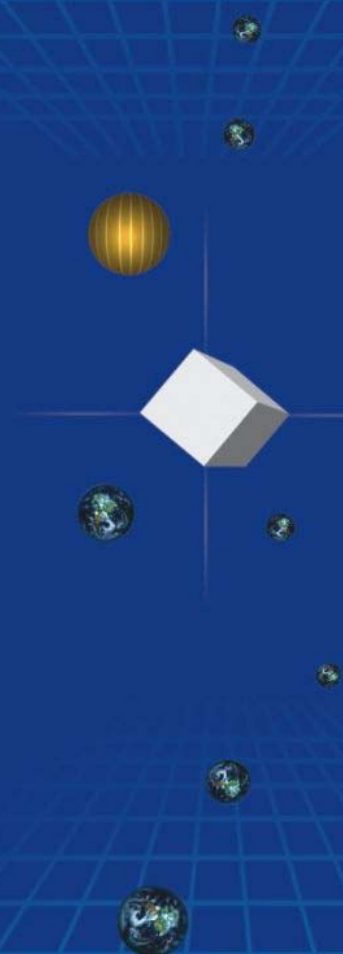


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## FPGA Implementation of FFT Algorithm for OFDM Based IEEE 802.16d (Fixed WiMAX) Communications

K. Harikrishna, T. Rama Rao, and Vladimir A. Labay

**Abstract**—The IEEE 802.16d communication standard uses orthogonal frequency division multiplexing (OFDM). In the widely used OFDM systems, the fast Fourier transform (FFT) and inverse fast Fourier transform pairs are used to modulate and demodulate the data constellation on the sub-carriers. In this paper, a high level implementation of a high performance FFT for OFDM modulator and demodulator is presented. The design has been coded in Verilog and targeted into Xilinx Spartan3 field programmable gate arrays. Radix-2<sup>2</sup> algorithm is proposed and used for the OFDM communication system. The design of the FFT is implemented and applied to fixed WiMAX—IEEE 802.16d communication standard. The results are tabulated and the hardware parameters are compared. The proposed architecture is least in number of multipliers used and the memory size, and second to the least in number of adders used.

**Index Terms**—Fast Fourier transform, orthogonal frequency division multiplexing, radix conversion, Verilog.

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## A Learning Automata Based Area Coverage Algorithm for Wireless Sensor Networks

Habib Mostafaei, Mohammad Reza Meybodi, and Mehdi Esnaashari

**Abstract**—One way to reduce energy consumption in wireless sensor networks is to reduce the number of active nodes in the network. When sensors are redundantly deployed, a subset of sensors should be selected to actively monitor the field (referred to as a “cover”), whereas the rest of the sensors should be put to sleep to conserve their batteries. In this paper, a learning automata based algorithm for energy-efficient monitoring in wireless sensor networks (EEMLA) is proposed. Each node in EEMLA algorithm is equipped with a learning automaton which decides for the node to be active or not at any time during the operation of the network. Using feedback received from neighboring nodes, each node gradually learns its proper state during the operation of the network. Experimental results have shown that the proposed monitoring algorithm in comparison to other existing methods such as Tian and LUC can better prolong the network lifetime.

**Index Terms**—Area coverage, energy-efficiency, learning automata, wireless sensor networks.

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## Design of Enterprise Storage Architecture for Optimal Business Continuity

Rekha Singhal, Prasad Pawar, Shreya Bokare, Rashmi Kale, and Yogendra Pal

**Abstract**—This paper presents a solution for optimal business continuity, with storage architecture for enterprise applications, which will ensure zero data loss and quick recovery. The solution makes use of Internet protocol storage area network (IPSAN), which is used for data management without burdening the application server, as well as mix of synchronous and semi-synchronous replication techniques to replicate data to remote disaster recovery site. We have presented the detailed design of both synchronous and semi-synchronous with case study of using open source database postgres to prove our point for optimal business continuity. The theoretical presentation is also given for the same.

**Index Terms**—Business continuity, disaster recovery, Internet protocol storage area network, semi- synchronous replication, synchronous replication.

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## Parametric Evaluation of Video Motion Tracking Data Sets

Mukesh Motwani, Rakhi Motwani, and Frederick Harris, Jr

**Abstract**—Video tracking is a complex problem because the environment, in which video motion needs to be tracked, is widely varied based on the application and poses several constraints on the design and performance of the tracking system. Current datasets that are used to evaluate and compare video motion tracking algorithms use a cumulative performance measure without thoroughly analyzing the effect of these different constraints imposed by the environment. But it needs to analyze these constraints as parameters. The objective of this paper is to identify these parameters and define quantitative measures for these parameters to compare video datasets for motion tracking.

**Index Terms**—Benchmarking, datasets, design, metrics, video tracking.

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## Performance Comparison of DCT and VQ Based Techniques for Iris Recognition

H. B. Kekre, Tanuja K. Sarode, Vinayak Ashok Bharadi,  
Abhishek A. Agrawal, Rohan J. Arora, and Mahesh C. Nair

**Abstract**—Iris recognition enjoys universality, high degree of uniqueness and moderate user co-operation. This makes iris recognition systems unavoidable in emerging security & authentication mechanisms. An iris recognition system based on vector quantization (VQ) techniques is proposed and its performance is compared with the discrete cosine transform (DCT). The proposed system does not need any pre-processing and segmentation of the iris. We have tested Linde-Buzo-Gray (LBG), Kekre's proportionate error (KPE) algorithm and Kekre's fast codebook generation (KFCG) algorithm for the clustering purpose. Proposed vector quantization based method using KFCG requires 99.99% less computations as that of full 2-dimensional DCT. Further, the KFCG method gives better performance with the accuracy of 89.10% outperforming DCT that gives accuracy around 66.10%.

**Index Terms**—Biometrics, discrete cosine transform, iris recognition, Kekre's fast codebook generation, Kekre's proportionate error, Linde Buzonad Gray, vector quantization.

doi: 10.3969/j.issn.1674-862X.2010.03.005

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## Palmprint Recognition Based on Statistical Local Binary Orientation Code

Mei-Ru Mu and Qiu-Qi Ruan

**Abstract**—A novel coding based method named as local binary orientation code (LBOCode) for palmprint recognition is proposed. The palmprint image is firstly convolved with a bank of Gabor filters, and then the orientation information is attained with a winner-take-all rule. Subsequently, the resulting orientation mapping array is operated by uniform local binary pattern. Accordingly, LBOCode image is achieved which contains palmprint orientation information in pixel level. Further we divide the LBOCode image into several equal-size and nonoverlapping regions, and extract the statistical code histogram from each region independently, which builds a global description of palmprint in regional level. In matching stage, the matching score between two palmprints is achieved by calculating the two spatial enhanced histograms' dissimilarity, which brings the benefit of computational simplicity. Experimental results demonstrate that the proposed method achieves more promising recognition performance compared with that of several state-of-the-art methods.

**Index Terms**—Gabor filter, local binary pattern, orientation code, palmprint recognition.

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## An Eigen-Normal Approach for 3D Mesh Watermarking Using Support Vector Machines

Rakhi Motwani, Mukesh Motwani, Frederick Harris, Jr., and Sergiu Dascalu

**Abstract**—The use of support vector machines (SVM) for watermarking of 3D mesh models is investigated. SVMs have been widely explored for images, audio, and video watermarking but to date the potential of SVMs has not been explored in the 3D watermarking domain. The proposed approach utilizes SVM as a binary classifier for the selection of vertices for watermark embedding. The SVM is trained with feature vectors derived from the angular difference between the eigen normal and surface normals of a 1-ring neighborhood of vertices taken from normalized 3D mesh models. The SVM learns to classify vertices as appropriate or inappropriate candidates for modification in order to accommodate the watermark. Experimental results verify that the proposed algorithm is imperceptible and robust against attacks such as mesh smoothing, cropping and noise addition.

**Index Terms**—3D mesh models, support vector machine, watermarking.

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## Fragile Watermarking of 3D Models Using Genetic Algorithms

Mukesh Motwani, Rakhi Motwani, and Frederick Harris, Jr.

**Abstract**—This paper describes a novel algorithm for fragile watermarking of 3D models. Fragile watermarking requires detection of even minute intentional changes to the 3D model along with the location of the change. This poses a challenge since inserting random amount of watermark in all the vertices of the model would generally introduce perceptible distortion. The proposed algorithm overcomes this challenge by using genetic algorithm to modify every vertex location in the model so that there is no perceptible distortion. Various experimental results are used to justify the choice of the genetic algorithm design parameters. Experimental results also indicate that the proposed algorithm can accurately detect location of any mesh modification.

**Index Terms**—3D mesh models, fragile watermarking, genetic algorithms, SNR.

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## A Novel Ultra Low Power High Performance Atto-Ampere CMOS Current Mirror with Enhanced Bandwidth

Seyed Javad Azhari, Khalil Monfaredi, and Hassan Faraji Baghtash

**Abstract**—A novel CMOS atto-ampere current mirror (AACM) is proposed which reaches the minimum yet reported current range of 0.4 aA. Operation of this circuit is based on the source voltage modulation instead of the conventionally used gate voltage modulation which interestingly prevents usage of commonly required voltage shifting in those circuits. The proposed circuit has a simple structure prohibiting large chip area consumption which consumes extremely low power of 1.5  $\mu$ W. It is thus the best choice for ultra low power low voltage (ULPLV) applications. By using a very simple frequency compensation technique, its bandwidth is widened to 15.8 kHz. Simulation results in SMIC (Semiconductor Manufacturing International Corporation) 0.18  $\mu$ m CMOS technology with Hspice are presented to demonstrate the validation of the proposed current mirror.

**Index Terms**—Atto-ampere, current mirror, low voltage, ultra low power.

doi: 10.3969/j.issn.1674-862X.2010.03.009

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## A Fast-Speed Pulse Detector Based on N-Type Si-Schottky Diode via Tuning Circuit

Ling Wang, Xiao-Hong Tang, Fei Xiao, and Shang-Yun Wu

**Abstract**—A fast-speed pulse detector based on n-type Si-Schottky diode mounted in the waveguide is investigated. The relation of the fast-speed pulse detector between response time and 3 dB bandwidth is analyzed. By adopting the tunable circuit, the matched bandwidth is achieved as wide as possible. Experimental results show that the pulse response time of the detector is less than 150 ps within random carrier signal 500 MHz bandwidth range between 35 GHz to 39 GHz via tuning circuit. The detector is very easy to operate because it does not need bias current or synch-pulse source.

**Index Terms**—Detector, fast-speed pulse, millimeter-wave, response time, Si-Schottky diode.

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## Design of Novel Compact Electromagnetic Bandgap Structures with Enhanced Bandwidth

Ping Jiang and Kang Xie

**Abstract**—Two kinds of compact electromagnetic band gap (EBG) structures are designed. A two layer compact EBG structure configured with cross spiral shape line inductors and interdigital capacitors is first presented. Because of its significantly enlarged equivalent inductor and capacitance, the period of the lattice is approximately 4.5% of the free space wavelength. By inseting several narrow slits in the ground plane, the bandwidth of the main bandgap is enhanced by nearly 19%. Further effort has been made for designing a three layer compact EBG structure. Simulation results show that its period is reduced by about 26% compared to that of proposed two layer EBG structure, and the bandwidth of the main bandgap is about 3 times as that of the proposed two layer EBG structure. The detailed designs including a two layer compact 3×7 EBG array with and without defect ground plane and the three layer EBG array are given and simulation results are presented.

**Index Terms**—Defect ground structure, electromagnetic band gap, high surface impedance, surface wave.

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## Prediction Model Based on BP-ANN and PCA for the Peak Occurrence of *Liriomyza huidobrensis*

Lin-Nan Yang, Fei Zhong, Li-Min Zhang, Lin Peng, and De-Zhong Yao

**Abstract**—*Liriomyza huidobrensis* (Blanchard) is an important vegetable pest of pathology. In order to improve the accuracy of prediction of *Liriomyza huidobrensis* and to control the *Liriomyza huidobrensis* effectively, this paper presents a new prediction model by principal components analysis (PCA) and back propagation artificial neural network (BP-ANN) methods. The historical data from 1999 to 2007 on population occurrence are analyzed in order to find out a non-linear relationship between the pest occurrence and the meteorological factors. And then by using analysis results, the prediction model of *Liriomyza huidobrensis* occurrence in Jianshui in Yunnan is built. The new model has successfully applied to verify the paddy stem borer population occurrence in 2006. Test results show that the new prediction model with BP-ANN and PCA can improve the prediction accuracy.

**Index Terms**—Artificial neural network, *Liriomyza huidobrensis* (Blanchard), prediction model, principal components analysis.

doi: 10.3969/j.issn.1674-862X.2010.03.012

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## Detecting Power Imbalance in Multi-Cylinder Inline Diesel Engine Genset

S. H. Gawande, L. G. Navale, M. R. Nandgaonkar, D. S. Butala, and S. Kunamalla

**Abstract**—A model of fuel injection adjustment for balancing the 4-stroke six cylinder diesel engine coupling genset is developed by detecting imbalance in operating engine by the frequency analysis of the crankshaft's speed variation. In this work, the crankshaft is considered to be a rigid body, so that the variation of its angular speed could be directly correlated to the total gas-pressure torque. By analyzing only the lower harmonic orders, the speed variation spectrum can filter out the distortions produced by the dynamic response of the crankshaft. The information carried by these harmonic orders permits to establish correlations between measurements and the average gas pressure torque of the engine, and to detect imbalance and identify faulty cylinders. Detailed experimental reading are taken on diesel engine coupling genset on the test bed of Greaves Cotton Ltd Pune, India.

**Index Terms**—Diesel engine, frequency, harmonic orders, imbalance.

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## Improved Design and Modeling of Micromachined Tuning Fork Gyroscope Characterized by High Quality Factor

Ji-Ping Guan and Xiao-Ming Liu

**Abstract**—This paper proposes an improved design of micromachined tuning fork gyroscope (M-TFG) to decouple the cross talk between driving and sensing directions better and to increase resolution. By employing dual-folds spring suspension, the drive mode and the sense mode are mechanically decoupled. Through careful layout design of the location of the dual-folds spring suspension and the drive combs, the mechanical coupling effect is further decreased by isolating the unwanted excitation from detection. The quality factor investigation demonstrates that high quality factor can be attained by using this structure, which can bring in accurate resolution. As a result, this design has the potential to accomplish low bias drift and accurate resolution for initial level applications.

**Index Terms**—Decouple, gyroscope, micromachined, quality factor, tuning fork.

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# Call for Papers

## 2011 IEEE International Conference on Smart Grid and Clean Energy Technologies

2011 IEEE International Conference on Smart Grid and Clean Energy Technologies (IEEE ICSGCE2011) will be held in September 27-30, 2011 in Chengdu, China. IEEE ICSGCE2011 is sponsored by International Association of Computer Science and Information Technology (IACSIT), Journal of Electronic Science and Technology (JEST - International), the Institute of Electrical and Electronic Engineers (IEEE), and University of Electronic Science and Technology of China (UESTC). The Conference is also supported by University of Wollongong (Australian) and China Energy Association (CEA).

IEEE ICSGCE2011 will be a forum aiming at bringing together participants from academia, industry, engineering, and administrative organizations to exchange novel ideas, explore enabling technologies, discuss innovative designs, address open problems, and share field trial experiences in smart grid and clean energy technologies. The Conference will feature keynote speeches and special sessions by international experts on smart grid evolution.

The Conference proceeding will be published by IEEE, and all accepted papers by the IEEE ICSGCE2011 will also be included in IEEE Xplore, and indexed by EI Compendex, INSPEC, and Thomson ISI (ISTP). Authors of selected papers will be invited to submit an extended version of their contribution for possible inclusion in the special issue of the international journal, Journal of Electronic Science and Technology (JEST - International), which is indexed by EI INSPEC, CA and DOAJ.

The Conference organizing committee invites researchers worldwide to submit papers and share the valuable experiences with the scientists from the world. IEEE ICSGCE2011 scope covers, but not limited to, the following topics:

### Smart Grid Architectures

- ◆ Smart Grid Strategy and Planning
- ◆ Smart Grid Architectures and Models
- ◆ Smart Grid Implementation and Field trials
- ◆ Smart Grid Security and Reliability Management
- ◆ Smart Grid for Energy Savings and Financial Management
- ◆ Smart Grid Load and Energy Management
- ◆ Smart Grid Market Operations
- ◆ Integration of Distributed Resources
- ◆ Smart Grid Standards
- ◆ National/International Energy Security

### Smart Grid Technologies

- ◆ Smart Grid Networking
- ◆ Smart Grid and Area Networks
- ◆ Protection, Fault monitoring and Predictive Maintenance
- ◆ Communications of Bi-Directional Energy Transfer
- ◆ Power and Energy System Generation, Transmission, and Distribution
- ◆ Wide-Area Monitoring and Control
- ◆ Communication-Based Robust Control
- ◆ Smart Appliances and Consumer Devices
- ◆ Smart Sensors and Advanced Metering
- ◆ Smart Grid Demand Response
- ◆ Smart Grid Interactive Technologies
- ◆ Smart Grid Information Technologies
- ◆ Integration of Sensing, Communication, and Control
- ◆ Adaptive Communication-Based Protection
- ◆ Smart Grid Cyber & Physical Security
- ◆ Smart Grid Interconnections and Communications
- ◆ Dynamic Optimization and Control
- ◆ Smart Grid Testing and Assessing Technologies
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- ◆ Renewable Energy Applications
- ◆ Wind Energy Integration
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### Important Dates

Full Paper Submission Deadline	15 April 2011	Early Bird Registration	1 July 2011
Notification of Acceptance	15 June 2011	Authors' Registration Deadline	15 July 2011
Final paper Submission	15 July 2011	Conference Dates	27-30 September 2011

Prospective authors are invited to submit manuscripts in English. All submissions will be peer-reviewed by experts in the field based on originality, significance, quality and clarity. Authors should use MS-Word templates obtained from the conference site to format their papers. Authors should submit both .doc files and .pdf files of their manuscripts via the online submission system.



# Call for Papers

## Journal of Electronic Science and Technology Announcing a Special Issue on Artificial Intelligence with Rough Sets

**\*\* Submission Deadline: 10 December 2010 \*\***

Since the introduction of rough sets in 1982 by Professor Zdzislaw Pawlak, we have witnessed great advances in both theory and applications. In order to promote development of rough sets, we are preparing a special issue on "Artificial Intelligence with Rough Sets" published by JEST (International), Journal of Electronic Science and Technology, which is a refereed international journal focusing on IT area. The aim of this special issue is to present the current state of the research in this area, oriented towards both theoretical and applications aspects of rough sets.

JEST invites you to prepare an article or comprehensive surveys for the forthcoming issue. Topic scopes to be covered include but not limited to:

- **Foundations & Applications of Rough Sets**
- **Data Mining & Knowledge Discovery in Databases**
- **Foundations & Applications of Granular Computing**
- **Rough Set Components in Hybrid Intelligent Systems**
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The deadline for submission of manuscripts is **10 December 2010** and the publication of this issue is scheduled for **June 2011**. All submissions are encouraged to send directly by Email to one of the Guest Editors:

Prof. William Zhu: [williamfengzhu@gmail.com](mailto:williamfengzhu@gmail.com)

Prof. Yiyu Yao: [yiyu@cs.uregina.ca](mailto:yiyu@cs.uregina.ca)

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### The following supporting documents are required for preparing manuscripts:

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- 2) Registration Form and JEST Template with Editing Notes: all available at [http://www.intl-jest.com:88/index.php?p=category&category\\_id=34](http://www.intl-jest.com:88/index.php?p=category&category_id=34), All manuscripts should be prepared in MS Word. And biographies with photographs of all authors are mandatory.
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JEST (International), Journal of Electronic Science and Technology, dedicates to publishing research articles and reviews relating the state-of-the-art achievements in electronic science and technology. The most highlight areas of the Journal include communication technology, computer science and information technology, information and network security, optoelectronic and photonic technologies, bioelectronics and biomedicine, neural networks and intelligent systems, etc. More information of the Journal is available at <http://www.intl-jest.com>. The JEST (International) devotes itself to providing the best possible publication opportunity. All original, high quality contributions that are not yet published or that are not currently under review by other journals or conferences are welcomed.

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