this work reaches well beyond the accurate prediction of an L-I characteristic. [C646]

"Experimental limits of an inertial sensor based on cold atoms interferometry"

We investigate the limits of our cold atoms interferometer to rotation and acceleration measurements. In contrast with previous atomic setups, emphasis was placed on the long term stability and compactness of the device through the use of laser cooled atoms, as previously shown with the field of atomic clock. It has been designed to give access to all six axes of inertia (three accelerations and three rotations). The expected improvement in stability will enable to consider applications in inertial navigation, geophysics and tests of general relativity as the equivalence principle or Lense-Thirring effect. [C647]

"Short Course 1: Practical Optical Parametric Oscillators"

Summary form only given. This course provides an overview of optical parametric oscillator (OPO) device technology from basic operation principles to advanced architectures. The course will begin with a description of the fundamental concepts in nonlinear frequency conversion, followed by a discussion of the critical design issues for OPO devices -and then a review of the current status of OPO technology. The discussion will encompass OPO systems operating in all time-scales, from the continuous-wave (cw) to the ultrafast femtosecond regime. [C648]

"Selection of Best Projection from 3D Star Coordinate Projection Space using Energy Minimization and Topology Preserving Mapping"

This paper presents two algorithms for autonomously selecting the best projection among all possible configurations when projecting a high-dimensional (HD) data set on to a 3-dimensional (3D) space using 3D star coordinate projection (3D SCP). The proposed automated algorithms use two different objective functions that minimize the stress and preserve the pair wise distance among data points before and after the projection. The objective functions follow the principle of preserving topology similar to the multidimensional scaling (MDS). The concept of topology preserving mapping is found to be effective in autonomously selecting the best projection using the 3D SCP for visualization. Empirical analyses on artificial and real datasets are performed to show the utility of the proposed methods and their performances were also compared against linear and nonlinear projection-based visualization algorithms. [C649]

"Negative Group Delay Circuit for Feed-Forward Amplifier"

We present a design and an implementation of a negative group delay circuit, which consists of lumped parameter element. It is very small and simple circuit. The circuit is composed of three resonators with resistors, which are arranged to pi type circuit to improve the reflection. We discuss the principle of a negative group delay circuit and apply the circuit to the feed-forward amplifier. It is confirmed that the delay line of the distortion cancellation loop is shortened 40% by connecting the circuit to the driver stage of the error amplifier. The efficiency of the feed-forward amplifier has been improved from 9% to 12%. [C650]

"Design of Strain and Bandgap Profiles of InGaAsP Fabricated by Selective Area Metal-Organic

"Vapor Phase Epitaxy for Polarization Independent Operation"

We designed the strain and bandgap distribution of tensile InGaAs/InGaAsP grown by selective-area MOVPE using vapor-phase diffusion model. A design principle of selective-area growth for integrating polarization independent components is discussed. [C651]

"New Microwave Flow Sensor based on a Left-Handed Transmission Line Resonator"

This paper presents a new material density sensor for process monitoring applications based on a composite right/left-handed transmission line resonator. Compared to a conventional right-handed line resonator an increased sensitivity could be demonstrated by measurements of a prototype. The presented sensor principle promises the possibility to design precise permittivity sensors with low to moderate costs. The areas of application of such sensors are gas/solids, gas/liquid and liquid/solids flows in various industrial applications. [C652]

"Architecture of the Secoqc Quantum Key Distribution network"

The European projet Secoqc (Secure Communication based on Quantum Cryptography) aims at developing a global network for unconditionally secure key distribution. This paper specifies the requirements and presents the principles guiding the design of this network, and relevant to its architecture and protocols. [C653]

"Novel Substrate Integrated Waveguide fixed phase shifter for 180-degree Directional Coupler"

Substrate integrated waveguide (SIW) is a new type of guided wave structure which could be used in both microwave and millimeter wave integrated circuits. The study found that SIW's metallic via structure is very suitable for achieving fixed phase difference by different SIW widths. In this principle, a very simple way was used to realize the fixed phase shifter in equal length SIW firstly, and designed a 23 GHz 3 dB 180-degree H-plane directional coupler in this technique. It can achieve an over 8.7% bandwidth with plusmn0.25 dB power equality, -19.2 dB isolation and 180 degrees phase shift between the output and coupled ports. [C654]

"Notice of Violation of IEEE Publication PrinciplesEnergy Optimization with Multi-level Clustering Algorithm for Wireless Sensor Networks"

Notice of Violation of IEEE Publication Principles"Energy Optimization with Multi-level Clustering Algorithm for Wireless Sensor Networks"by Mohd Fadlee A. Rasid, Raja Syamsul Azmir Raja Abdullah, M. Hossein Fotouhi Ghazvini and Maryam Vahabiin the Proceedings of the International Conference on Wireless and Optical Communications Networks, 2007. WOCN '07, 2-4 July 2007After careful and considered review of the content and authorship of this paper by a duly constituted expert committee, this paper has been found to be in violation of IEEE's Publication Principles.This paper contains substantial duplication of original text from the paper cited below. The original text was copied without attribution (including appropriate references to the original author(s) and/or paper title) and without permission."Energy Conserving Architectures and Algorithms for Wireless Sensor Networks"by Frank Comeau, William Robertson, Shyamala C. Sivakumar, and William J. Phillipsin the Proceedings of the 39th Hawaii International Conference on Systems Science 4-7 Jan 2006Wireless sensor network is a distributed event-based system that differs from traditional communication network. Transporting information in an energy efficient manner is critical in operating this network for a long period of time. An optimum data dissemination strategy and communication protocols that minimize the use of energy can significantly prolong the lifetime of a sensor network. Hierarchical routing protocols are actively studied in terms of the energy usage and packet latency. Clustering technique in hierarchical protocol can significantly reduce energy consumption in a network. In this paper, we present a multi-level clustering algorithm designed to reduce network energy consumption in wireless sensor networks. [C655]

"Frequency Multipliers with Inclined Electron Flow"

A great interest has been shown in using terahertz range. Considered in this paper are the possibilities of using frequency multiplication principles in designing vacuum electromagnetic radiation sources featured by inclined electron flow in the short-wave bands including terahertz band. Presented here are the results of simulation and experimental studies of millimeter-wave frequency multipliers, particularly, multiplier klynotrons, multiplier orotrons and multiplier orbotrons with increased frequency multiplier factors $k_f=15$. Electro-dynamic system of these devices is a power take-off cascade. It is shown that power take-off cascade can operate within the frequency band which exceeds an octave with frequency conversion factor over 10. Energy and frequency characteristics of the frequency multiplier are given. [C656]

"Measuring Device SNA-26"

Considered in this paper are the principle of operation, capabilities and general technical characteristics of the SNA-26 -multifunctional measuring device -combining the functions of wideband spectrum analyzer, amplitude-frequency characteristic meter, VSWR and generator of Ultra-high frequencies, which is designed and prepared for production by the limited company "Beta TV-COM". [C657]

"Multi Chip Module (MCM) Design for Packaging of a MEMS Pressure Sensor"

This research describes design and development of an MCM MEMS pressure sensor package. The low profile (0-50 psia) packaged module contained the silicon MEMS pressure sensor die designed based upon piezoresistive principle and had footprint of 2.3 mm times 2.3 mm with a thickness of 0.5 mm. The sensor was integrated with an application specification integrated circuit (ASIC) chip (MAX 1452trade from MAXIMreg) in an MCM configuration designed on a 75 mum polymer substrate (Upilextrade). The flex substrate was first passivated with 4 mum layer of BCB followed by Ti-Cu-Ti sputtering and selective electroplating of Ni and Au to define the required conductor pattern. The electrical connections from the sensor and ASIC chips to the flex circuitry were performed by thermosonic wire bonding. The wire bonds were secured in place by a glob top encapsulant. Ribbon cables having conductor size of 36 AWG served as input-output (I/O) connections from the package to the outside environment. The I/O cables were solder attached on to the flex circuitry and eventually encapsulated with an electrically non-conducting epoxy, thereby ensuring a strong mechanical joint. The cable attached flex circuitry loaded with sensor and ASIC dies were attached to a custom machined metal base using a suitable epoxy. Finally, the whole package was adhesively capped using a meshed lid. The final package had an outside diameter of 8 mm and a total height of 1 mm. This package can be implemented in a range of applications from aerospace to biomedical environments. Reliability tests (thermal shock and temperature cycling) were performed on the packaged devices. The stressed sensor package revealed excellent robustness with no signs of physical damage. As part of initial qualification on the packaged module to test its electrical functionality characteristics, units packaged with only the 'sensor' device were subjected to controlled pressure conditions. The output result showed perfect linear response o- f voltage in accordance to change in pressure. These initial tests underlined the feasibility of an MCM approach for integrating a sensor with an ASIC chip for low profile package designs. [C658]

"Ultrafast Optoelectronic Switching of an Optically Clocked Transistor Array"

We investigate the design and optimization of an optically clocked transistor array (OCTA) OEIC for highspeed serial-to-parallel and parallel-to-serial conversion of asynchronous burst optical packets. >100-Gb/s switching operation is achieved in a proof-of-principle demonstration. [C659]

"Evaluating Xen for Router Virtualization"

In this paper, we evaluate the performance of a software IP router forwarding plane inside the Xen virtual machine monitor environment with a view to identifying (some) design issues in Virtual Routers. To this end, we evaluate and compare the forwarding performance of two identical Linux software router configurations, run either above the Xen hypervisor or within vanilla Linux. Even with minimal sized packets, we show that the Xen DomO privileged domain offers near native forwarding performance at the condition that the solicitation to unprivileged domains stay minimal, whereas Xen unprivileged domains offer very poor performance in every cases. This shows that an important design principle for virtual router platforms must be to handle all forwarding, for all virtual routers, onto the same forwarding engine, in order to avoid much detrimental per-packet context switching. [C660]

"Performance Analysis of Anti Aiming Noise AM Jamming for Pseudo-random Code Phase Modulation and PAM Combined Fuze"

The performance of anti aiming noise AM jamming for the pseudo-random code phase modulation and PAM combined fuze is discussed in this paper. First, the principle of the combined fuze is introduced briefly, then, the signal to jamming ratio (SJR) and SJR gain of its receiver are deduced in detail when there exists the aiming noise AM jamming. Finally, its performance of anti aiming noise AM jamming is analyzed. The results show that the combined fuze not only has stronger performance of anti aiming noise AM jamming, but the performance can be improved further through designing appropriate parameters such as pseudo-random code period, code-element width and high frequency pulse width. [C661]

"Experimental demonstration of cross-order arrayed waveguide grating triplexer"

Experimental results on a cross-order arrayed waveguide grating triplexer for fiber-to-the-home applications are presented. The cross-order design allowed us to fabricate compact devices of a size of only 19 mm times 1.6

mm. The measured spectra confirmed the operation principle of the device. [C662]

"Design of a [CDC-20 GHz] buffered track and hold circuit in InP DHBT technology"

This paper describes the design and realization of a buffered track and hold (BTH) circuit fabricated in InP-InGaAs-InP double heterojunction bipolar transistor (DHBT) technology (FT= 180 GHz). This BTH is intended for a single shot, 20 GHz bandwidth and 40 GS/s sampling frequency digitizer based on the non simultaneous spatial sampling principle. Based on a high speed switched emitter follower (SEF), the BTH can ensure 20 GHz bandwidth signal compatible with the targeted objectives. First experimental results in the frequency domain and a novel optimized architecture leading to a combination between the SEF and the Cherry Hooper design based buffer are also presented. [C663]

"The breakthrough of specialty fiber fabricated by PCVD based process"

In this paper, the principle of PCVD process was introduced briefly. The material composition and structure design combining with waveguide design of PCVD preform were analyzed. Besides, the application, key features and advantages of some specialty fibers fabricated by PCVD process were introduced. [C664]

"Stereo viewing zone in autostereoscopic display based on parallax barrier"

A well-designed autostereoscopic display based on parallax barrier can produce high-quality stereo images without crosstalk in the stereo viewing zones. The concept of stereo image quality factor was defined to indicate the stereo viewing zone of the display. The stereo viewing zone was analyzed using geometry principle. Simulated program was developed to calculate the stereo viewing zone. The calculated results of an autostereoscopic display monitor were given and the stereo viewing zone was obtained by defining threshold value of stereo image quality factor. [C665]

"Materials Science-based Device Performance Engineering for Metal Gate High-k CMOS"

Advanced CMOS engineering strongly requires materials science-based technology in addition to (rather than) demonstrating exotic non-planar device structures and/or various smart integration techniques. This paper describes typical examples of materials-related device engineering in metal gate/high-k CMOS developments, focusing on basic issues such as EOT scalability with higher-k, an inversion layer mobility degradation mechanism and the V_{TH} tuning principle. These considerations will be key to designing high performance CMOS. [C666]

"A 180°,B° Phase Shifter With Small Phase Error for Broadband Applications"

In commonly used multi-bit high-/low-pass phase shifters, the phase error is mostly due to the first bit, which provides the 180deg phase shift. This paper explores the design of a 180deg phase shifter that combines a high-pass filter with a transmission line to reduce the phase error over a large bandwidth. Compared to the conventional high-/low-pass phase shifter, the proposed phase shifter shows better performance in both phase error and amplitude balance over a broad bandwidth. To illustrate the principle, a 180deg phase shifter using this topology is designed, fabricated and measured. The phase error is measured to be plusmn2deg, plusmn3.5deg and plusmn4.5deg over a bandwidth of 31.8%, 43.4% and 49.3% respectively. The measured amplitude imbalance of the two branches is within 0.4 dB from 840 to 1310 MHz and the return loss is found to be better than 17 dB inclusive of the effect of the switches and the discrete components. [C667]

"Refractive Gauss-to-Tophat Beam Shapers Improve Structure Quality and Speed in Micro-machining"

The transformation principle of a Gaussian beam into a homogeneous top-hat profile by means of free-form refractive micro-optics is reviewed. Various flat-top profiles achieved with different laser sources as well as micro-machining results are demonstrated. [C668]

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The transformation principle of a Gaussian beam into a homogeneous top-hat profile by means of free-form refractive micro-optics is reviewed. Various flat-top profiles achieved with different laser sources as well as micro-machining results are demonstrated. [C669]

"A Novel Piecewise Linear Slope Compensation Circuit in Peak Current Mode Control"

To solve the excessive compensation problem that affects the performances of the peak current mode (PCM) controlled converter system, a novel slope compensation circuit named piecewise linear slope compensation was proposed, which provides compensation signals with different slopes according to different duty cycles. The design principles were introduced and the practical circuit was composed and optimized at length. The piecewise linear slope compensation circuit was designed and simulated in 1.5 μm HV BCD process. Simulation results were consistent with expectations well, which showed that the circuit has greatly improved the output current capacity and transient response of the DC/DC power supply system. [C670]

"New Design Method for a Dual band Waveguide Iris Polarizer"

In this paper, we present new design method for a square iris polarizer to be used in dual-band (Ka-band; 20.8 ~ 21.2 GHz, 30.6 ~ 31 GHz) antenna feeds. To act principles for a square iris polarizer, design concept, design method are proposed and Ka-band polarizer is designed using the commercial software HFSS. The designed polarizer has less than 30 dB return loss and less than 0.3 dB axial ratio in all operation band. [C671]

"A Dipole-disk Antenna with Equal Beamwidths"

A novel method of radiation pattern shaped of dipole-disk antenna by adding a hemisphere conductor is proposed in this paper. The improved dipole-disk antenna has identical beamwidths in E- and H-plane, while its profile does not increase. A model of this antenna is built, stimulated and optimized by a commercial software Ansoft HFSS. Numerical analysis based on stimulation results is made and the design principles involved are described. [C672]

"A Low-Power AC/DC Rectifier for Passive UHF RFID Transponders"

The operating principle of typical MOSFETs AC/DC rectifier is introduced in this paper. In order to maximize the operating range of RFID transponder, low-power design techniques are needed. Therefore, the key design parameters optimization of passive rectifier is discussed. Besides, the design of a low-power rectifier for passive UHF RFID transponder, which is compatible with standard CMOS process and can be applied to the environment in which the distance from interrogator changes greatly, is also presented in this paper. Measurement results showed that if a 510 kilo-ohm resistance is added at the rectifier output and 4 W EIRP interrogator transmit power, the rectifier can output 1.6 V to 2 V DC voltage, the minimum RF input power is about 230 μW corresponding to a reading distance of 3.45 m. [C673]

"Simulation of Beam-Wave Interaction for Millimeter Wave Coupled-Cavity Traveling Wave Tube Using PIC"

A method of particle-in-cell (PIC) has been introduced to simulate beam-wave interaction of millimeter wave coupled-cavity traveling wave tube (TWT). The principle of PIC was analyzed theoretically. Both the move track of particles of electron beam and the change of electric field were simulated before and after beam-wave interaction with our self-designed PIC software. The simulation results show that dynamic beam-wave interaction of millimeter wave TWT can be expressed accurately using PIC, which may provide guidance for the research of beam-wave interaction of TWT. [C674]

"Reverberation chamber for accurate antenna measurements within 2-30 GHz"

Reverberation chambers are widely used for antenna measurements, primarily mobile terminal antennas around 1-2 GHz. Reverberation chambers for higher frequencies are rare. This paper presents a reverberation chamber designed for accurate antenna measurements within 2-30 GHz. Design principles and tradeoffs are presented, as well as verification tests and resulting measurement accuracy. [C675]

"Development of miniature LTCC filter for TV broadcasting band by using substrates of mixed dielectrics"

Novel design opportunities for microstrip bandpass filters built by using layered substrates of mixed ceramic dielectrics having different permittivities are investigated on the example of a filter for UHF band. The possibilities to enhance and control the rejection band characteristics are demonstrated based on FDTD simulations and lumped element equivalent circuits. A miniature LTCC-filter of (3.6times2.8) mm² size is presented. Measurements of the filter prototypes fabricated by using the multilayer LTCC technology have confirmed the design principles with good agreement. [C676]

"Four-square phased array for multi-beam applications using novel matrix feed"

Modern communications systems use multi-beam antennas for the sectorization of 360deg azimuthal coverage or diversity and MIMO concepts. One suitable antenna realization is based on the phased array principle, where four elements placed at the edges of a square are required in order to form four overlapping beams in azimuth. In its basic form, excitation phases of 0deg, 90deg and 180deg are required for beam forming. The paper presents a novel multi-beam matrix network created by four 90deg-hybrid couplers which realizes the required excitation for four beams spaced by 90deg in the azimuth plane. A proof-of-concept antenna was designed which employs miniature surface-mount couplers in a microstrip feed network and uses vertical monopole radiators. [C677]

"A systematic way to YIG-filter-design"

YIG-filters are key components in microwave test and measurement instruments. Whereas their basic principles are well established, only few details about the design and realization of modern multi-octave filters have been published. Therefore, research and development to find a systematic and accurate way of calculating and reproducibly building modern YIG-filters has been initiated at Rohde & Schwarz. This enables us to obtain a profound understanding and control of parameters and overcome empirical methods of manual rework. [C678]

"Tri-band and dual-polarized antenna based on composite right/left-handed transmission line"

Relaxing the composite right/left-handed (CRLH) balance condition enables arbitrary tri-band CRLH resonant devices. This paper presents a tri-band and dual-polarized antenna based on this principle. The proposed CRLH antenna operates in the transversally-polarized zeroth order (ZO) shunt mode ($n = 0$) and in the two longitudinally-polarized half-wavelength (HW) modes ($n = \pm 1$). Explicit synthesis formulas are given for the CRLH tri-band operation. A specific microstrip design using MIM (metal-insulator-metal) series capacitors and shunt stub inductors is demonstrated. In this design, the three resonant modes $n = -1$, $n = 0$ and $n = +1$ exhibited similar input impedances (allowing a simple feeding structure), radiation patterns and efficiencies/gains. [C679]

"A Microstrip Bandpass Filter with an Electronically Reconfigurable Transmission Zero"

This paper presents a type of two-pole microstrip bandpass filter with one reconfigurable transmission zero. The couplings between the resonators and the non-resonant nodes are used to generate the transmission zero. The desired tunability of the transmission zero is realized by changing the center frequencies of the two resonators. In the practical designs, varactors are employed to shift the center frequencies of the resonant node. To verify the working principles, filters implementing the proposed topology are fabricated and measured. Good results have been obtained [C680]

"Optimization of a Multi-port Amplifier Using a Least Squares Evolutionary Relaxation Method"

A satellite designed for mobile telecommunications applications may contain a large aperture reflector fed by an array at its principle focus. Each radiator element of the array has a one-to-one correspondence with a spot on the earth, so that radiation patterns are pointed at different locations on the Earth by different combinations of elements. Before the signals arrive at the array with their specified complex weights they must undergo amplification. This can be provided by a beam forming network composed of between 10 and 20 multiport amplifiers (MPA). The object of this paper is to describe an optimization method that will improve the performance of the beam forming network [C681]

"A Compact 90-degree Twist using Novel Ridged Waveguide for Integrated Waveguide Subsystems"

A compact waveguide twist using a single step of novel ridged structure for integrated waveguide subsystems is proposed. The cross-section of the ridged waveguide has the shape of two squares partially overlapped. The advantages of this configuration are the facilitation of manufacturing and the reduction of overall dimensions. In this paper, the broadband operation principle is described by using equivalent circuit, moreover the its design using HFSS and the experimental results are presented. In the result, the return loss in excess of 30dB could be obtained over 22 percent of frequency band without additional waveguide steps. The twist length is 0.22 times the wavelength of the standard rectangular waveguides [C682]

"An implementation of an ultrasonic device for the visually impaired"

This paper describes a simple and inexpensive but yet reliable ultrasonic device to help the visually impaired to

detect objects several meters away. There are a number of ways to design a device employing ultrasonic principles. In our approach the detection produces a change of duty cycle in the received signals, and then it is converted into a variable frequency, and eventually the user is alerted by the sound from a buzzer. The transmitter sends a continuous 40 kHz signal without modulation. The reflected ultrasonic signal collected by the receiver is very weak, and thus it needs to be amplified and rectified. Two Peripheral Interface Controllers (PICs) are employed in this design. [C683]

"Unattended Ground Sensor System Based on Fiber Optic Disk Accelerometer"

The basic principle and critical characteristics of unattended ground sensors (UGS) based on fiber optic disk accelerometers are introduced. Mechanical principles of fiber optic disk accelerometers (FODA) and calculation methods are presented. An FODA with a high sensitivity of 120 rad/g and a resonance frequency of 300 Hz is designed and used for detection in military affairs [C684]

"Terrestrial Concentrator PV Modules Based on GaInP/GaAs/Ge TJ Cells and Minilens Panels"

This paper is a description of research activity in the field of cost-effective modules realizing the concept of very high solar concentration with small-aperture area Fresnel lenses and multijunction III-V cells. Structural simplicity and "all-glass" design are the guiding principles of the corresponding development. The advanced concentrator modules are made with silicone Fresnel lens panels (from 8 up to 144 lenses, each lens is 4times4 cm² in aperture area) with composite structure. GaInP/GaAs/Ge triple-junction cells with average efficiencies of 31.1 and 34.7% at 1000 suns were used for the modules. Conversion efficiency as high as 26.3% has been measured indoors in a test module using a newly developed large-area solar simulator [C685]

"Fully Functional "Real Time" Non-Linear Device Characterization System Incorporating Active Load Control"

This paper demonstrates, for the first time, a fully functional "real time" large signal characterization system; achieved by successful integration of a large signal multi-tone waveform measurement system with active load-pull based on the envelope load-pull principle. This approach allows for the utilization of slowly modulated signals to provide rapid and improved large signal device characterization capabilities. For example, the power amplifier is a key component in many systems; the successful design of which is reliant on the availability of comprehensive non-linear measurement data of the transistors utilized. Unfortunately, non-linear device measurements are both complex and generally very time consuming to perform, hence design is often based on a limited data set. Performing non-linear measurements under slowly modulated conditions could considerably speedup the measurement of non-linear device performance. However, to date these measurements approaches have only been possible in passive load-pull systems. The solution presented here overcomes this major limitation. A number of measurements are demonstrated showing both the present utilization and future potential of this approach to rapidly provide the comprehensive measurement data sets needed for accurate, cost and time efficient power amplifier design [C686]

"High-Efficiency CdTe and CIGS Thin-Film Solar Cells: Highlights and Challenges"

Thin-film photovoltaic (PV) modules of CdTe and Cu(In,Ga)Se₂ (CIGS) have the potential to reach cost-effective PV-generated electricity. These technologies have transitioned from the laboratory to the market place. Pilot production and first-time manufacturing are ramping up to higher capacity and enjoying a flood of venture-capital funding. CIGS solar cells and modules have achieved 19.5% and 13% efficiencies, respectively. Likewise, CdTe cells and modules have reached 16.5% and 10.2% efficiencies, respectively. Even higher efficiencies from the laboratory and from the manufacturing line are only a matter of time. Manufacturing-line yield continues to improve and is surpassing 85%. Long-term stability has been demonstrated for both technologies; however, some failures in the field have also been observed, emphasizing the critical need for understanding degradation mechanisms and packaging options. These two thin-film technologies have a common device/module structure: substrate, base electrode, absorber, junction layer, top electrode, patterning steps for monolithic integration, and encapsulation. The monolithic integration of thin-film solar cells can lead to significant manufacturing cost reduction compared to crystalline Si technology. The CdTe and CIGS modules share common structural elements. In principle, this commonality should lead to similar manufacturing cost per unit area, and thus, the module efficiency becomes the discriminating factor that determines the cost per watt. The long-term potential of the two technologies require R&D emphasis on science and engineering-based challenges to find solutions to achieve targeted cost-effective module performance, and in-field durability. Some of the challenges are common to both, e.g., in-situ process control and diagnostics, thinner absorber, understanding degradation mechanisms, protection from water vapor, and innovation in high-speed processing and module design. Other topics are specific to-the technology, such as lower-cost and fast-deposition processes for CIGS, and improved back

contact and voltage for CdTe devices [C687]

"Strained-Silicon as New High-Speed Technology"

In the report we consider the basic prospects of development of strained-silicon technology in a communication facility, designs and principle of action MOSFET and the better hetero bipolar transistor (HBT) for wireless integrated circuit (IC), which working on frequencies of exceeding 350 GHz, analyze and compare performance data of HBT with GaAs and SiGe [C688]

"Polarization Control via Tunable Nano-Structures in PDMS"

We propose a compact and low-cost design for polarization control using tunable form-birefringence on PDMS nanostructures fabricated by nano-imprint lithography (NIL). The operation principle is demonstrated in a fabricated device by changing the nanostructure electrostatically [C689]

"Low loss arrayed waveguide grating with mode converters designed by wavefront matching method"

We propose a novel mode converter designed with the wavefront matching method for suppressing the mode transition loss in an arrayed waveguide grating multiplexer. We fabricated and examined the multiplexer, and confirmed the loss reduction principle [C690]

"Need-oriented waveguide design based on wavefront matching method"

The wavefront matching method provides us with a new way to obtain the optimum shape for waveguides used in planar lightwave circuit devices. This presentation reviews the principle behind the method and shows its usefulness with some experimental results. [C691]

"Q band duplexer design based on LTCC technology"

This paper reports on a LTCC (low-temperature cofired ceramics) Q band waveguide duplexer. It is designed and optimized applying a segmented approach combining a hybrid method coupling EM simulations and circuit analyses. Filter experimental behavior validates LTCC for Q band application. Duplexer theoretical performances are encouraging and validate the principle of feasibility [C692]

"Compact Diplexer Design Using Different E-Plane Triplets to Serve Contiguous Passbands with High Interband Selectivity"

An advanced compact E-plane triplet cavity arrangement is introduced to provide either the implementation of transmission zeros (TZs) above or below of a filter passband. The principle configuration allows the realization of inductive (TZ above passband) and capacitive (TZ below passband) irises to accommodate with the respective sign conventions for the filter couplings. This general triplet cavity structure is applied to a compact diplexer design using 6th order filters with asymmetric responses at 10GHz. Each filter consists of two cascaded triplets controlling independently two TZs close to one side of the passband to satisfy the high interband selectivity of the contiguous receive and transmit bands. The overall design concept has been proven by the realization of the diplexer. Good agreement of computed and measured results are obtained. Moreover, the comfortable margins regarding the requirements admit of production without the need of any tuning [C693]

"RF-MEMS Switched Varactor for High Power Applications"

A new kind of MEMS switched varactor has been developed to handle high power RF signals, ($P > 1W$), at S and X-band. The design principle is presented, as well as measurements results featuring an analysis of the reliability tests. The fabricated varactors have shown a capacitance ratio of 7-8 at 5 GHz and good performances reproducibility while undergoing 1 billion cycle tests under an input RF power of 1W @ 10GHz, and 250 million cycle tests under 5W @ 3GHz, both in hot switching conditions, without visible degradation [C694]

"Formation of Magnetoelectronic Integral Devices using the Γ, B «System on Chip» Principle"

Considered in this paper are peculiarities of creating magnetic sensitive ICs on the basis of anisotropic magnetoresistive converter. The examples listed demonstrate the possibility of practical realization. It is shown that creation of magnetic sensitive intellectual ICs using "system on chip" technology is actual and expedient. Such an approach allows keeping the experience in creation of new systems, reducing design cost, and increasing functionality. Simultaneously the problem is solved regarding enhancement of the basic technical

characteristics of magnetic controlled devices. Weight and power consumption are reduced, reliability is increased considerably. Electronic chips, combining the functions of measurement, computation and communication, may become the basis for creation of distributed self-aligning systems [C695]

"Architecture for interoperability and reuse in data mining systems"

Data mining systems are mainly built to assist users to automatically abstract useful information from large data sets. Thus, they often lack supports for other important practical considerations commonly used in software development (e.g., ease of software modification and maintenance, and portability of resulting models). This paper studies principles for the development of data mining systems from software engineering perspectives. In particular, we propose a framework architecture that provides four desirable characteristics: extensibility, modularity, flexibility and interoperability. The architecture utilizes a design pattern called Pipes and Filters together with data replication to provide loosely coupled structures for the systems. It also facilitates interoperability and reusability of the resulting predictive models obtained from the mining process by means of appropriate interface mechanisms. The proposed architecture promises important advantages that can enhance the usability of data mining systems. [C696]

"Development and Analysis of Interval Detection Algorithm Invariant to Signal Energy Frequency Distribution"

Developed is an interval energy detection algorithm that decides on analyzing several spectral ratios obtained by means of DFT. To reduce the spectrum spreading used is a method based on the invariance principle application, alternative to the time weighing method. The algorithm obtained ensures detection probability invariance to the signal energy frequency distribution. [C697]

"Fusion of Visible and Thermal Images Using Support Vector Machines"

Both in military and civilian applications, an increasing interest is being shown in fusing infra-red and visible images. In this paper, we propose a novel pixel-based infra-red and visible image fusion algorithm exploiting discrete wavelet frame transform (DWFT), kernel principle component analysis (K-PCA) and support vector machine (SVM). Strong characteristics of DWFT such as translation invariant signal representation and directional selectivity add additional support to fusion process. K-PCA exploits the low frequency features mainly attributed from infra-red image, while SVM, on the other hand, exploits detail regions. Evaluations of the proposed technique through an image database show that the proposed method gives promising results both objectively and visually. [C698]

"Cryptographic transitions"

A cryptographic transition is defined as managing the passage from one security architecture to another in a methodical approach that is consistent with prudent business practices and security guidelines. This paper addresses the three technology issues that drive the business and security justifications for initiating a transition; the principles guiding policy and practices when conducting a transition; the process to conduct a successful transition; and provides the pros and cons of several actual case studies of cryptographic transitions. [C699]

"Project Resolution; Reconfigurable Systems for Mobile Local Communication and Positioning"

The aim of RESOLUTION project is developing of a wireless three-dimensional (3D) local positioning system with resolution in the centimetre regime and real-time ability. The system is intended to work in environment with strong multipath effects and fading. The solution will be implemented in advanced CMOS technology. Main project goals are: development of a wireless 3D high accuracy local positioning system, a novel frequency modulated continuous wave (FMCW) radar principle with pulsed active reflector will be employed, positioning system will be implemented on basis of common WLAN systems, to allow multifunctional tasks, highly integrated system on chip (SoC) frontends will be designed on advanced CMOS technology, smart power and adaptive performance control will be applied to minimize the power consumption according to application needs, in order to enhance the performance and coverage range, the transceiver features adaptive antenna combining in the radio frequency (RF) receiver. [C700]

"Wideband Vector Network Analyzer Design by Multisixport Principle"

Paper presents simple sixport principle and its frequency bandwidth. The novel multisixport approach is presented with its possibilities, typical parameters and frequency bandwidth more than 1:100 if necessary. [C701]

"Extended composite right/left-handed (E-CRLH) metamaterial and its application as quadband quarter-wavelength transmission line"

A novel extended composite right/left-handed (E-CRLH) transmission line (TL) metamaterial structure, constituted by the combination of the conventional CRLH (C- CRLH) and the recently introduced dual CRLH (D-CRLH) prototypes, is proposed. This E-CRLH metamaterial is characterized by eight LC parameters (four C-CRLH and four D-CRLH parameters), which allow unprecedented diversity in the manipulation of the dispersion relation of the resulting TL structure. In particular, an E-CRLH TL metamaterial, under an extended balance condition, exhibits two frequencies of infinite wavelength propagation. In addition, the E-CRLH is intrinsically a quadband (arbitrary quadruplet of frequencies) structure. The latter property is exploited here into the design of a quadband quarter- wavelength transformer, and may be applied in principle to any TL-based microwave component. [C702]

"Development of an MCPA using digital pre-distortion for digital terrestrial TV broadcasting"

This article describes development and construction of an evolutionary MCPA (multi-channel power amplifier) using digital pre-distortion for digital terrestrial TV broadcasting. In this equipment, a wide-band of 50 MHz and over, is produced by using a high-speed A/D and D/A converter with a sampling frequency of 200 MHz and more. We also developed a new method that detects PA distortion by adding the RF output signal and inverted RF input signal to reduce the dynamic range and new algorithm to compensate with a high speed. Using these new methods, we obtained IMs of -50 dB and under with multiple channel inputs and much higher efficiency than conventional ones. This technology also can be applied for designing amplifiers in the GHz band because its theory of principle does not depend on operating frequencies. [C703]

"Modeling in the Bioimpedance Measurement Techniques Using General-Purpose Software"

In this paper, implementation of general-purpose software for PC-modeling of bioimpedance (BI) measurement systems is described. The main attention is turned to a novel multi-channel system, measurement principles and general schematic solution of which are introduced. It is pointed out that general-purpose software is a cheap and flexible tool for system-level behavioral simulation of BI measurement systems. It can be an alternative to the use of special modeling software at the first stage of study and design in the BI measurement techniques [C704]

"Simplified Robotics Avionics System: A Integrated Modular Architecture Applied Across a Group of Robotic Elements"

The latest NASA initiative for Human Space, namely the Space Exploration Vision, which encompasses Project Constellation, provides new opportunities for system implementation. The second wave of development after Crew Exploration Vehicle and Crew Launch Vehicle development, and following Shuttle retirement, will be development of lunar base concepts and operations leading to early robotic missions. The current vision for lunar base implementation anticipates that there will be highly integrated robotic pre-construction operations and robotic assistants for the astronauts. In preparation for this robotics involvement, there is a series of robotic precursor missions to the Moon and Mars. Historically, many humans are required to control a single robot; in practice the Mars Exploration Rovers require a staff of approximately 70 to support continual operation of a single robotic rover. In addition robotic avionics has typically been customized for each robot. While this has been effective for prior robotic missions, the habitation and exploration of the Moon and Mars requires many robots working in tandem with humans. The limited NASA budget to implement the Space Exploration Vision requires that multiple robots be commanded by a minimal operations staff and that a common set of avionics electronics be used across the multitude of robots needed. Traditional robotic avionics do not address either the additional autonomy or commonality required by this new set of robotic missions. One solution to address these concepts is to apply a Honeywell patent pending architecture that uses an integrated modular avionics (IMA) approach across a multiplicity of robots. This concept treats a group of robotic elements as a single system. Instead of each robot having a separate avionics system, a single shared avionics system will be deployed across the robots. This sharing would be implemented using an IMA system approach with each element of the robotic system being connected using a-- Virtual Backplanetrade. The IMA approach is a next generation avionics architecture where each element knows when an internal failure occurs and removes itself from the system. IMA utilizes a fail passive design that communicates to a COTS backplane for input/output and to the aforementioned Virtual Backplanetrade for intra-system communication. Each robot implements either single or multiple hardware-enhanced ARINC-653 software partitions. Together these partitions form a single system that provides the simplicity of a simplex system; implements the highest levels of reliability; provides the flexibility to easily reconfigure both software applications and hardware interfaces; allows for rapid prototyping using low-cost COTS hardware; and is easily expandable beyond the initial point implementation. The avionics for each robot interfaces to the local sensors and effectors. The high-level control of the robot may be local or may reside on

another robot, a group of robots, or a remote base station. From a system standpoint, control of multiple robots is viewed as a single system with multiple components as opposed to multiple individual systems interacting together. The system level control could include redundant elements spread across multiple robots depending on the level of fault tolerance and reliability that is required. The robotic system could also be dynamically reconfigured when multiple elements (robot assistants, robotic vehicles) join or leave the system, adjusting to changing mission needs. The application of IMA principles to robotics applications provides an infrastructure that has been demonstrated to reduce cost, schedule, and risk throughout the life of the program. In addition, this infrastructure provides the means for applying new approaches to solving problems such as multi-robot collaboration [C705]

"Analysis Shaping and Decryption principle of the Information Digital Packet Words at Transmission of the Signal on Cable Network of the Power Supply 6,3 kV with Insulated by Neutral Wire"

To dispose of wrong decryption of the code word, sent on network of supply, the coding and decryption methods was designed, under which hindrance can be not perceived, as start-bit of the next machine word [C706]

"Open Source On-Chip Logic Analyzer for FPGA-s"

In this paper, principles of an FPGA internal logic analyzer are presented. The analyzer code is written in VHDL and inserted into design at the source description level. This allows to keep it independent of used design software and FPGA architecture. This analyzer was created under GPL license so that everyone can use and modify it. First, the existing commercial tools are described in brief. Then the architecture of the created analyzer is described. It is shown that this kind of a logic analyzer is small enough to fit inside smaller modern FPGA-s and that it runs fast enough to be used in wide range of designs, In addition, possible improvements are described [C707]

"Gate Leakage vs. NBTI in Plasma Nitrided Oxides: Characterization, Physical Principles, and Optimization"

Since nitrided oxides improve gate leakage at the expense of NBTI, one must optimize nitrogen concentration in oxinitride samples for reliable performance and reduced power dissipation. Here, we analyze wide range of NBTI stress data to develop a predictive model for gate leakage and first self-consistent model for field acceleration within R-D framework. This model anticipates a novel design diagram for co-optimization of leakage and NBTI for arbitrary nitrogen concentration and effective oxide thickness [C708]

"1 nm NiSi/Si Junction Design based on First-Principles Calculation for Ultimately Low Contact Resistance"

This paper studies the Schottky barrier height (SBH) modulation effect induced by dipoles generation at the nickel silicide (NiSi)/silicon (Si) interface, based on first-principles calculations. Dipole comforting SBH is dramatically reduced to 0.1 eV in 1 nm region around the interface for the case of B atoms substituted for Si atoms. The results suggest that NiSi with appropriate dopant preparation is a plausible electrode material for ultimately small p-MOSFETs [C709]

"Design and Realization of Micro Fiber Spectrometers for Bioluminescence Detecting Systems' Stray Light Detection"

The paper concerns about the principle and the optimizing design method for optical system of micro fiber spectrometer, which suits for stray light detection of bioluminescence detecting systems. By choosing asymmetrical crossed czerny-turner (CZ) configuration as the basic optical structure and selecting system parameters according to the allowance of system's aberrations and the dimensions of CCD detector, we developed a micro fiber spectrometer based on planar grating with a working wavelength range between 330 nm and 930 nm. system's spectral resolution is up to at least 0.5 nm according to actual measurement (50 μ m). [C710]

"Novel optical mux-demux module for fiber-optic communication applications"

We demonstrated a novel design for a multi channel optical MUX/DEMUX module, which uses the principle of a Cassegrain-telescope. We carried out some optical simulations to show the feasibility to build up a multiplexer or de-multiplexer module for Dense Wavelength Division Multiplexing (4 channels). The set-up consists of a concave mirror that receives different beams which are then focused at the centre. For the case of a MUX-

module, different radial positions enable injecting the system different wavelength inputs as the concave mirrors concentrates all the beams in one point (collector fibre). Moreover, for the case of a DEMUX-module, a bulk grating is positioned at one point between the concave mirror and the focal point of it, and when a stream of pulses with different wavelengths reaches this point, it automatically distributes the incoming signal in different radial positions (several collector fibers). [C711]

"Overview of Real-Time Database Management System Design for Power System SCADA System"

A supervision control and data acquisition (SCADA) system is a communication and control system used for monitoring, operation and maintenance of energy infrastructure grids. Compared with traditional applications, a SCADA system has a harsh deadline for critical tasks. There is special time constraint for the real time database used in a SCADA system. The real time database in SCADA extends traditional database to include in-memory database. Such real time database management are designed to operate in the harsh environment of real-time systems, with strict requirements for resource utilization, and are ready to provide the performance and reliability required by real-life applications. In this paper, the main principle of real time database has been introduced. Its implementation in power system SCADA is discussed and a sample database is briefly introduced [C712]

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