



# Journal of Artificial Intelligence

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## **Formalizing Deniability**

Bo Meng

A formal framework of deniability in the deniable authentication protocol is presented. By introducing Kessler and Neumann logic as a tool, the proposed framework formalizes the strong deniability and weak deniability, which are the key properties in the deniable authentication protocol. The formal framework establishes what can construct an evidence of deniability. Based on the construction, the simple and easy to be applied framework enables the identification of deniability and provides a heuristic to take evidence of deniability into consideration in the early stages of designing a deniable authentication protocol. Two typical deniable authentication protocols, including a interactive and a non-interactive one are analyzed by both informal method and the proposed formal framework. (*Information Technology Journal* 8 (5): 625-642, 2009; *doi*: 10.3923/itj.2009.625.642)

## **An Ontology-Based Manufacturing Design System**

Sun Wei, Ma Qin-yi and Gao Tian-yi

In this study, an ontology-based system is proposed to solve problems raised in the manufacturing design by expanding traditional development activity with Knowledge Management (KM), a Product Knowledge Model (PKM) and the Intelligent Application System (IAS). The KM helps to management the knowledge in the design process, while the PKM supports to locate proper information and the IAS is responsible for applying the product knowledge among different application systems throughout the product life cycle. The PKM is encoded in OWL to realize semantic match and enhance the performance of organization capability and knowledge sharing. The routine design assistance is developed to reuse the product knowledge based on configuration method generating function satisfied solution rapidly by reasoning the configuration rules represented in SWRL. The information retrieval theory is involved to support manufacturing knowledge sharing. A prototype system of binging machine design is developed to verify the proposed approach, using the semantic web technology, for seamless sharing domain-specific design knowledge among multidisciplinary organizations and intelligent supporting the manufacturing design. (*Information Technology Journal* 8 (5): 643-656, 2009; *doi*: 10.3923/itj.2009.643.656)

## **Performance Evaluation of Mobile Sub-Networks Convergence Approaches in a Personal Distributed Environment**

K. Abd Jalil and J. Dunlop

There are two approaches to handle the convergence of mobile sub-networks in the Personal Distributed Environment (PDE). In order to make decision which approach to be used in the PDE, a simulation model was developed to compare the approaches. Based on the simulation model and also analytical studies, performance evaluations were carried out on both approaches. This study will start with the introduction of the PDE concept and followed by the overview of the protocol used to support network mobility in PDE. The explanation of the simulation model and its environment will then follows. This is then followed by the explanation on the implementation of both approaches in the simulation model. The de-convergence of the sub-networks using both approaches will also be discussed. This will then be followed by the discussion on the metrics used to carry out the performance evaluation together with its derivation. The results from the evaluations will then be presented. At the end of this study, the most suitable convergence approach of mobile sub-networks in the PDE will be determined. (*Information Technology Journal* 8 (5): 657-667, 2009; doi: 10.3923/itj.2009.657.667)

## **Integrated the Intelligent Agent Behavior Model and Billing Service into Communication System**

Steven K.C. Lo, Huan-Chao Keh, Yi-Hung Lin and Wang Jo-Chi

The evolution of mobile communications has been rapidly popular in recent years. In Taiwan, mobile phones predominantly possess multiple functions. In other words, mobile phones are not only conventional phones but also smart computer systems embedding with intelligent agent mechanisms to integrate heterogeneous applications. In addition, the billing system (Customer DB, Tariff and Sharing Schemes, Rating and Bill Data) is the crucial part of the communication system. It is an independent system to calculate the fee of communication. There are a lot of applications embedded into the mobile device in the market; however, how to integrate the billing system with the applications is insufficient. This study uses the RFID characteristics and intelligent agent attributes to establish a communication channel in order to automatically transmit data packets from the source site to the destination site. It exploits the intelligent agents to combine the intelligent parking system and the billing system. In addition, it proposes four kinds of intelligent

behavior models including the intelligent agent cooperation behavior model, communication behavior model, coordination behavior model and competition behavior model to improve the process more smoothly and automatically. Using the intelligent agent characteristics and integrating the RFID features with the billing system are the most significant key factors. The proposed method improves the process, reduces the management cost and provides more flexible, stable and available systems. (*Information Technology Journal* 8 (5): 668-677, 2009; doi: 10.3923/itj.2009.668.677)

### **DOSM: A Data-Oriented Security Model Based on Information Hiding in WSNs**

Xiangrong Xiao, Xingming Sun, Xinbing Wang and Lei Rao

In this study, we propose a non-cryptology and protocol-independent technique based on information hiding, called Data-Oriented Security Model (DOSM). Instead of one layer of protection, the proposed scheme offers two-fold protection against attack. An attacker first explores whether the data in question carries any useful information and then conducts extraction on it. Information is concealed by changing some properties of the data, which does not incur extra overheads to the sensor nodes. With the help of DOSM, each forwarding node can verify the embedded marks using the source node ID in each packet. This mechanism is used to filter data in a distributed manner. It can also avoid fake and tamper attacks by terminating bad packets as soon as they are detected. The data security is guaranteed by filtering the inconsistent packets between the hidden data and its source ID, which yields low energy consumption and high reliability. The simulation results show that the proposed DOSM protects the security of data communication and achieves data authentication invisibly at small overhead expense. (*Information Technology Journal* 8 (5): 678-687, 2009; doi: 10.3923/itj.2009.678.687)

### **The Effects of Firms Resources and Capabilities on its Performance of IC Design Industry in Taiwan**

Yuan-Yao Feng, Wei-Hwa Pan, Yueh-Chuen Huang and Yan-Kwang Chen

The aim of the study is to examine the relationship between firms resources and capabilities and its performance of IC design industry in Taiwan. The resource-bases view of the firms has become an important conceptual framework in strategic management but has been criticized for lack of an empirical base. A few researchers have been able to develop measures of resources and capabilities,

identify their importance in a specific industry context and link firm's resource positions to firm performance. In this study, we examine the relationship between firms' resources and capabilities and its performance of Taiwan's IC design industry. The empirical findings are as: R and D resources and capabilities have no effects on firms performance. Marketing resources and capabilities, operation resources and capabilities, human resources and management all have positive effects on firms performance. Physical capital resource and management have no effects on firms performance. The analysis in this study provide a more convincing evidence for examining a more long-term relationship between resources and capabilities on firms performance, thus provide a implications for the management of firms' resources acquisition, allocation and utilization activities of Taiwan's IC design industry so as to facilitate their firms performance. (*Information Technology Journal* 8 (5): 688-697, 2009; doi: 10.3923/itj.2009.688.697)

### **Realizing Large Virtual Web-Based Collaborative E-Commerce with B2X Middleware**

BIN XU

E-commerce enterprises are facing the challenges from globalization. However, it costs much time and budget in building and maintaining web-based collaborative e-commerce platforms. It's also difficult to integrate several collaborative platforms into a larger platform, so as to make better collaboration. Manual collaboration between different platforms results in non-timely information exchange in large scale e-commerce and un-efficient end-to-end business collaboration. Yet a new cost efficient middleware, B2X (business to any), is proposed to integrate different e-commerce platforms and related protocols are defined. The architecture and related protocol of B2X are presented. A prototype of B2X has been built and a continuous integration model for large virtual web-based B2B (Business to Business) collaboration with B2X is presented to enhance the collaboration between the e-commerce enterprises. (*Information Technology Journal* 8 (5): 698-707, 2009; doi: 10.3923/itj.2009.698.707)

### **A New CAD Models Retrieval Method Based on Shape Similarity**

Sun Wei, Ma Tie-Qiang and Guo Li

The CAD model retrieval based on shape similarity is the research focus of computer graphics and computer-aided design field. To obtain higher retrieval precision and efficiency, a new CAD model retrieval method based on

shape similarity is proposed. The method is divided into two steps. Firstly, breadth-first-search-based spanning tree algorithm is applied to obtain an initial boundary matching between retrieval object and retrieval condition. Secondly, the topology adjacency approximation algorithm is put forward to find the optimal boundary matching based on the initial boundary matching by the cycle and approximation process and the matching result is used to calculate the shape similarity between retrieval object and retrieval condition. In order to calculate the similarity between various types of boundary faces, a new similarity calculation method is present. Finally, a CAD model retrieval system on the platform of UG is developed based on the proposed method. Experimental results show that the proposed method is feasible and effective. (*Information Technology Journal* 8 (5): 708-716, 2009; *doi*: 10.3923/itj.2009.708.716)

### **Simulated Distribution of the Retinal Photoreceptors for Space Variant Resolution Imaging**

Zuojin Li, Weiren Shi and Zhi Zhong

This study presents a new computable method to simulate distribution of the retinal photoreceptors for space variant resolution imaging. In this presented method, first, a model of Laplacian and Gaussian multi-resolution pyramids is built; second, a weighting function coming from human visual psychological experiments is adopted in the presented model, lastly, a typical linear interpolation method is used between steps of multi-resolution pyramids. Another contribution of this study displays some experiments revealing the preliminary relationship between the place of gaze (foveation), image resolution and image compression rate. Compared with traditional uniform image processing methods, some experiment results show that the presented method in this study, approaches closer to the biological fact of visual perception and resolves the ring artifacts distortion, a problem left behind from the earlier study. The most obvious application of space variant resolution technique can be presented for digital image compression in low-bandwidth image communication. (*Information Technology Journal* 8 (5): 717-725, 2009; *doi*: 10.3923/itj.2009.717.725)

### **Security Policy Management for Systems Employing Role Based Access Control Model**

Chao Huang, Jianling Sun, Xinyu Wang and Yuanjie Si

In this study, we propose the redundancy and inconsistency checking algorithms to support the policy management of systems employing role based access control

model. Present method is based on the formal definition of the policy redundancy and policy inconsistency. Via constructing the role graph, we analyze the redundancy and inconsistency one by one. According to the features of each type of redundancy and inconsistency, present algorithm checks all the possible violations and generates the related policy elements to help the security administrator to amend the policy afterwards. The performance test demonstrates that the approach is efficient enough for practical usage. Present approach could guarantee the conciseness as well as consistency of the access control policy, at same time reduce the burden of access control administration significantly. (*Information Technology Journal* 8 (5): 726-734, 2009; doi: 10.3923/itj.2009.726.734)

### **Modeling of Software Fault Detection and Correction Processes Based on the Correction Lag**

Yanjun Shu, Hongwei Liu, Zhibo Wu and Xiaozong Yang

This study presents a software reliability growth model integrating the fault detection process with the fault correction process. Although, a few research projects have been devoted to the modeling of these two processes, most of them studied the correction lag from a theoretical viewpoint of time delay. In this study, the correction lag is characterized by the remaining uncorrected faults which can be clearly observed from the actual data. Through analyzing its varying trend, the Gamma curve is found to be appropriate in representing the correction lag function. Then, the proposed model is derived. Two real data sets of software testing are used to evaluate models. Experimental results indicate that the proposed model not only provides better performance than other models on both fault detection and correction processes, but also does better in describing the correction lag. Finally, a revised software cost model is presented based on the proposed model. From the analysis on the determination of software release time, the new cost model shows more practical than the traditional approach. (*Information Technology Journal* 8 (5): 735-742, 2009; doi: 10.3923/itj.2009.735.742)

### **Robust Controller Design for Synchronization of Two Chaotic Circuits**

Shun-Jih Wang, Neng-Sheng Pai and Her-Terng Yau

This study present a robust algorithm to synchronize, under the master/slave configuration, a class of piecewise linear chaotic circuits based on sliding mode

control. The synchronization objective is to obtain identical synchronization between the master and slave systems in spite of the existence of external disturbances and structural variations. A switching surface is adopted such that it becomes easy to ensure the stability of the error dynamics in the sliding mode. Then a Sliding Mode Controller (SMC) is derived to guarantee the occurrence of the sliding motion, even when the system is undergoing external disturbance and structural variations. This controller renders the closed loop system robust with respect to matched bounded disturbances and to terms produced by structural variations. The advantages of this method can be summarized as: (1) it is a systematic procedure for chaos suppression, (2) it can be applied to a variety of chaotic systems whether it contains uncertainties or not, (3) this controller is robust to external disturbance and (4) there is no chattering in controller, so it is easy to implement. Numerical simulations have verified the effectiveness of this method. (*Information Technology Journal* 8 (5): 743-749, 2009; *doi: 10.3923/itj.2009.743.749*)

## **Modeling and Design for Dynamic Workflows Based on Flexible Activities**

Peng Li and Yuyue Du

A rapidly changing environment forces the workflow management systems to change their workflow processes ever more frequently. In order to improve the flexibility of workflow management systems, a dynamic workflow model is proposed in this study. The concepts of flexible activities and historical execution information are put forward to construct dynamic workflow models in this method. Each flexible activity is used to encapsulate a group of indeterminate factors, e.g., the constraint rules and optional sub-activities when reifying a flexible activity. Historical execution information is the executive logging of a previous workflow instance. Two algorithms are put forward to guarantee the correctness of sub-workflows and the global control of dynamic processes. Furthermore, a simple example is given to validate the proposed dynamic workflow model. However, this method cannot perform well if there existing loop structures in sub-workflows and the reifying processes of flexible activities are not intelligent enough. (*Information Technology Journal* 8 (5): 750-756, 2009; *doi: 10.3923/itj.2009.750.756*)



## **Cooperation Enforcement Among Selfish Nodes in Ad Hoc Networks under Noise**

Dongbin Wang, Mingzeng Hu, Hui Zhi and Jianwei Ye

In ad hoc networks, the source node can take help of the intermediate nodes to communicate with the destination node by relaying the packets hop by hop. But nodes are constrained with limited resources, so nodes tend to be selfish and cooperative behaviour in forwarding packets for others can not be taken for granted. In the study, we present a two-player packet forwarding game under noise. An incentive-compatible condition under which the selfish one will be deterred from defection by the subsequent punishment and then turn to cooperate is analyzed. The impact of parameter settings of punishment strategy and isolation strategy on cooperation enforcement is discussed. The simulation results show that the proposed packet forwarding approach can effectively stimulate cooperation among selfish nodes under noise. (*Information Technology Journal* 8 (5): 757-763, 2009; **doi**: 10.3923/itj.2009.757.763)

## **Weight-Based Feature Selection for Conditional Maximum Entropy Models**

Lu Li, Xuan Wang and XiaoLong Wang

Conditional maximum entropy models provide a unified framework to integrate arbitrary features from different knowledge sources and have been successfully applied to many natural language processing tasks. Feature selection methods are often used to distinguish good features from bad ones to improve model performance. The selection of features in traditional methods is often performed based on different strategies before or along with feature weight estimation, however, weights themselves should be the only factor to measure the importance of features. This study proposes a new selection method based on divide-and-conquer strategies and well-trained feature spaces of small sizes. Features are divided into small subsets, on each of which a sub-model is built and its features are judged according to their weights. The final model is constructed based on merged feature space from all sub-models. Experiments on part of speech tagging show that this method is feasible and efficient. (*Information Technology Journal* 8 (5): 764-769, 2009; **doi**: 10.3923/itj.2009.764.769)

## **Design of TDD/TDMA 4G System with Link Adaptation**

Liu Zunxiong, Xu Zheng, Feng Xingle and Lu Zhaogan

In current 4G system given in recent literatures, channel estimation overhead and complexity of Multi-User Detectors (MUD), may lead to bad performance in fast fading channel scenarios when large number of users exists. So, a novel 4G system with TDD/TDMA as duplex and wireless access is designed to reduce channel estimation spending and avoid MUD, as only one user can be active to communicate with base station. Under the requirement of 4G systems, radio frame structure is elaborately designed to fit for fast fading channel scenarios. The system architecture with consideration of link adaptations for a novel eigenmodes coupled universal space-time codes, is given and evaluated for performance of TDD/TDMA 4G systems. Results show the proposed TDD/TDMA 4G can meet the requirement of 4G system under the classical ITU channel profiles. (*Information Technology Journal* 8 (5): 770-775, 2009; **doi:** 10.3923/itj.2009.770.775)

## **Range-Based Clock Synchronization Protocol for Wireless Sensor Networks**

Zhetao Li, Renfa Li and Liangjiao Liu

This study presents a novel range-based clock synchronization protocol by exploiting non-synchronized TDOA. It combines the method of Network Time Protocol (NTP) with round-trip TDOA. By applying round-trip TDOA repeatedly, all nodes in network efficiently synchronize to each other. Furthermore, clock synchronization and ranging can be performed simultaneously. Simulation results show it outperforms Timing-sync Protocol for Sensor Networks (TPSN) and Reference Broadcast Synchronization (RBS) in terms of the number of message exchanges and synchronization error. (*Information Technology Journal* 8 (5): 776-780, 2009; **doi:** 10.3923/itj.2009.776.780)

## **Spectral Analysis of Sanskrit Devine Sound OM**

A.A. Gurjar and Siddharth A. Ladhake

Our attentiveness and concentration are pilfered from us by the proceedings take place around us in the world in recent times. Different challenges and impediments are faced by the people work in the industries, offices and

even in business. It is tough to handle the stress some times. Therefore, to come out of the aforementioned troubles, meditation is essential for all human beings. In the same way, for psychological stress, speech signal is uttered to be a considerable indicator. In the direction of mediating human subject, OM is a spiritual mantra, outstanding to fetch peace and calm. The entire psychological pressure and worldly thoughts are taken away by the chanting of OM mantra. Elimination of disruption and introduction of new dynamism in the body are given by the OM chanting. The consciousness could be promoted through the repetition of OM mantra. Furthermore, this mantra transcends the restrictions of a mentality. To systematically understand the meditative chant, termed the divine sound OM, is the endeavor of this research work. Spectral analysis has been carried out for OM mantra to study its structure and to identify the factors, which have been found to influence the human nerve system. By this analysis, we could conclude stress gets minimized after OM chant. (*Information Technology Journal* 8 (5): 781-785, 2009; *doi*: 10.3923/itj.2009.781.785)

### **Composing Disparate Services and Data Dynamically Based on EBS**

Shu-Qing Peng and De-Yun Chen

In this study, a new framework that disparate services and data are composed dynamically based on ESB is proposed, in which business process is analyzed into multiple work-data flows. Dynamic routing mechanism is applied to map abstract description of services and data to their respective providers. This new framework can implement dynamic composition of disparate services and data. (*Information Technology Journal* 8 (5): 786-790, 2009; *doi*: 10.3923/itj.2009.786.790)

### **Asymptotically Optimal Geographical Routing for Multimedia Wireless Sensor Networks**

Zhetao Li, Renfa Li, Di Wu and Conte Mohamed

In multimedia wireless sensor networks, multiple packets are generated for the same destination. All these packets go through the same route in a session when using current geographical routing. However, detour is inevitable in geographical routing without the help of global state. A progressive yet effective strategy is proposed to mitigate inefficient detour in geographical routing. In asymptotically optimal geographical routing, detour mode was substituted by greedy mode with

the help of a subset of nodes acting as way points. The average performance of the proposed algorithm is compared to Greedy Perimeter Stateless Routing (GPSR) and the benchmark shortest path algorithm. Simulation results show that in average the proposed algorithm can reduce as much as 50% of hops on the routes obtained by GPSR. (*Information Technology Journal* 8 (5): 791-795, 2009; *doi*: 10.3923/itj.2009.791.795)

### **Speech Recognition Algorithm of Parallel Subband HMM Based on Wavelet Analysis and Neural Network**

Zhou Ping, Tang Li-Zhen and Xu Dong-Feng

The purpose of speech recognition is able to extract the content of the speech in various conditions and transform from speech to text automatically. Based on human hearing perception mechanism, we propose a decomposition method using independent parallel subbands for speech recognition. In this method, wavelet processing is introduced into Hidden Markov Model (HMM) and Fuzzy Neural Network (FNN) is used to improve the convergence speed and to avoid local optimal in speech detection. Experiment results show that the proposed hybrid speech recognition model is more robust when noise presents. We combine the dynamic modeling of CDHMM and the classification capability of fuzzy neural network, this has been a hot research area in recent years and can be applied to speech-text transform devices. (*Information Technology Journal* 8 (5): 796-800, 2009; *doi*: 10.3923/itj.2009.796.800)

### **Machine Learning Approach in Optimizing Negotiation Agents for E-Commerce**

S.C. Ng, M.N. Sulaiman and M.H. Selamat

This study discusses the implementation of machine learning approach in negotiation agents that can learn their opponent's preferences and constraints during one-to-many negotiations. A novel mechanism in learning negotiation is introduced. The genetic-based model of multi-attribute one-to-many negotiation, namely GA Improved-ITA is proposed. The GA Improved-ITA agents first utilize Genetic-Based Machine Learning (GBML) to identify their opponent's preferable negotiation issues. It is then followed by branch and bound search to search for the best value for each of the issues. The performance of GA Improved-ITA is promising when it is compared with the results of one-to-many negotiations obtained by Bayesian learning model and heuristic search algorithm. (*Information Technology Journal* 8 (6): 801-810, 2009; *doi*: 10.3923/itj.2009.801.810)

## **Feature Selection for Image Steganalysis using Hybrid Genetic Algorithm**

Zhihua Xia, Xingming Sun, Jiaohua Qin and Changming Niu

Learning-based methodology has been demonstrated to be an effective approach to dispose the steganalysis difficulties due to the variety of image texture. A crucial process of the learning-based steganalysis is to construct a low-dimensional feature set. In this study, a feature selection method based on Hybrid Genetic Algorithm (HGA) is presented to select feature subsets which not only contain fewer features, but also provide better detection performance for steganalysis. First, the general framework about utilizing Genetic Algorithm (GA) to do feature selection for steganalysis is presented. Then, we analyze similarity among individuals (SI) in each generation and the Transformation of Generations (TG) to determine whether the GA has converged into a local area. Next, according to the SI and TG, the restarting operation is incorporated into the HGA to allow the algorithm to escape from the unsatisfactory local area. In the experiments, three feature subsets are formed from a universal feature set for three typical steganography methods, respectively. The experimental results show that the classifiers using the feature subsets gain better detection accuracy and higher speed than those using the universal set. (*Information Technology Journal* 8 (6): 811-820, 2009; *doi*: 10.3923/itj.2009.811.820)

## **Soundness Analysis of T-Restricted Interorganizational Logical Workflow Nets**

Wei Liu, Yuyue Du and Haichun Sun

Interorganizational Logical Workflow Nets (ILWN) can efficiently model cooperative systems based on Petri nets, workflow techniques and temporal logic. But soundness of arbitrary ILWNs is hard to decide. This study defines the concept of T-restricted Logical Workflow Nets (LWN) and proposes an important subclass of ILWNs composed of  $n$  T-restricted LWNs: T-restricted ILWNs. The sufficient and necessary conditions of T-restricted ILWNs preserving soundness are obtained and the rigorous analysis approach is presented based on their static net structures only. Moreover, two approaches of combining  $n$  T-restricted LWNs into one T-restricted ILWN are given. The concepts and techniques proposed in this study are illustrated with a useful example of an auto gas station system. (*Information Technology Journal* 8 (6): 821-829, 2009; *doi*: 10.3923/itj.2009.821.829)

## **Mining Personalized User Profile Based on Interesting Points and Interesting Vectors**

Zeze Wu, Qingtian Zeng and Xiaowen Hu

To dig out the implicit meanings in user's multi-behavior sequences, a new approach of mining personalized user profiles is proposed. Firstly, the method is presented to mine user's interesting points and interesting vectors. A user's interesting profile is obtained by combining the interesting point group with interesting vector group together, which is denoted by a weighted directed graph. Then, an algorithm is proposed to calculate the similarity between such user profiles. To verify the effectiveness of the approach proposed in this study, personalized recommendation experiments are realized by using content-based filtering and collaborative filtering, respectively. The results show that the average not acceptance rates of these recommendation services are only 5.94% using content-based filtering recommendation and 3.7% using collaborative filtering. It indicates that the approach proposed in this study is quite available in mining personalized user profiles. (*Information Technology Journal* 8 (6): 830-838, 2009; *doi*: 10.3923/itj.2009.830.838)

## **Neural-Based GA Optimization on Multi-Objective CNC Turning**

Tian-Syung Lan

With the  $L_9$  ( $3^4$ ) orthogonal array of Taguchi experiment, the four cutting parameters with three levels are selected to determine the  $3^4 = 81$  sets of full experimental combinations. Additionally, the ECOCA-PC3807 CNC (Computer Numerical Control) lathe is utilized to diameter finish turn the S45C. The surface roughness (Ra), tool wear ratio ( $\mu\text{m}^{-2}$ ) and cutting force (N) are experimentally measured as quality objectives. The BPN (Back-Propagation Network) is moreover introduced to learn the randomly selected 45 sets of experimental results. The remaining 36 sets of experimental results are furthermore employed to verify the constructed multi-quality predictor for CNC turning. Considering the learning rate as 1 and momentum factor as 0.5; the results of 4000 times of BPN training through a hidden layer indicated that the prediction accuracy of 95.87, 94.32 and 92.29% for surface roughness, of tool wear ratio and cutting force, respectively. The GA optimization on multi-objective CNC turning proposed in this study surely provides an economic and prospective approach. (*Information Technology Journal* 8 (6): 839-846, 2009; *doi*: 10.3923/itj.2009.839.846)

## **Quality Prediction Model of Injection-Molded Rib Design using Back-Propagation Network**

Tian-Syung Lan and Ming-Yung Wang

In this study, an analytical model of a rectangular thermoplastic ABS (Acrylonitrile Butadiene Styrene) plastic cover with rib of a given thickness (2.8 mm) was introduced and the dimensions as well as width of the rib were selected as the control factors for simulation. Additionally, the deflection under a constant force of 150 Newton at the back centre of the cover was defined as quality characteristic. Moreover, the  $L_9(3^4)$  orthogonal array for four factors and three levels from Taguchi method was additionally considered to layout the  $3^4 = 81$  sets of full simulations. By commencing the BPN (Back-Propagation Network) to learn the selected 45 sets of simulated results. The remaining 36 sets of simulated results are then employed to verify and construct a quality predictor of rib design. Considering the learning rate as 1 and momentum factor as 0.5, the results of 20000 times of BPN training through a hidden layer indicated that the accuracy of deflection prediction reached 95.87%. In this study, the full FEM (Finite Element Method) simulated results from the 81 sets of combinations layout by Taguchi method are learned and verified by BPN for the design of injection-molded rib. It is shown that the quality of a plastic rib can surely be effectively found with the proposed economic and prospective BPN. This study exactly contributes an economical technique to the quality prediction of rib design for plastic injection industry in minimizing the development period of a new product. (*Information Technology Journal* 8 (6): 847-854, 2009; *doi*: 10.3923/itj.2009.847.854)

## **Fractal Cluster Based Aging Model of Electrical Treeing in Polymeric Insulation**

A. Samee, Z.H. Li, C.H. Zhang and Z.P. Huang

The aim of this study was to develop an aging model based on the concept of generation of micro voids due to thermally-activated, electrically-enhanced breakage of bond structure of the polymeric insulation. Here, we have modeled electrical tree structures as fractal cluster which are formed due to coalescing of micro voids. In this study we have derived the electrical tree growth rate equation and formula for time of electrical tree propagation to failure. We have extended this approach for multifactor aging which can modify the bond breaking and repair energies of insulation under multi-stress conditions, which can eventually affect the electrical tree growth time to failure. We have provided an overview of phenomenological and physical aging models, the mechanism of formation of

micro-voids from breaking of bond under combined thermal and electrical stress and the process of fractal clusters (electrical trees) formation due to coalescence of micro-voids. (*Information Technology Journal* 8 (6): 855-862, 2009; *doi*: 10.3923/itj.2009.855.862)

## **Multi-Video-Sources Selection Strategy in Mobile P2P Streaming Media Architecture**

Mande Xie

A mobile peer to peer architecture for streaming media system was firstly proposed. According to the architecture, a serial scheduling and parallel scheduling algorithm were proposed for multi-video-sources. If quality of service monitored by the receiving-peer is degraded, the serial scheduling algorithm triggered the video source change event and synchronized the multi-video-sources by the time model of the streaming sequence. If the multi-video source concurrently sent the data to the receiving-peer, the parallel scheduling algorithm assigned the transmission task by frame-level bit assignment strategy. The algorithm firstly formulated the assignment problem to a nonlinearity programming problem and then transformed it into an integer programming problem based on the piece linear rate-distortion model. At last, the assignment problem was transformed into a general linear programming problem by relaxing the constraint condition. The algorithm was implemented by a greedy strategy and a piece approximate method was designed to map the solution between a linear programming problem and an integer linear programming problem. The experiment results show the algorithm is accuracy and valid and the distortion brought by the approximate method is neglected. The algorithm is very suited to a mobile P2P video streaming system. (*Information Technology Journal* 8 (6): 863-870, 2009; *doi*: 10.3923/itj.2009.863.870)

## **Ontology-Based Model for Software Resources Interoperability**

Bo Ding and Li-juan Sun

In this study, we propose an ontology-based framework to provide an integrated view, which could integrate various software resources and realize semantic interoperability between different software resources. Ontologies are divided into shared ontology and domain ontology. The design of shared ontology is described in detail. The shared ontology which has explicit ontological semantics, implements the uniform representation of heterogeneous information and helps to shield the heterogeneity of software resources



systematically. The domain ontology is a domain-specific functional design ontology repository, in which, the invoking functions of the specific platform is encapsulated. The Collaborative Functional Design Environment (CFDE) is built through the shared ontology and the domain ontology. The CFDE facilitates the semantic interoperability among diverse software resources, which provides more software resources and better service to users. (*Information Technology Journal* 8 (6): 871-878, 2009; doi: 10.3923/itj.2009.871.878)

## **Successful Supply Chain Practices through Organizational Knowledge and E-Business Technology**

P.K. Chen, Chung-Ming Huang and Chun-Hsien Su

In recent years, organizational knowledge has played an important role in supply chain. Many manufacturers believe that the creation and sharing of organizational knowledge can improve supply chain practices. This study explores, the effect of organizational knowledge on supply chain practices and whether organizational knowledge can be created and shared through e-business. We examine the influence among e-business technology, organizational knowledge, supply chain practices and competitive performance. Present results indicate that organizational knowledge has a positive effect on supply chain practices, leading to competitive performance. Otherwise, organizational knowledge can be created through e-business. In addition, e-business technology can also play a role in knowledge sharing, so as to improve organizational knowledge. This in turn can affect the sharing between supply chain partners, which leads to effective supply chain practices. In this study, we analyze 552 samples from top manufacturing firms based in 24 countries and perform Structural Equation Modeling (SEM) to test our hypotheses. (*Information Technology Journal* 8 (6): 879-886, 2009; doi: 10.3923/itj.2009.879.886)

## **Fair Blind Signature Based Authentication for Super Peer P2P Network**

Xiaoliang Wang and Xingming Sun

Anonymity has received increasing attention in the literature due to the users' awareness of their privacy nowadays. While, anonymity related issues have been extensively studied in Peer-to-Peer (P2P) systems, numerous concerns have been raised about the issue of providing authentic partners in P2P systems. In addition, the network authority requires controlled anonymity, so that misbehaving entities in the network remain traceable. We are working on seeking novel and more

effective methods to control anonymity, authentication and traceability. In this study, we propose a security architecture to ensure anonymity and authentication for honest users and keep traceability for misbehaving users in P2P systems. We use Fair Blind Signature Trust (FBST) to resolve the conflicts among anonymity, authentication and traceability. Signature scheme that has information about identity ensures authentication. At the same time, use of blind signature and additional anonymous scheme provides anonymity. Moreover, traceability is achieved due to the fairness of fair blind signature. Security analysis shows that the FBST can perfectly solve tradeoff between anonymity, authentication and traceability. (*Information Technology Journal* 8 (6): 887-894, 2009; *doi*: 10.3923/itj.2009.887.894)

### **Using Immune Network in Nonlinear System Identification for a 3D Parallel Robot**

Pin-Chang Chen

Nonlinear system identification can improve control performance significantly, especially when the system dynamic behaviors are unknown and with great nonlinearity. The concept of immune network simulated the concentration of a set of antibodies. The immune system has the following features: self-organizing, memory, recognition, adaptive and ability of learning. Therefore, immune network could be applied to nonlinear system identification and provided various feasible system models with robust and adaptive characteristics. In this study, a new type of 3D parallel robot arm manipulator with human interface and the parallel motion control of a platform manipulator actuated by three AC servomotors are introduced. To comprehensively realize the performance of the parallel robot, the immune network which theoretically derived for the application of quantified and graphical performance synthesis is presented. Thus, the capability of this parallel robot in its applications as well as its future research and development are approached. The findings of this study should contribute positively to the practice of using immune network to improve the nonlinear system identification and develop a system model with robust and adaptive characteristics. (*Information Technology Journal* 8 (6): 895-902, 2009; *doi*: 10.3923/itj.2009.895.902)

### **Study of MDA Based Semantic Web Service Composition**

Zhengdong Zhu, Yanping Chen, Ronggui Lan and Zengzhi Li

This study presents a Semantic Web Services composition method based on Model-Driven Architecture (MDA). It uses UML class and use-case diagram to build a model of static composition for OWL-S and it uses activity diagram to

build a model of dynamic composition for OWL-S. Based on semantic matching degree, the matching methods are used to select a subset of the available web services and then the most suitable composite web services is identified. Through a translation to a verifiable Promela model, the composition UML models are verified by SPIN tool. The verified UML models are stored as templates in the knowledge base of ontology for reuse. Present method not only improves the development efficiency of the semantic web, but, also ensures the correctness of the composition process. (*Information Technology Journal* 8 (6): 903-909, 2009; **doi**: 10.3923/itj.2009.903.909)

## **Privacy Preserving in Ubiquitous Computing: Architecture**

Tinghuai Ma, Sen Yang, Wei Tian and Wenjie Liu

In this study, we summarize the main principles of privacy-aware system and present a new architecture. We preserve the person's location privacy by using the methods of spatiotemporally-based anonym and location information disturbing. In the spatiotemporally-based anonym method, the space and time are divided into pieces. While, an entity hands over from one domain to another, its ID will be refreshed. In the location information disturbing method, there are two methods to disturb coordinate data. One is transferring coordinate to a random data, the other is transferring coordinate to a fixed data. (*Information Technology Journal* 8 (6): 910-916, 2009; **doi**: 10.3923/itj.2009.910.916)

## **Taguchi Optimization of Multi-Objective CNC Machining Using TOPSIS**

Tian-Syung Lan

In this study, surface roughness, tool wear and Material Removal Rate (MRR) are major intentions in modern Computer Numerical Controlled (CNC) machining industry; therefore, the  $L_9(3^4)$  orthogonal array of Taguchi experiment is selected for optimizing the multi-objective machining. Through, the examination of surface roughness ( $R_a$ ), tool wear ratio ( $\text{mm}^{-2}$ ) and the calculation of Material Removal Rate (MRR) ( $\text{mm}^3 \text{min}^{-1}$ ); machining objectives are then received. By using Technique for Order Preference by Similarity to Ideal Solution (TOPSIS), the multiple objectives can additionally be integrated and introduced as the S/N (signal to noise) ratio into the Taguchi experiment. The mean effects for S/N ratios are moreover analyzed by MINITAB to achieve the multi-objective turning parameters. Through, the confirmation results, it is shown that the three objectives

from our optimum parameters are all greatly advanced compared to those from benchmark parameters. Parametric optimization is a hard-solving matter because of the interactions between parameters. This study not only proposes a novel parametric optimization technique using Technique for Order Performance by Similarity to Ideal Solution (TOPSIS), but also contributes the satisfactory solution for multiple CNC turning objectives with profound insight. (*Information Technology Journal* 8 (6): 917-922, 2009; doi: 10.3923/itj.2009.917.922)

### **Improving Accuracy of Intention-Based Response Classification using Decision Tree**

S.A. Ali, N. Sulaiman, A. Mustapha and N. Mustapha

This study focused on improving the dialogue act classification to classify a user utterance into a response class using a decision tree approach. Decision tree classifier is tested on 64 mixed-initiative, transaction dialogue corpus in theater domain. The result from the comparative experiment show that decision tree able to achieve 81.95% recognition accuracy in classification better than the 73.9% obtained using Bayesian networks and 71.3% achieved by using Maximum likelihood estimation. This result showed that the performance of decision tree as classifier is well suited for these tasks. (*Information Technology Journal* 8 (6): 923-928, 2009; doi: 10.3923/itj.2009.923.928)

### **An Investigation on Cost and Accuracy Analysis of Real-Time Kinematic GPS Method in Acquisition of Spatial Data for GIS**

Omer Mutluoglu and Ayhan Ceylan

In this study, acquisition of spatial data for GIS with RTK-GPS and conventional survey methods have been compared in view of cost and accuracy. One of the main components of a Geographic Information System (GIS) is the formation of the database. More than 70% of the time and cost is spent on developing this database. The success of a GIS project depends on the accuracy and currentness of the obtained spatial data required for development of the GIS project. This study presents analyses of the accuracy and costs of several methods of obtaining spatial data for a GIS project in a test area selected at the Campus of Konya Selcuk University. About a 20 ha test area were established in Selcuk University Campus to compare RTK-GPS and classic methods. Detail points in the test area were measured according to polar coordinate method by using electronic

tacheometry. Spatial data concerning the same area were obtained with Real Time Kinematic GPS (RTK GPS). Polar coordinate method (classical method) was accepted as a basis and compared with the spatial data obtained from RTK-GPS method in terms of accuracy and cost. As a result, it was noted that real-time kinematic GPS methods were found to be appropriate for the GIS projects requiring high accuracy (e.g., cadastral, public works, infrastructures, etc.). (*Information Technology Journal* 8 (6): 929-933, 2009; *doi*: 10.3923/itj.2009.929.933)

## **A Critical Review of Receipt-Freeness and Coercion-Resistance**

Bo Meng

In this study, we first briefly introduce the development status of core cryptographic primitives related to implementation of receipt-freeness and coercion-resistance. These core cryptographic primitives consist of blind signature, deniable encryption, mix net/verifiable shuffles, designated verifier proof/signature, knowledge proof protocol, plaintext equivalence test, secure multi-party computation and deniable authentication protocol. Then, a typical deniable encryption scheme is analyzed and improved. Moreover, the state-of-art of receipt-freeness and coercion-resistance, based on the internet voting model proposed by us, is presented. Finally, the status in quo of formal analysis of receipt-freeness and coercion-resistance is discussed. (*Information Technology Journal* 8 (7): 934-964, 2009; *doi*: 10.3923/itj.2009.934.964)

## **A Review of Hardware Transactional Memory in Multicore Processors**

X. Wang, Zhenzhou Ji, Chen Fu and Mingzeng Hu

In this study, we give a review of the current Hardware Transactional Memory (HTM) systems for Multicore processors. Hardware transactional memory systems are classified into the following three categories: how to perform version management and conflict detection, whether to support unbounded transactional memory and whether to support transactions nesting. Finally, we discussed two active research challenges: the relationship between transactional memory and Input/Output operations and Instruction Set Architecture (ISA) supporting. (*Information Technology Journal* 8 (7): 965-970, 2009; *doi*: 10.3923/itj.2009.965.970)

## **Off-Line Jawi Handwriting Recognition Using Hamming Classification**

Z. Razak, N.A. Ghani, E.M. Tamil, M.Y. Idna Idris, N.M. Noor, R. Salleh, M. Yaacob, M. Yakub and Z.B.M. Yusoff

This study proposes a System-on-chip design for an off-line Jawi handwriting character recognition application. The system is implemented using VHSIC Hardware Description Language (VHDL). The character recognition chip will be developed using Discrete Wavelet Transform (DWT) for feature extraction and Hamming distance algorithm for classification of Jawi characters. The system architecture and implementation will also be discussed in this study. A set of 132 Jawi character's image has been used for generating the unique code during feature extraction process and has been tested for recognition process. (*Information Technology Journal* 8 (7): 971-981, 2009; *doi: 10.3923/itj.2009.971.981*)

## **Blind and Robust Watermarking for Street-Network Vector Maps**

Yu-Chi Pu and I-Chang Jou

This investigation develops a novel and blind watermarking approach suitable for street-network vector maps that records the information about roads by points and line segments. The proposed method simplifies the map using the Douglas Peucker algorithm to obtain the feature points and then subdivides the map into mesh segments. After map segmentation, the watermark is embedded in each segment. The proposed approach is superior to other vector map watermarking methods, since, it resolve the synchronization problem from the alternation of vertex coordinates. Moreover, the detection step does not require the original map in either the segmentation step or the watermarking step. Simulation results indicate that the proposed approach can withstand a variety of common attacks, including similarity transformation, map shifting, cropping, simplification and noise addition. (*Information Technology Journal* 8 (7): 982-989, 2009; *doi: 10.3923/itj.2009.982.989*)

## **Conditioning for State Space Reduction in Program Model Checking**

Long Yuejin and Xiao Jianyu

This study aim to propose a scheme of applying program conditioning to reduce state space for program model checking, in which the antecedent of a implication

form in LTL formula of program property is taken as the constrained condition of program conditioning and the statements irrelevant to satisfiability of the property are deleted. Analysis and experiment show that not only this scheme can effectively reduce a program's state, but also it can preserve the program's property. (*Information Technology Journal* 8 (7): 990-997, 2009; doi: 10.3923/itj.2009.990.997)

## **A Process Generation Approach of Dynamic Workflows Based Description Logics**

FuXin Zhang and YuYue Du

To make workflow processes more flexible, a dynamic generation approach for workflow processes corresponding to an instance is presented in this study. An activity, a part of a workflow, is defined as an action based on Description Logics (DLs). User preferences are considered, since a final solution should satisfy user preferences as much as possible. Also, a hierarchical workflow ontology model is proposed and a deciding method for basic routing relations in workflows is provided to produce the processes completely. Then for generating the processes, a new planning algorithm of workflow processes, DPWPG: Dynamic Planning for Workflow Process Generation, is presented and used to search matching activities in a workflow ontology model, according to ontological reasoning in semantic activities and users' preferences. Finally, an example is given to test the performance of the planning algorithm. (*Information Technology Journal* 8 (7): 998-1005, 2009; doi: 10.3923/itj.2009.998.1005)

## **SRRG: An Effective Self Recovery Routing Game for Mobile Ad hoc Network**

Q. Dan-Yang, M. Lin, S. Xue-Jun and X. Yu-Bin

Mobile ad hoc network (MANET) is a centerless packet radio network without the use of any fixed infrastructure. Tremendous attentions have been received because of capabilities of self configuration and self maintenance especially in public safe and disaster recovery situations. Attenuation and interference caused by node mobility and wireless channels sharing, however, weaken the stability of communication links, which makes routing protocol design present nontrivial challenges such as broadcast storm, stale route and delay. The negative impact of wireless routes discontinuity on pervasive communication is alleviated by an effective Self Recovery Routing Game (SRRG) proposed in this study for source-

initiated routing protocols by restricting route require zone on intermediate forward nodes according to the solution of optimal exploring equations. The purpose of SRRG is to reduce overhead during route maintenance as well as allowing continuous packet forwarding for fault resilience. NS2 based simulating results indicate that SRRG based on AODV presented in this study achieves much notable improvement for performance of MANET in packet successful delivery rate and total overhead, what is more, obtains much lower average end-to-end delay susceptibility on network capacity and node mobile state simultaneously to improve robustness and survivability. (*Information Technology Journal* 8 (7): 1006-1012, 2009; *doi*: 10.3923/itj.2009.1006.1012)

### **Performance Study of Cooperative Diversity System over Nakagami-m Fading Channels**

Jingning Wang, Xuejun Sha, Linan Sun and Zhongzhao Zhang

In this study, a cooperative diversity scheme with decoded-and-forward plus amplify-and-forward is proposed by employing truncated stop-and-wait automatic repeat request for error control. All the transmission channels are assumed to exhibit Nakagami-m fading and the cross-layer performance is analyzed for the proposed scheme, such as the channel efficiency in physical layer, throughput and packet loss rate in link layer. The simulation results show that, the proposed scheme has the better cross-layer performance than other cooperative systems. By choosing a suitable partner, the proposed cooperative scheme can provide better performance than non-cooperative systems and spatial diversity gain can be obtained. (*Information Technology Journal* 8 (7): 1013-1019, 2009; *doi*: 10.3923/itj.2009.1013.1019)

### **The Application of Value Analysis Based on Kano's Two Dimensions Model and Value Expansion Model**

Kun-Lin Hsieh

How to obtain the useful Business Intelligence (BI) had known as an important work for most enterprises in Taiwanese, especial for the leisure industry. Hence, in this study, we will demonstrate a value analysis procedure based on the Kano's two dimensions model and value expansion model to address such issue. Besides, an illustrative example owing to the leisure farming at Taitung area in Taiwan is also taken to demonstrate the feasibility and rationality of the proposed procedure. The important findings and conclusions in this study can be summarized as: (1) the



Must-be values (keep health, self-satisfactory, leisure experience) for leisure farming case were mined by using the proposed Kano's model; (2) the important products/services, benefits were obtained from the Must-be values by using the proposed value expansion model; (3) managers can know how to rationally and feasibly construct their corresponding competitive strategies for different customers' clusters. (*Information Technology Journal* 8 (7): 1020-1026, 2009; *doi: 10.3923/itj.2009.1020.1026*)

## **A Quantum Secure Direct Communication with Authentication**

Zu-Ning Chen, Zheng Qin and Lei Lu

In this study, a novel quantum secure direct communication protocol is proposed with authentication using the quantum superdense coding scheme and a braid-based key agreement protocol. The security of the proposed protocol is based on the no-cloning theorem, the correlations of quantum entanglement and the fact that the  $p$ -th root finding problem on braid groups is intractable even on quantum computers, as well as classical computers. In the proposed protocol, the sender Alice and the receiver Bob firstly apply a braid-based key agreement protocol to share a secret random number, whose size and magnitude are undecided in advance, for authentication. Then, Alice and Bob share a set of EPR pairs. Both sides authenticate each other through the Bell state measurement on their check qubits. Alice encodes a secret message on their message qubits in terms of superdense coding and then sends her message qubits to Bob. After receiving Alice's message qubits, Bob decodes them so as to get the secret message. We prove rigorously that the proposed QSDC protocol can resist the known attacks so far, particularly the man in the middle attacks. At the same time the proposed protocol is similar in the communication way to the common communication. (*Information Technology Journal* 8 (7): 1027-1032, 2009; *doi: 10.3923/itj.2009.1027.1032*)

## **A Study on Unified Term Co-Occurrence Model**

Qiao Ya-Nan, Qi Yong and Hou Di

In order to improve the comprehensive performance and expand the scope of application of traditional term co-occurrence models, this study proposes Unified Term Co-occurrence Model. It unites two types of traditional term co-occurrence models (which are called mother models of Unified Term Co-occurrence Model) and could make a series of compound models of them for various research conditions. Precision and stability are two key performance indicators of term co-occurrence models. The first type of traditional term co-occurrence

models are good at stability and the second type of traditional term co-occurrence models are good at precision. The experimental results in this study confirm that precision and stability of Unified Term Co-occurrence Model (UTCM) are not lower than both of its mother models. Then, a new measure for comprehensive performance is proposed and Unified Term Co-occurrence Model (UTCM) achieves better comprehensive performance compared with both of its mother models. Researchers can use unified term co-occurrence model instead of traditional models as an important tool to get more rational experimental results in relative research fields such as information retrieval, natural linguistic processing and computational linguistics, etc. (*Information Technology Journal* 8 (7): 1033-1038, 2009; *doi*: 10.3923/itj.2009.1033.1038)

### **Inducing Positive and Negative Rules Based on Rough Set**

Tinghuai Ma, Jiazhao Leng, Mengmeng Cui and Wei Tian

Traditional classification rules take the positive form as  $C \rightarrow D$ . A new method of retrieving the negative  $\neg C \rightarrow \neg D$  form is introduced in this paper. Negative rules can improve the classification quality in some case. We propose a classification algorithm named Rule Generation based on Classification Attribute (RGCA) to deduct negative and positive rules. The RGCA algorithm won't need processing records item by item. The real dataset are used to verify the presented algorithm. The result shows the negative rules is more than positive rules based on RGCA algorithm, the classification accuracy of RGCA algorithm is better than traditional positive based algorithm. (*Information Technology Journal* 8 (7): 1039-1043, 2009; *doi*: 10.3923/itj.2009.1039.1043)

### **An Energy-Aware Cluster-Based Routing Protocol for Wireless Sensor and Actor Network**

Zhicheng Dai, Zhi Li, Bingwen Wang and Qiang Tang

In this study, an Energy-Aware Cluster-Based Routing (EACBR) protocol which adapts to the characteristics of WSN is proposed. Sensors and actors are divided into some clusters and every cluster including an actor and some sensors is considered to different subnet. The Shortest Path Trees (SPTs) from sensors as resource to actor as destination in every subnet are calculated by Dijkstra algorithm. The process of EACBR protocol is divided into rounds and SPTs are dynamically generated according to network states in each round. The analysis and simulation results show that EACBR protocol can prolong network lifetime and reduce transmission delay. (*Information Technology Journal* 8 (7): 1044-1048, 2009; *doi*: 10.3923/itj.2009.1044.1048)

## **The Design of Firewall in Mobile Phone Based on Cross-Layer Collaboration**

Hao Yu, Ming-Xiang He and Hai-Chun Sun

Being different from the traditional packet filter firewall, this study gives a design model of mobile phone firewall which is based on the cross-layer collaboration. Firstly, author designed the functional model and the overall framework. Secondly, author devised the key process and algorithm. At last, the author validated the advantage of model through simulation experiments. Through, the simulation experiments, the model is proved to be effective to reduce the firewall's consumption of resources and improve the efficiency and quality of firewall in mobile phone. (*Information Technology Journal* 8 (7): 1049-1053, 2009; *doi*: 10.3923/itj.2009.1049.1053)

## **Modeling Multimedia Synchronization using Petri Nets**

Wei Liu and Yuyue Du

In this study, Logical Time Interaction Petri Nets (LTIPN) were designed to describe multimedia synchronization based on the previous models. In the model, we introduce logical expressions which are used to describe passing value indeterminacy in an logical time Petri net to model multimedia synchronization. And all multimedia synchronization events including multimedia objects are expressed by transitions of Petri nets, while the previous models mostly use places of Petri nets to express multimedia objects. This study provides users simple and intuitive modeling approaches. Basic temporal relations between multimedia objects, multimedia synchronization strategies and user interactive operations can be represented simply and explicitly by the LTIPN. (*Information Technology Journal* 8 (7): 1054-1058, 2009; *doi*: 10.3923/itj.2009.1054.1058)

## **Connectivity Preserving Distributed Coordination Control with Few Long Range Interactions**

Dong-Mei Wang and Hua Jing Fang

Distributed coordination control of multi-agent systems raises fundamental and novel problems in recent years. A great new challenge is the development of robust distributed motion algorithms. In this study, a distributed control strategy for connectivity preserving coordinated motion of multi-agent system is presented by

introduction small-world connections among mainly local interactions. For arbitrary initial network topology, the group consists of several connected subgroups. Some agents are modeled as virtual leader and steer the disconnected subgroup to flock together. In this way, flocking problem can be solved under more relaxed conditions, which need no connectedness of the dynamic topology all the time, even the connectedness of the initial graph. Further, we show that the strategy is robust against connection failures between followers and leader in the leader following coordination control. Simulation results are given to validate the method. (*Information Technology Journal* 8 (7): 1059-1064, 2009; *doi*: 10.3923/itj.2009.1059.1064)

## **Applying SMV for Security Protocol Verification**

Jia Mei, Huaikou Miao and Pan Liu

With the rapid development of the internet, a lot of attentions have been paid to the reliability of the security protocols. Model checking can be used to obtain the assurance that a protocol can not be threatened by an intruder. In this study, on the basis of former researches, an approach is presented for using efficient and complete formal verification tool SMV to model and verify security protocol. By this approach, we can construct related model easily and verifying the property automatically. We illustrate the approach by taking Otway-Rees protocol as an example and discover an attack upon the protocol. Finally, the protocol is adapted to satisfy the security properties. (*Information Technology Journal* 8 (7): 1065-1070, 2009; *doi*: 10.3923/itj.2009.1065.1070)

## **An Efficient MDC Framework Based on DCT and SPIHT**

Lin-Lin Tang and Zhe-Ming Lu

Multiple Description Coding (MDC) is one of the promising methods for robust transmission over non-prioritized and unpredictable networks. Based on the Discrete Cosine Transform (DCT) and the Set Partition in Hierarchical Trees (SPIHT) compression method, this study proposes a new MDC framework. We make full use of the energy concentration of DCT and the similarity among the blocks composed of reordered DCT coefficients to apply the SPIHT algorithm to the transform-domain images composed of reordered DCT blocks. The purpose of using the reordered coefficients is to realize the energy redistribution. Redundancy is introduced by the full and partial encoding method which means the three descriptions, each using different bit rates to encode the information from

three different orientations, i.e., vertical, horizontal and diagonal directions. For transmission we adopt three channels, each containing the hybrid information from three different directions. Experimental results demonstrate that present technique is effective and practical. (*Information Technology Journal* 8 (7): 1071-1075, 2009; doi: 10.3923/itj.2009.1071.1075)

### **Detection on the Period of Long PN Code in DS/SS Signals at Low SNR**

Zhong Zhi, Zhao Xintong and Ren Guanghui

To accurately detect the period of long PN sequence in electronic countermeasures in Direct Sequence/Spread Spectrum (DS/SS) communication, a method is proposed in which the influence of information code on the detection of the period of SS signals was eliminated by delaying and multiplying the input DS/SS signals with the known PN rate and then the period of long PN sequence was obtained by reprocessing the power spectrum. Simulation results show that the method proposed can detect both long and short PN sequences accurately at the signal-to-noise ratio less than -13 dB and the detection is little affected by the period of symbol, but it is affected by the period of PN sequence and longer N needs longer sample time if the detected SNR is the same. (*Information Technology Journal* 8 (7): 1076-1079, 2009; doi: 10.3923/itj.2009.1076.1079)

### **A Novel Approach for MMIC Reliability Testing Based on Weibull Distribution**

Zheng-Liang Huang, Fa-Xin Yu, Shu-Ting Zhang, Yao Zheng and Ji-Xin Liu

This study describes a reliability test method for reliability evaluation of MMICs (Monolithic Microwave Integrated Circuits) in product inspection applications. It takes advantages of the potentiality of various reliability test approaches, aiming at meeting the requirement of MMIC development. In this way, quicker realistic reliability assessment can be also realized for new products or those without historic data. Applications of this prediction model to real MMICs are illustrated and a general overview of the corresponding parameters' influence is given. The results of this study indicate in order to predict the GaAs MMICs reliability in a fixed shorter time and smaller sample size, one can design the test based on the combination of empirical methods and statistical methods. This study proposed a reliability prediction combining Arrhenius method and Weibull statistical method and

we find Weibull slope is important for the MMICs reliability characterization. The analysis predicts excellent reliability for MMICs based on Arrhenius method, Weibull method and zero fails result. (*Information Technology Journal* 8 (7): 1080-1083, 2009; *doi*: 10.3923/itj.2009.1080.1083)

## **A Multi-Channel Multimedia Content Distribution Strategy using Multiple Description Coding**

Xuefeng Jiang, Shan Jiang and Ting Peng

Recently multi-channel media broadcast systems on P2P network have emerged in applications such as long-distance education and multimedia broadcast television. As these systems suffer from an obvious serious conflict between huge amounts of data and limited available bandwidth over the Internet, it's unpractical to provide the best network service for the all multimedia service channels. So, there are two key issues for the multi-channel systems: (1) how to reduce transmission delay that multimedia stream of each channel is distributed to all consumers and (2) how to guarantee the QoS metrics of some concernful channels, such as bit rates and latencies. Legacy relevant approaches mainly focus on the assignment of priorities to different peers and provide differentiated service quality to them thereafter. However, the issues of low-delay transmission and service differentiation for the entire channels have not addressed yet. In this study, we propose a multi-channel multimedia dissemination strategy named DiffStream. In DiffStream, Multiple Description Coding (MDC) technology is utilized and each channel disseminates partial streaming data instead of all. And service differentiation is also achieved by treating different channels with varying priorities and reserving bandwidth in advance to different channels in application layer. In addition, an extensive mechanism of vacant bandwidth preemption for improving bandwidth utilization is also raised. Experiments are carried out on NS2 and the results have demonstrated DiffStream's effectiveness in achieving our design objectives. (*Information Technology Journal* 8 (8): 1084-1093, 2009; *doi*: 10.3923/itj.2009.1084.1093)

## **Characteristics of Flow past a Square Cylinder using the Lattice Boltzmann Method**

S. Ul-Islam and C.Y. Zhou

The Lattice Boltzmann Method (LBM) has been seen as an alternative tool for the computational simulation of fluid dynamics. In this study, we use the LBM with

Single-Relaxation-Time (SRT) collision model to simulate two-dimensional (2D) laminar flow past a square cylinder. The main aim of the study is to systematically investigate the influences of the locations of the inflow, outflow and side walls boundaries, where Reynolds number is kept at 100 for all calculations. The side wall boundary locations will be analyzed using the periodic and symmetric boundary conditions. Analyses of the relaxation time parameter also have been investigated. Some physical quantities, such as the drag coefficient, mean drag coefficient, root mean square values of lift coefficient and the Strouhal number are examined for the purpose. We also examined the vortex shedding formation which provides an excellent means of visualizing the von Karman vortex street. We found that there is a certain range for inflow, outflow and side wall boundaries where physical quantities such as drag and mean drag coefficients, root mean square value of lift coefficient and the Strouhal number show some changes. Results also show that, there is a change for physical quantities when the relaxation time parameter is changed from certain range and also effect the computational time. The physical quantities are obtained and compared with other existing experimental and numerical results. (*Information Technology Journal* 8 (8): 1094-1114, 2009; *doi*: 10.3923/itj.2009.1094.1114)

## **Processing Techniques for Querying Multimedia Contents**

Zhongsheng Cao, Zongda Wu, Yuanzhen Wang and Guiling Li

In our earlier studies, we have designed a general-purpose multimedia query language called UMQL, which allows users to query multimedia data based on their content information and then for its internal query representation, we have also designed an operator-based internal query algebra called UMQA, which has equivalent ability with UMQL on multimedia query specification, but focuses on internal query processing implementation. In this study, we discuss the query processing techniques for querying multimedia contents efficiently, namely, how to interpret and implement a UMQA-based query plan to obtain target multimedia data from a database efficiently. More specifically, we first of all discuss the efficient implementations of main UMQA operators. Then, we in theory analyze the execution costs for the implementation algorithms of UMQA operators and present the experimental results of performing these implementation algorithms on a prototype information system. Finally, the acceptable experimental results show that all the processing techniques proposed in this study for querying multimedia contents are feasible and applicable. (*Information Technology Journal* 8 (8): 1115-1128, 2009; *doi*: 10.3923/itj.2009.1115.1128)

## **Towards Common Acquaintance Immunization Strategy for Complex Network**

Pan Liu, Huaikou Miao and Jia Mei

The study presents a new immunization strategy for computer networks and populations with board and, in particular, scale-free degree distributions. The proposed strategy calls for the immunization of common acquaintances of random nodes (individuals). Similar to acquaintance immunization, our strategy also requires no knowledge of the node degrees or any other global information. Firstly, we analyze the successful and unsuccessful probability of acquaintance immunization with a simple example and the strategy ineffective reasons. Then, we study the probability of looking for common neighbors and present common acquaintance immunization strategy. Next, to compare common acquaintance immunization with acquaintance immunization, we implement a series of experiments from different aspects. The result of experiments shows that common acquaintance immunization gains higher stability and reliability for protecting complex network and can detect the structure of the unknown network. The conclusions of the study are that, compared with other immunization strategy, our approach requires no the whole information of complex network and efficiently immunizes the HUBS in complex network. (*Information Technology Journal* 8 (8): 1129-1139, 2009; *doi*: 10.3923/itj.2009.1129.1139)

## **Realization of a Covert Communication System Over the Public Switching Telephone Network**

Jixin Liu and Zheming Lu

In this study, a covert communication applying the vector quantization based information hiding algorithm and the Public Switching Telephone Network (PSTN) is implemented. The system aims at offering good security of the secret binary image message and the real-time performance that is very important for the speech calling of the telephone service. Therefore, we adopt a simple and effective encryption method for the secret binary image message prior to the embedding process. The embedding position is also protected by using a secret key. By using these methods, the requirement of short-term protection in the bursting phone call communication for the secret binary image message and the real-time encryption are both fulfilled. Furthermore, an information hiding algorithm based on vector quantization is proposed and the advantage of it is discussed. We evaluate the system with the ITU-T G.729a standard speech codec in StegoPhone, which is



our platform for research on covert communication technology via PSTN. The experimental results show that our method has negligible hearing effects on the conversation speech and meet the requirement of the real-time calling conversation communication via PSTN. (*Information Technology Journal* 8 (8): 1140-1149, 2009; **doi**: 10.3923/itj.2009.1140.1149)

## **Design of Full Order Observer in Speed Sensorless Induction Motor Drive**

Deng Xin, Zhao Jin, Geng Tao and Liu Yang

This study proposes the full order observer feedback gain and adaptive speed PI design methods in speed sensorless induction motor drive. The characteristic of speed estimation plant function, which has impact on adaptive speed estimation PI design, is influenced by the feedback gain design. It is found that poor damping exists when feedback gain is zero and a simple, parameter independent feedback gain design method is introduced. Estimated speed steady state accuracy, noise sensitivity and the relation between speed estimation loop and speed control loop are the affecting factors in adaptive speed estimation PI design. The method of adaptive speed estimation PI design is proposed according to the speed control loop. Steady state and dynamic performance of the sensorless drive using simulation are demonstrated. (*Information Technology Journal* 8 (8): 1150-1159, 2009; **doi**: 10.3923/itj.2009.1150.1159)

## **The Analysis of the Synthetic Range Profile Based on Doppler Filter Bank using FFT**

Wei Peng, Xuegang Wang, Kesong Chen and Bin Tang

A wideband imaging architecture based on subbanding and Doppler filter bank using FFT is developed and its performance is analyzed in detail. The theoretical analysis shows that owing to Doppler dispersion, the target's range profile will produce distortion with the increase in target velocity. The distortion includes range shift and amplitude deformation. At the same time, two related theoretical formulas are deduced for the calculation of the range shift value and evaluation of the amplitude deformation extent of a moving target's range profile formed by the proposed imaging architecture and thereby the maximum critical velocity is derived. When target velocity is less than the maximum critical velocity, a moving target's range profile with acceptable distortion can be obtained. Specific conclusions are verified with some simulations. (*Information Technology Journal* 8 (8): 1160-1169, 2009; **doi**: 10.3923/itj.2009.1160.1169)

## **The Security Analysis and Enhancement of Photographic Authentication**

Hsien-Chou Liao, Cheng-Hsiung Hsieh, Ching-Wen Chen and Wei-Chiang Chen

The aims of this study were to analyze the security of Photographic Authentication (PA) systematically, show that PA is vulnerable under the polling attack and give some suggestions to enhance its security. To achieve the above goals, an automatic attack tool is designed to analysis the security of PA systematically. The tool captures the displayed photos, matches with historical ones to accumulate their counts. It selects the photo with highest count and repeats the process until successful login. In order to interfere with the photo match of the attack tool, a noise displacement method is also used to add noises into the original photos. Correspondingly, two noise reduction techniques are implemented in the attack tool for security analysis of PA with noise displacement methods. Furthermore, a simulation tool is designed to analysis the security of PA under a large number of photo sets. The security of PA is analyzed clearly from the experimental and simulation studies and enhancement ways of PA are also summarized in this study. (*Information Technology Journal* 8 (8): 1170-1179, 2009; *doi*: 10.3923/itj.2009.1170.1179)

## **Using Renyi Cross Entropy to Analyze Traffic Matrix and Detect DDoS Attacks**

Ruoyu Yan and Qinghua Zheng

In this study, we propose Renyi cross entropy to analyze matrix traffic and detect anomaly rather than other entropy metrics, such as Shannon entropy, used extensively in many earlier studies. At first, we introduce a new type of traffic termed IF-flow (internal flow) collected in router. IF-flow can make the attack traffic more conspicuous in a large number of normal traffics, which makes attacks, especially DDoS attacks, spotted more easily. Then, the analysis of Renyi cross entropy of IF-flow matrix traffic, Abilene matrix traffic confirms that matrix traffic distribution has local stability in time. This conclusion provides a guidance to accurately detect anomaly. Finally, Renyi cross entropy is used to detect DDoS attacks existed in IF-flow testing data set and Abilene testing data set. The results of detection experiments show Renyi cross entropy based method can detect DdoS attacks at the beginning with higher detection rate, lower false alarm than Shannon entropy based method. (*Information Technology Journal* 8 (8): 1180-1188, 2009; *doi*: 10.3923/itj.2009.1180.1188)

## **A View-Based Approach to Three Dimensional Object Recognition**

Xu Sheng and Peng Qi-Cong

To improve the performance of three-dimensional object recognition systems, we propose a view-based method in this study. First we extract wavelet moments, texture features and color moments from the 2D view images of 3D objects. Wavelet moments have the multi-resolution properties in addition to the invariant properties under translation, scaling and rotation. Texture features can distinguish objects which have similar shapes and different appearance. Color moments are robust and insensitive to the size and pose of objects. Support Vector Machine (SVM) is chosen as classifier. Then the feature subset selection and SVM parameters optimization are accomplished automatically and simultaneously using Genetic Algorithm (GA) in an evolutionary way. We assessed our method based on the original and noise corrupted 3D object dataset COIL-100. One hundred percent correct rate of recognition was obtained when the number of presented training views for each object was 36 (10 degrees interval) and 18 (20 degrees interval). When the number of training views was reduced, the correct rate of recognition was also satisfied. (*Information Technology Journal* 8 (8): 1189-1196, 2009; *doi*: 10.3923/itj.2009.1189.1196)

## **Distributed Index based on Geographic Hashing Table for Mobile Ad Hoc Networks**

Yongsheng Fu, Xinyu Wang and Shanping Li

Distributed Hash Table (DHT) has proven to be an efficient platform for building a variety of scalable and robust distributed applications like content sharing and location in the internet. However, the adaptation of DHT technology to Mobile Ad-hoc NETWORK (MANET) is not straightforward. Network scalability and routing as well as information distribution are major problems for nodes in a MANET, who are only aware of their immediate neighborhood. Several algorithms implement DHT using geographic information in MANET, but they can not adapt well in large-scale network without an efficient localization mechanism. This study propose a new DHT implementation named Distributed Index based on Geographic Hash Table (DI-GHT) in MANET. In DI-GHT, using hashing function, the shared resource location information (index) is mapped to nodes in a geographic area rather than a geographic position. The network is partitioned into domains and DI-GHT distributes resource index in all domains. The requestor finds the index information in the nearest domains using the hash

function and then retrieves the resource. The simulation results and analysis show that DI-GHT outperforms original Geographic Hash Table (GHT) in terms of query success rate and message cost. (*Information Technology Journal* 8 (8): 1197-1204, 2009; **doi**: 10.3923/itj.2009.1197.1204)

### **Auto Rate MAC Protocol Based on Congestion Detection for Wireless Ad Hoc Networks**

Wei Wu, Zhongzhao Zhang, Xuejun Sha and Chenguang He

Some auto rate protocols at the MAC layer have been proposed to improve the throughput of Ad Hoc networks with multiple rates support at physical layer. However, all of them neglect the influence of network congestion. The network performance will deteriorate as a result of transmitting data to a congested node. In this study, an auto rate protocol based on congestion detection called auto rate based on congestion detection (ARCD) is proposed. In the ARCD protocol, congestion level is detected at the receiving nodes and fed back to the sending nodes along with the rate selection information and then the sending nodes transmit a limited number of back-to-back packets at appropriate rates. The simulation results show that the ARCD protocol can not only improve the throughput and packet delivery ratio of Ad Hoc networks by taking full advantage of channel condition, but also achieve hop-by-hop congestion control. (*Information Technology Journal* 8 (8): 1205-1212, 2009; **doi**: 10.3923/itj.2009.1205.1212)

### **Tower Bridge Movement Analysis with GPS and Accelerometer Techniques: Case Study Yonghe Tower Bridge**

Mosbeh R. Kaloop and Hui Li

This study investigates the possibility of using Wden Matlab function and Fast Fourier Transformation (FFT) method for bridge tower movement analysis. GPS and accelerometer techniques were used to collect the lateral displacements, acceleration and torsion displacements data of a Yonghe bridge tower. The analysis of test results indicate that the: (1) noise of GPS signals is high (2) signals accuracy obtained from the wden function increased by 20%; (3) traffic loads are the main factor affects the tower movement; (4) power spectral density is a good parameter to detect the tower movements and (5) GPS can be used as a trustworthy tool for characterizing the dynamic behavior of the low frequency bridges. (*Information Technology Journal* 8 (8): 1213-1220, 2009; **doi**: 10.3923/itj.2009.1213.1220)

## **First-Price Sealed Auction Model with Increased Fairness for Resource Allocation in Grids**

M. Mirzayi and M.R. Khayyambashi

The goal of grid computing is to achieve all kinds of resources sharing between organizations. Auctioning models are a source of solutions to the challenge of resource allocation in grid. Auction models can guarantee the interest of participants in the grid with fairness and efficiency. In this study, we modify the bidding stage using Signcryption model and a new definition of grid auction fairness is presented that is based on communication network measurement. First-price sealed auction (FPA) is used for resource management using new methods. SimGrid simulation framework is used which support auction protocols and evaluate results from users' perspective as well as from resources' perspective. The results showed that the new model has a good behavior in grid environment and security and fairness increase in auction model with this method. (*Information Technology Journal* 8 (8): 1221-1227, 2009; doi: 10.3923/itj.2009.1221.1227)

## **An Extended iSCSI Protocol Recognizing Multicast Session: iTRM**

Huailiang Tan, Weixin Tang and Bin Yin

This study presents an extended definition for iSCSI protocol that recognizes multicast session: iTRM (iSCSI transparent reliable multicast) protocol. The iTRM protocol extends the definition of iSCSI PDU in order to interpret multicast session announcement. Sharing data for iSCSI sessions is delivered via multicast session and NAK of multicast session is transmitted by iSCSI session to ensure reliability of multicast transmission. The iTRM protocol adopts a transparent agent that monitors I/O accessing behavior of iSCSI initiators and launches the multicast session when sharing data is requested by several iSCSI initiators. Test results show iTRM protocol improves the performance of parallel I/O operations when initiators boot simultaneously from a single target. iTRM also enhances the stability of I/O performance of iSCSI network computing system. (*Information Technology Journal* 8 (8): 1228-1234, 2009; doi: 10.3923/itj.2009.1228.1234)

## **A Fast Association Rules Mining Algorithm for Dynamic Updated Databases**

Ni Tian-quan, Wang Jian-dong, Peng Xiao-bing and Liu Yi-an

To overcome the difficulty of updating frequent item sets in the dynamic database, this study proposes a new algorithm for efficiently mining association rules in dynamic updated databases. The algorithm constructs the corresponding vector subspace according to the number of nonempty subsets in the item sets which is based on the concept of the Apriori algorithm that the maximal frequent item sets are definitely the subsets of database's item set. After the construction of the vector subspace, the dynamic tuples additions and deletions of the database, as well as the updated solutions to the frequent item sets when the minimum support is changed, are determined efficiently by the vector inner computing. Studies show that the algorithm is not only simple in that it needs only to scan the database once, but also capable of processing super database. (*Information Technology Journal* 8 (8): 1235-1241, 2009; doi: 10.3923/itj.2009.1235.1241)

## **An Intelligent Topic Map-Based Approach to Detecting and Resolving Conflicts for Multi-Resource Knowledge Fusion**

Huimin Lu and Boqin Feng

In this study, we propose a novel concept of intelligent topic map, which embodies the multi-level, multi-granularity and inherent relevant characteristics of knowledge and realizes knowledge reasoning. With the intelligent topic map as infrastructure, we design a specific ontology fusion process for multi-resource knowledge fusion. Also, we define the taxonomy of merging conflicts which occur during the process of intelligent topic maps merging. We define and classify merging conflicts into data-level conflicts, structure-level conflicts, rule-level conflicts and temporary-level conflicts. We propose the detection and resolution schemes for each merging conflict. Additionally, we implement the multi-resource knowledge fusion conflicts detection and resolution system based on rules. The experimental results show that our method can correctly detect and resolve the conflicts in topic maps merging and it is helpful to improve the quality of multi-resource knowledge fusion. (*Information Technology Journal* 8 (8): 1242-1248, 2009; doi: 10.3923/itj.2009.1242.1248)

## **Intelligent Model for Automatic Text Summarization**

M.S. Binwahlan, N. Salim and L. Suanmali

The navigation through hundreds of the documents in order to find the interesting information is a tough job and waste of the time and effort. Automatic text summarization is a technique concerning the creation of a compressed form for single document or multi-documents for tackling such problem. In this study, we introduced an intelligent model for automatic text summarization problem; we tried to exploit different resources advantages in building of our model like advantage of diversity based method which can filter the similar sentences and select the most diverse ones and advantage of the non diversity method used in this study which is the adaptation of intelligent techniques like fuzzy logic and swarm intelligence for building that method which gave it a good ability for picking up the most important sentences in the text. The experimental results showed that our model got the best performance over all methods used in this study. (*Information Technology Journal* 8 (8): 1249-1255, 2009; **doi:** 10.3923/itj.2009.1249.1255)

## **K-Means Clustering to Improve the Accuracy of Decision Tree Response Classification**

S.A. Ali, N. Sulaiman, A. Mustapha and N. Mustapha

The use of deep generation with statistical-based surface generation merits from response utterances readily available from corpus. Representation and quality of the instance data are the foremost factors that affect classification accuracy of the statistical-based method. Thus, in classification task, any irrelevant or unreliable tagging of response classes represented will result in low accuracy. This study focused on improving dialogue act classification of a user utterance into a response class by clustering the semantic and pragmatic features extracted from each user utterance. A Decision tree approach is used to classify 64 mixed-initiative, transaction dialogue corpus in theater domain. The experiment shows that by using clustering technique in pre-processing stage for re-tagging response classes, the Decision tree is able to achieve 97.5% recognition accuracy in classification, better than the 81.95% recognition accuracy when using Decision tree alone. (*Information Technology Journal* 8 (8): 1256-1262, 2009; **doi:** 10.3923/itj.2009.1256.1262)

## **An Enhanced Particle Swarm Optimization Algorithm**

Xue-yao Gao, Li-quan Sun and Da-song Sun

Particle Swarm Optimization (PSO) algorithm is often used for finding optimal solution, but it easily entraps into the local extremum in later evolution period. Based on improved chaos searching strategy, an enhanced particle swarm optimization algorithm is proposed in this study. When particles get into the local extremum, they are activated by chaos search strategy, where the chaos search area is controlled in the neighborhood of current optimal solution by reducing search area of variables. The new algorithm not only gets rid of the local extremum effectively but also enhances the precision of convergence significantly. Experiment results show that the proposed algorithm is better than standard PSO algorithm in both precision and stability. (*Information Technology Journal 8 (8): 1263-1268, 2009; doi: 10.3923/itj.2009.1263.1268*)

## **A Review of Software Transactional Memory in Multicore Processors**

Chen Fu, Zhibo Wu, Xiaoqun Wang and Xiaozong Yang

The transactional memory in multicore processors has been a very hot research area over past several years. Many transactional memory systems have been proposed to solve the synchronization problem of multicore processors. Software transactional memory is one of the critical methods to ease parallel programming and improve the scalability in the environment with many cores. In this study, we give a review of the current software transactional memory systems for Multicore processors. Software transactional memory systems are classified into the following categories: transaction granularity, data organization, version management, conflict detection and synchronization. Finally, we discuss an active research challenge: whether strong isolation should be supported for the tradeoff between performance and semantics correctness in software transactional memory systems. (*Information Technology Journal 8 (8): 1269-1274, 2009; doi: 10.3923/itj.2009.1269.1274*)

## **The Characteristics of Orthogonal Trivariate Wavelet Packets**

Qingjiang Chen and Zongtian Wei

The notion of orthogonal nonseparable trivariate wavelet packets, which is the generalization of orthogonal univariate wavelet packets, is introduced. An



approach for constructing them is presented. Their orthogonality properties are discussed. Three orthogonality formulas concerning these wavelet packets are obtained. The orthonormal bases of space  $L^2(\mathbb{R}^3)$  is presented. (*Information Technology Journal* 8 (8): 1275-1280, 2009; **doi:** 10.3923/itj.2009.1275.1280)

### **Steganalysis Based on Difference Statistics for LSB Matching Steganography**

Jiaohua Qin, Xingming Sun, Xuyu Xiang and Zhihua Xia

In this study, a new steganalytic method, which exploits the difference statistics of neighboring pixels, is proposed to detect the presence of spatial LSB matching steganography. In the proposed method, the differences between the neighboring pixels (DNPs), the differences between the local extrema (DLENs) and their neighbors in grayscale histogram are used as distinguishing features and the SVM is adopted to construct classifier. Experimental results show that the proposed method is efficient to detect the LSB matching steganography for the compressed and uncompressed images and outperforms other recently proposed algorithms. (*Information Technology Journal* 8 (8): 1281-1286, 2009; **doi:** 10.3923/itj.2009.1281.1286)

### **Blockwise Reversible Data Hiding by Contrast Mapping**

Wien Hong, Jeanne Chen and Tung-Shou Chen

The insatiate demands for applications of imagery on the internet have further emphasized the importance of data hiding research. In this study, we proposed an improved reversible contrast mapping data hiding scheme that emphasized on the variance feature of the cover image. The cover image is partitioned into blocks where the variance of each block is calculated and sorted. Data was then embedded by reversible contrast mapping in these sorted blocks for which low variance blocks are embedded prior to those high variance blocks. In the proposed scheme, high payload is maintained and embedment can be selective to achieve high stego-image quality. In comparison to another similar work, the proposed scheme preserved significantly high quality in the stego-image especially for small payload. (*Information Technology Journal* 8 (8): 1287-1291, 2009; **doi:** 10.3923/itj.2009.1287.1291)

## **Time-Multiplexing CNN Simulation Using Limiting Formulas of RK(7,8)**

R. Ponalagusamy and S. Senthilkumar

In this research, a versatile algorithm for simulating CNN arrays and time multiplexing is implemented using numerical integration algorithms. The approach, time-multiplexing simulation, plays a pivotal role in the area of simulating hardware models and testing hardware implementations of CNN. Owing to hardware limitations in practical sense, it is not possible to have a one-one mapping between the CNN hardware processors and all the pixels of the image. The simulator provides a solution by processing the input image block by block, with the number of pixels in a block being the same as the number of CNN processors in the hardware. Simulation results and comparison have also been presented to show the efficiency of the Numerical Integration Algorithms. In this research, RK-eight stage seventh order limiting formulas are implemented and it is found that the RK (7,8) algorithm outperforms well in comparison with the Explicit Euler, RK-Gill, RK-fifth order and RK-sixth order algorithms. A more quantitative analysis has been carried out to clearly visualize the goodness and robustness of the numerical algorithms. (*Research Journal of Information Technology 1 (1): 1-16, 2009; doi: 10.3923/rjit.2009.1.16*)

## **Frontal Colored Face Recognition System**

Zouhir Wakaf and Mariam M. Saii

A system for face recognition in colored frontal face images is proposed. This study presents a new scheme for feature extraction based on deformable models and morphs using the 2D wavelet multi-resolution decomposition, then, a classical semi-parametric system of a multi layered perceptron neural network is employed for classification purpose. A heuristic is designed for defining the face only bounding rectangle thus excluding most of the facial hair, ears and neck and then we defined depending on this computed rectangle four regions of interest, representing the forehead, eye's sockets, nose and chin regions. This heuristic also gives our system invulnerability against both translations and z-axis limited rotations. Next, 2D wavelet coefficients for the three channels of red, green and blue are computed for the whole image using the multi-resolution decomposition. A classification system of back propagation multi layered perceptron neural network is designed and trained with momentum learning and the cross validation during network training in the search procedure and the hyper tangent nonlinearity

as an activation function. Our system is experimented with colored faces from the Stirling University database and the preliminary results we obtained show an 88% success rate. (*Research Journal of Information Technology 1 (1): 17-29, 2009; doi: 10.3923/rjit.2009.17.29*)

### **Improving the Performance of the Authorization Process of a Credit Card System Using Thread-Level Parallelism and Singleton Pattern**

S.H.Ab. Hamid, M.H. Nizam Md. Nasir, W.Y. Ming and H. Hassan

This study presents an architectural framework and prototype of a credit card authorization system using multi-threading and shared memory pool techniques in order to improve the response time during the authorization process. Through the multi-threading technique, each worker thread will be assigned several child threads to perform online fraud validation concurrently, depending on the numbers of cryptographic elements presented in the transaction message. Meanwhile, the worker thread itself performs the card restriction validation based on the information stored in the card's shared memory pool. This approach was implemented to reduce the idle time while waiting for the slow cryptographic operation in each input/output operation that is performed through an external device and to accelerate the authorization process through a memory operation instead of accessing similar information from a database. The implementation of these techniques was then measured in terms of response time. The results showed that the performance of the multi-threaded authentication engine was almost double that of the single-threaded authentication engine and the number of credit card authorizations that can be processed using the shared memory was 10% higher than the number of credit card authorizations that can be processed using a database at a single point. (*Research Journal of Information Technology 1 (1): 30-40, 2009; doi: 10.3923/rjit.2009.30.40*)

### **Opportunistic Distributed Space-Time Coding with Semi-Distributed Relay-Selection Method**

P. Zhang, F. Wang, Z. Xu, S. Diouba and L. Tu

Cooperative diversity has been recently proposed as a way to form virtual antenna arrays that provide dramatic gains in slow fading wireless environments. Opportunistic Relaying (OR) and Distributed Space-Time Coding (DSTC) are two attractive cooperative diversity schemes. In this study, we introduce a new

cooperative scheme: Opportunistic Distributed Space-Time Coding (ODSTC). In ODSTC scheme, more than one relays with best channel conditions are selected. It can achieve a good tradeoff between performance and complexity. We also propose a criterion to select between DSTC scheme and ODSTC scheme. Further, a semi-distributed relay-selection method is given, which can select more than one best relays without topology information. (*Research Journal of Information Technology 1 (1): 41-50, 2009; doi: 10.3923/rjit.2009.41.50*)

### **Effective Video Analysis Preprocessing Algorithm Based on Rough Sets in Compressed Domain**

L. Xiang -wei, Z. Ming-xin, Z. Geng-lie, Z. Ya-lin and Z. Shuang-ping

This study is aimed to overcome the characteristic of redundant data for video analysis, the study propose a video analysis preprocessing algorithm based on Rough Sets (RS). Firstly, the representative data of video sequences is extracted. Secondly, the Information Table is constructed by extracted representative data. Finally, the Core of Information Table is achieved by making use of the attributes reduction theory of RS. As present experimental results indicate, the algorithm can get effective and scientific data to complete video analysis such as key frame extraction and shot segment. Compared to existing techniques, thr proposed algorithm enjoys following advantages. Only a subset of frames need to be considered during video analysis. The limitations of requirements for a huge amounts of memory and CPU resource is overcome. (*Research Journal of Information Technology 1 (1): 51-56, 2009; doi: 10.3923/rjit.2009.51.56*)

### **Evaluation of Delay of Voice End User in Cellular Mobile Networks with 2D Traffic System**

M.R. Amin and Md.I. Islam

In this study, a simple scheme to improve the performance of mobile cellular networks is presented by incorporating delay of voice end user to the new originating calls over handoff calls in a two-dimensional traffic model. Expressions for probability of forced termination of handoff calls and the blocking probability of new originating calls have been derived. It has been found from this study that the probability of forced termination of handoff calls is drastically reduced due to the incorporation of the delay of voice end user compared to the case when no delay of voice end user is used in the system. The results obtained from this study for performance improvement have been compared with the existing method of

channel reservation scheme for handoff calls and have been found that the obtained results provide much better performance improvement by reducing the probability of forced termination and the blocking probability. (*Research Journal of Information Technology 1 (2): 57-69, 2009; doi: 10.3923/rjit.2009.57.69*)

### **Rapid Shot Boundary Detection Algorithm Based on Rough Sets in Video Compressed Domain**

L. Xiang-Wei, L. Zhan-Ming, Z. Ming-Xin, Z. Ya-ILn and W. Wei-Yi

Based on rough sets (RS), a novel rapid shot boundary detection algorithm was proposed in discrete cosine transform (DCT) compressed domain. First, DCT coefficients and DC coefficients are extracted from video sequences, so an information system is constructed with DC coefficient. Second, information system is reduced by reduction theory of RS, the representation of the video frame is obtained by reduced DC coefficients. Finally, by introducing subdividing theory of RS, the frames of video are segmented objectively. The experimental results show that the algorithm can achieve higher performance. Compared to conventional algorithm, the algorithm enjoys many advantages. Firstly, only a subset of frames needs to be considered during analysis, allowing the reduction of the computational complexity, so the algorithm can avoid the expensive computations in decompression processes. Secondly, the relativity of segmentation of video shot becomes more scientific than earlier methods. Its robustness and effectiveness are validated by experiments with various kinds of video sequences. (*Research Journal of Information Technology 1 (2): 70-78, 2009; doi: 10.3923/rjit.2009.70.78*)

### **Role of Information Communication Technologies Adoption in SMES: Evidence from Botswana**

Henry Ongori

This study tries to find out the driving forces for ICTs adoption, benefits, ICTs tools and barriers to ICTs adoption by SMEs. The methodology adopted for the study was a survey method whereby a convenience random sampling of 150 managers/owners of SMEs were selected for study in Gaborone, Botswana. The data was analyzed by descriptive statistics. The findings of the study indicated that, SMEs have not fully adopted ICTs in their business process because of internal and external challenges. This study will make pertinent contribution to the existing literature and inspire managers to come up with appropriate strategies

on how to adopt ICTs in their business process in order to be competitive. (*Research Journal of Information Technology 1 (2): 79-85, 2009; doi: 10.3923/rjit.2009.79.85*)

## **Mechanisms of Customer Knowledge Management in E-Commerce Websites**

M.S. Zanjani, N. Sakhaee and H. Shahbaznezhad

The study aims to present a customer knowledge management mechanisms model (CKM3) which is based on the theoretical aspects stemming from the information retrieval and analysis of the latest results in related literature and the research multiple case study results. This model encompasses an extensive look at the three different dimensions of customer knowledge in more details than prior CKM researches and introduces the comprehensive set of electronic mechanisms in accordance with each identified types of customer knowledge. The study has important implications for e-commerce web sites seeking to improve their Business and customer value through effective selection and deployment of CKM mechanisms. (*Research Journal of Information Technology 1 (2): 86-93, 2009; doi: 10.3923/rjit.2009.86.93*)

## **Malaysia Sexuality Education Multimedia Courseware Design: Will it be a Solution in Teaching Sexuality Subject Matter in School?**

A. Jaafar and S.L. Chan

The government of Malaysia has introduced the National Sexuality Education Guideline in 2006 to overcome social problems amongst juveniles. An early study related to the perception of teachers and students toward the sexual education curriculum taught in schools currently was carried out. The study showed that there are big gaps between the perception of the students and the teachers towards several issues, such as resource and content adequacy of Malaysia sexuality education today. The theoretical framework of Malaysia Sexuality Education (MSE) was designed and developed based on several learning theories and human-computer interactive theories to handle the sensitive sexuality issues for the Malaysian community especially the teenagers. Then, theoretical framework was executed through a comprehensive research methodology which the model ADDIE integrated with usage-centered design to achieve high usability courseware. In conclusion, the effort of developing the Malaysia Sexuality

Education (MSE) courseware is hopefully will be a solution to the current problem that happens in Malaysia sexuality education now. (*Research Journal of Information Technology 1 (3): 94-106, 2009; doi: 10.3923/rjit.2009.94.106*)

## **Quantization Based Robust Image Watermarking in DCT-SVD Domain**

A. Abdulfetah, X. Sun and H. Yang

In this study, we proposed a robust quantization based digital image watermarking for copy right protection in DCT-SVD domain. The proposed watermarking algorithm which combines both merits of the algorithm based on Discrete Cosine Transform (DCT) and algorithm based on Singular Value Decomposition (SVD). The watermark is embedded by applying a quantization index modulation process on largest singular values of image blocks in the DCT domain. To avoid visual degradation of watermarked image, we have enhanced a model to take into consideration blocks statistics of the host image. Watermark detection is efficient and blind in the sense only the quantization parameters but not the original image is required. Experimental results show that the proposed method is more robust than SVD and DCT-SVD methods. (*Research Journal of Information Technology 1 (3): 107-114, 2009; doi: 10.3923/rjit.2009.107.114*)

## **A Robust Tamperproof Watermarking for Data Integrity in Relational Databases**

V. Prasannakumari

Watermarking for Databases is one of the fastest growing areas of research dealing with security and authentication issues for digital contents when they are shared or distributed to others. One of the security aspects is to authenticate tamperproof receipt of the database when it has been over any communication channel. My approach is to append a new attribute which will serve as a watermark containing checksum of all other attributes and an aggregate value for any one of the numeric attribute. Since, the values at none of the attributes are altered to accommodate watermarks, precision is preserved. The implementation proves the technique robust against common database attacks. (*Research Journal of Information Technology 1 (3): 115-121, 2009; doi: 10.3923/rjit.2009.115.121*)