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| Tue | 09:30-10:30 | Keynote 1            |
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## Tuesday, March 2

09:30 - 10:30

### Keynote 1

Prof. Ahmed Kamal, Iowa State University, USA

Since network backbones carry huge amounts of traffic, the failure of a single link can result in the loss of service, and consequently revenue. This is why backbone networks are required to be self-healing, and to automatically recover from failures. Recovery from failures has traditionally been provided using either restoration or protection techniques, where protection is the faster, and hence the preferred mode of survivable operation. However, proactive protection requires reserving backup resources, which are typically close to two thirds of the resources. This presentation will discuss recent advances in providing the self-healing functionality in networks such that self-healing is both fast, and resource efficient, which is achieved by using the technique of network coding. In this case, one set of protection circuits provides protection for multiple connections, and multiple signals can be transmitted on the same protection circuit simultaneously. This is done by linearly combining those signals using the technique of network coding. The strategy enables the transparent and instantaneous recovery from link failures, similar to proactive protection, but at a reduced cost due to protection circuit sharing. We show how this technique can be implemented to protect against single link failures, and then how it can be extended to protect against multiple failures. The advantage of this technique is twofold: failures do not have to be detected, and signals do not have to be rerouted, hence leading to less involvement of the control and management planes, which expedites the error recovery process. Also, protection circuits are shared by multiple connections, since multiple signals are linearly combined and transmitted on the same circuit, hence leading to the implementation of protection at a reduced cost. This technique can be implemented in the data forwarding plane, e.g., at the IP or MPLS layers, and can be regarded as a method for implementing Fast IP or MPLS protection, respectively.

Chair: Zaher Aghbari (University of Sharjah, UAE)

10:40 - 12:30

### Information Systems

Chair: Ibrahim Kamel (University of Sharjah, UAE)

#### *Secure Management Layer for JXTA-Based Information Sharing Systems*

Yasseen Al makady (De Montfort University, Saudi Arabia); Helge Janicke (De Montfort University, United Kingdom)

Information is becoming more and more critical to our businesses, governance and social life. Social networking and increasingly pervasive communication technologies lead to a variety of technologies to control and facilitate the exchange of information, many of them based on peer-to-peer concepts. Security issues, such as confidentiality and integrity, arising from the rapid increase of the information exchange are often secondary and not sufficiently addressed by the available technologies. In this paper we will use JXTA, a technology that facilitates communication, resource sharing and distribution amongst peers, to build an information management layer that focuses on the efficient and secure exchange of information.

pp. 1-4

#### *Practical Software Project Total Cost Estimation Methods*

Khaled Hamdan (UAE University, UAE); Khaled Shuaib (UAU, UAE); Hazem El Kkhatib (UAE University, UAE)

Software project management has become a crucial field of research due to the increasing role of software in today's world. When a project is insufficiently supported, the quality and speed of the project will suffer. Improving the functions of project management is a main concern in software development organizations. The essence of this paper is to estimate software project cost by Analogy estimation model, incorporating organizational and intercultural factors was developed and evaluated. Analysis was done to show how such added factors can improve the overall accuracy of estimating the cost of a project.

pp. 5-8

#### *Associative Classification Techniques for Predicting E-Banking Phishing Websites*

Maher Aburrous (University of Bradford, United Kingdom); Alamgir Hossain (IEEE member, United Kingdom); Keshav Dahal (University of Bradford, United Kingdom); Fadi Thabtah (PHD, Jordan)

Classification Data Mining (DM) Techniques can be a very useful tool in detecting and identifying ebanking phishing websites. In this paper, we present a novel approach to overcome the difficulty and complexity in detecting and predicting e-banking phishing website. We proposed an intelligent resilient and effective model that is based on using association and classification Data Mining algorithms. These algorithms were used to characterize and identify all the factors and rules in order to classify the phishing website and the relationship that correlate them with each other. We implemented six different classification algorithm and techniques to extract the phishing training data sets criteria to classify their legitimacy. We also compared their performances, accuracy, number of rules generated and speed. The rules generated from the associative classification model showed the relationship between some important characteristics like URL and Domain Identity, and Security and Encryption criteria in the final phishing detection rate. The experimental results demonstrated the feasibility of using Associative Classification techniques in real applications and its better performance as compared to other traditional classifications algorithms. The experiments also indicate that associative classification algorithm MCAR is highly competitive when compared with other traditional classifications in term of prediction accuracy and efficiency.

pp. 9-12

*Extracting Membership Functions by ACS Algorithm Without Specifying Actual Minimum Support*

Ehsan VajdaniMahmoudi (Islamic azad university-mashad branch, Iran); Fateme Saadatmand (College Uni. Of Borås, Sweden); Masood Niazi (Islamic Azad University - Mashad Branch, Iran); Mohammad Hossein Yaghmaee (Ferdowsi university of mashad, Iran)  
Ant Colony Systems (ACS) have been successfully utilized to optimization problems in recent years. However, few works have been done on applying ACS to data mining. This paper proposes an ACS-based algorithm to extract membership functions in fuzzy data mining. The membership functions are first encoded into binary bits and then given to the ACS to search for the optimal set of membership functions. With the proposed algorithm, a global search can be performed and system automation is implemented, because our model does not require the user-specified threshold of minimum support. We experimentally evaluate our approach, and reveal that our algorithms significantly improve membership functions and reduce the computation costs.  
pp. 13-16

*Language Specific Crawling Based on Web Pages Features*

Masomeh Azimzadeh (Itrc, Iran); Mohamad Javad Kargar (University, Iran); Alireza Yari (Iran Telecom Research Center, Iran)  
Since World Wide Web contains large set of data in different languages, retrieving language specific information creates a new challenge in information retrieval called language specific crawling. In this paper, a new approach is proposed for language specific crawling in which a combination of some selected content and context features of web documents have been applied. This approach has been implemented for Persian language and evaluated in Iranian web domain. The evaluation results show how this approach can improve the performance of crawling from speed and coverage points of view.  
pp. 17-20

*Application of TTCN-3 Test Language to Testing Information Systems in eHealth Domain*

Diana Vega (TU Berlin/Fraunhofer FOKUS, Germany); George Din (Fraunhofer FOKUS, Germany); Ina K Schieferdecker (TU Berlin/Fraunhofer FOKUS, Germany)  
The adoption of standards in eHealth domain, such as Health Level 7 (HL7) used for data representation, or as Integrating Healthcare Enterprises (IHE) for describing interactions between actors, is an important step in enabling healthcare systems to adapt to the individual situations of the patient over time. In this context, interoperability of eHealth information systems is a main concern. This paper addresses the challenges of interoperability testing of different HL7 based systems and presents a test framework based on TTCN-3 language.  
pp. 21-24

**14:30 - 16:00**

**Multimedia I**

Chairs: Oualid B. Ali (University of Sharjah, UAE), Abdullah Hussein (University of Sharjah, UAE)

*Gabor Wavelet for Road Sign Detection and Recognition Using a Hybrid Classifier*

Younes Rakhshani Fatmehsari (University of Tehran, Iran); Alireza Ghahari (University of Tehran, Iran); Reza A. Zoroofi (University of Tehran, Iran)  
Driver support systems (DSS) of intelligent vehicles analyze the image of road scenes captured by camera and detect the road signs. Then by recognizing the type of traffic sign, can warn the driver. In this field many methods have been proposed. Some of them are for online systems and the others are offline. Most of them use the HIS color space for detection of road signs. But in this paper the YCbCr color space is used. This paper proposes a new method for both detection and classification of red road signs. The strategy consists of three steps. In the first step the input image has been transferred from the RGB color space to the YCbCr color space and the red pixels is extracted. Then the road sign object is detected from those that had been extracted as red objects. In the second step this road sign image must be convolved with a bank of Gabor wavelets and extract the feature vectors for classification. Finally in the third step these feature vectors are classified by a hybrid classifier that is composed of one-vs.-rest support vector machines (OVR SVMs) and naive bayes (NBs) classifier. The proposed method was implemented for classification of four classes of red road signs and obtained the accuracy of 93.1%. Moreover the proposed method is robust against the translation, rotation, and scale.  
pp. 25-28

*On the Study of Overhead Reduction for Confused Document Encrypting Schemes*

Tzu-jung Yao (National Chi Nan University, Taiwan); Quincy Wu (National Chi Nan University, Taiwan)  
Confused Document Encrypting Scheme is a technique for data hiding. It involves concealing the secret text inside the cheating text. If the cheating text is intercepted, the secret text may still be undetected. This study focuses on reducing the amount of data transmission in delivering confused documents. We can use any article on the internet as a cheating text. The sender only needs to transmit the encrypted Uniform Resource Locator (URL), and then the receiver can follow the URL and download the cheating text. This avoids transmitting large amounts of cheating text, which is a major drawback of traditional confused document encrypting schemes. In this paper, we proposed a new approach which can improve existing confused document encrypting schemes by reducing their transmission overhead, and thus makes it suitable for wireless environment with low data rate.  
pp. 29-32

*Partial Image Retrieval Using SIFT Based on Illumination Invariant Features*

Masaki Kobayashi (University of Tsukuba, Japan); Keisuke Kameyama (University of Tsukuba, Japan)  
In content-based image retrieval (CBIR), the apparent color of objects are strongly influenced by the illumination variation, and this may affect retrieval results adversely. In this work, we propose a framework which can find partial object matchings by using illumination invariant local features, and achieved the image retrieval robust to apparent color changes. Additionally, we experimented in searching partial similarities to query images, such as logos and trademarks under different illumination conditions, and verified the system's robustness to apparent color changes.  
pp. 33-36

*Interactive Applications for Mobile TV*

Muhammad Saleemi (Abo Akademi University, Turku, Finland)  
This paper explores the concepts of interactive applications, their usability and system architectural aspects in interactive mobile TV. The paper evaluates application scenarios for different interactive applications that can be supported by future Mobile TV. These application scenarios has significance because they specify overall image of mobile interactive system that will be helpful for defining common application framework based on the user's perception. We conclude the paper by providing the directions for further research in the emerging area of interactive mobile TV applications.  
pp. 37-40

**Wednesday, March 3**

**09:30 - 10:45**

**Network I**

Chairs: Mohamed Watfa (University of wollongong / American University of Beirut, Lebanon), Mohamed Saad (University of Sharjah, UAE)

*A User Level Markov Model for Service Based CRRM Algorithm*

Leijia Wu (University of Technology, Sydney, Australia); Abdallah AL Sabbagh (University of Technology Sydney, Australia); Kumbesan Sandrasegaran (University of Technology, Sydney, Australia); Maged Elkashlan (CSIRO, ICT Centre, Australia)  
In order to support the conceptual development of Radio Access Technology (RAT) selection algorithms, the theory of Markov model has been used. Performance metrics can be derived from the steady state probabilities of a Markov model. This paper extends a User Level Markov model for a three co-located RATs system from existing two co-located RATs Markov models. The service based RAT selection algorithm has been studied using the proposed Markov model. Numerical results obtained from the proposed Markov model are presented.  
pp. 41-44

*Buffering Study Over Intermediate Hops Including Packet Retransmission*

Khalid Darabkh (The University of Jordan, Jordan); Backer N Abu-Jaradeh (The University of Jordan, Jordan)

Sequential decoding is one of the most important convolutional code's algorithms that can work in intermediate hops efficiently. It is of interest since its error detection and correction techniques are considered to be variable and dependent to channel state. In this paper, we conduct a new buffering study over intermediate hops' systems that employ sequential decoding algorithms. As a result of that, we find a closed form expression for the expected buffer occupancy under different assumptions. Our study can be applicable to any network environments that are affected by noise which consequently leads to high packet error rate. The results are presented and explained when considering different system's parameters.

pp. 45-48

#### *A Multi-Criteria Decision Making (MCDM) Network Selection Model Providing Enhanced QoS Differentiation to Customers*

Haris Pervaiz (Queen Mary University of London, United Kingdom)

Network Selection mechanisms play an important role in ensuring quality of service for users in a multi-network environment. These mechanisms handle the selection of an optimal wireless network to satisfy a user request. This paper proposes a radio resource management framework for integrated network selection mechanism control in multi-network environment as an interaction between the service providers and users in a competitive manner to admit high priority users or the services that maximize their rewards. The proposed scheme comprises of three steps namely as user profile, service profile and access network selection. The users are considered of three grades (Gold, Silver, Bronze) belonging to the different categories. The priorities are assigned to the users depending on their grade and category. The users belonging to same categories have same preferences for the decision factors (or QoS parameters). The Analytic Hierarchy Process (AHP) is applied to determine the relative weights of the evaluative decision factors for users according to their category preferences. The services differ from each other depending on their QoS requirements. Different policies are defined according to network load to prioritize the service request from high priority user as compared to other service requests. The access network selection mechanism calculates the payoffs based on the relative weights calculated using AHP and a utility function evaluation by each wireless network for each user. Analytical and simulation results demonstrate the effectiveness of proposed model to achieve optimum network utility along with prioritizing the resource allocation and optimizing the user's satisfaction. The proposed model is preliminary and its contribution is to create an admission policy that can adapt to different coverage areas of a wireless network and depends on the priority of users and their requirements.

pp. 49-52

#### *Content-Aware Selective Reliability for DCCP Video Streaming*

Michael Schier (University of Innsbruck, Austria); Michael Welzl (University of Oslo, Norway)

The growing use of real-time video in wireless networks, where loss rates are high yet bandwidth and CPU power of receivers can be scarce, calls for new methods to maintain good quality when packets are dropped. These methods should ideally only involve the sender and avoid increasing the amount of data sent across the network. We introduce a scheme that satisfies these requirements by selectively retransmitting only the most important packets in case of loss based on the video content at macroblock granularity. In a Linux implementation using the DCCP protocol, we show that our mechanism outperforms content-unaware retransmission strategies such as earliest-first.

pp. 53-56

**11:00 - 12:15**

**Pattern I**

Chair: Zaher AlAghbari (University of Sharjah, UAE)

#### *Pattern Matching Approach Towards Real-Time Traffic Sign Recognition*

Hasan Fleyeh (Dalarna University, Sweden); Taha Khan (Dalarna University, Sweden)

This paper addresses the problem of traffic sign recognition in real-time conditions. The algorithm presented in this paper is based on detecting traffic signs in life images and videos using pattern matching of the unknown sign's shape with standard shapes of the traffic signs. The pattern matching algorithm works with shape vertices rather than the whole image. This reduces the computation time which is a crucial factor to fit real-time demands. The algorithm is translation and scaling invariant. It shows high robustness as it is tested with 500 images and several videos and a recognition rate of 97% is achieved.

pp. 57-60

#### *Pattern Recognition for Classifying the Condition of Wooden Railway Sleepers*

Siril Yella (Dalarna University, Sweden); Asif Shaik (Dalarna University, Sweden); Mark Dougherty (Dalarna University, Sweden)

This paper summarises the results of using a pattern recognition approach for classifying the condition of wooden railway sleepers. Railway sleeper inspections are currently done manually; visual inspection being the most common approach, with some deeper examination using an axe to judge the condition. Digital images of the sleepers were acquired to compensate for the human visual capabilities. Appropriate image analysis techniques were applied to further process the images and necessary features such as number of cracks, crack length etc have been extracted. Finally a pattern recognition and classification approach has been adopted to further classify the condition of the sleeper into classes (good or bad). A Support Vector Machine (SVM) using a Gaussian kernel has achieved good classification rate (86%) in the current case.

pp. 61-64

#### *Vehicle Detection Using Morphological Image Processing Technique*

Aisha Ajmal (Sir Syed University of Engineering and Technology, Pakistan); Ibrahim M Hussain (Sir Syed University of Engineering and Technology, Pakistan)

Vehicle detection and classification of vehicles play an important role in decision making for the purpose of traffic control and management. In this paper we propose a novel and efficient algorithm based on image processing using aerial cameras for vehicle detection and classification especially in highways. The algorithm is mainly based on a sequence of morphological methods being applied on an image taken by an aerial camera of a road segment. The algorithm also uses thresholding and edge detection techniques for vehicle detection. Experiments are carried out over a wide range of vehicles, road segments and camera heights. A success rate of more than 85% and proper vehicle classification is achieved.

pp. 65-68

#### *Selecting a Reliable Steganography Method*

Hedieh Sajedi (Sharif University Of Technology, Iran); Mansour Jamzad (Sharif University of Technology, Iran)

Due to the various contents of images, the stego images produced by a steganography method may have different levels of undetectability against steganalyzers. In other words, a steganography method may cause less detectable statistical artifacts on some images compared to other images. In this paper, we analyze different features of images to find the similarity between proper cover images for each steganography method. Similarity between images is modeled in form of fuzzy if-then rules using an evolutionary algorithm. Subsequently for hiding secret data in a cover image, we suggest a reliable steganography method that results in an undetectable stego image against most recently reported steganalysis methods. Experimental results show the efficiency of the proposed method in improving the security of stego images.

pp. 69-72

#### *A Novel Coloring Framework for Grayscale Images*

Iyad F. Jafar (University of Jordan, Jordan); Ghazi M. AL Sukkar (University of Jordan, Jordan)

Coloring of grayscale images finds its place in many areas such as medical imaging and coloring of black and white images and videos. However, manual coloring is time consuming and ill-posed problem. In this paper we present a semi-automatic framework for coloring of grayscale images. Given a grayscale image, the new framework operates by prompting the user to specify a source color image of similar content to that of the grayscale image. Then, it employs a large set of grey level features, K-means clustering, and a new color assignment approach to transfer color to the grayscale image. Subjective and objective evaluation revealed the capability of the proposed framework in producing faithful and true color images.

pp. 73-76

**14:00 - 16:00**

**Tutorial 1**

Najah Abed AbuAli

IEEE 802.16m as an enabling technology for IMT-Advanced This tutorial will discuss the IEEE 802.16m as a candidate technology for IMT-Advanced. The tutorial will first present the IMT-Advanced requirements, then an overview of IEEE 802.16-2009. The enhancements required to be applied to IEEE802.16-2009 to meet the IMT-Advanced requirements. The tutorial will focus on the efforts made by the IEEE to present IEEE 802.16m as a candidate technology for IMT-Advanced. We will present the enabling technologies of IMT-Advanced and how they are mapped to the physical and MAC layer specifications of IEEE 802.16m. Finally, the tutorial will provide participants with timely perspective on hot research topics related to IEEE 802.16m.

Chair: Abdallah Shami (The University of Western Ontario, Canada)

## Thursday, March 4

09:00 - 10:00

### Keynote 2

Mr. Mubarak Balaswad, Director General – Information & e-Government Department, Sharjah

Chair: Zaher Aghbari (University of Sharjah, UAE)

10:00 - 11:00

### Pattern II

Chair: Rachid Sammouda (University of Sharjah, UAE)

#### *Prediction Model of Reservoir Fluids Properties Using Sensitivity Based Linear Learning Method*

Sunday Olusanya Olatunji (University of Technology Malaysia, Malaysia); Ali Selamat (Universiti Teknologi Malaysia, Malaysia); Abdul Azeez Abdul Raheem (King Fahd University of Petroleum and Mineral, Saudi Arabia)

This paper presented a new prediction model for Pressure-Volume-Temperature (PVT) properties based on the recently introduced learning algorithm called Sensitivity Based Linear Learning Method (SBLLM) for two-layer feedforward neural networks. PVT properties are very important in the reservoir engineering computations. The accurate determination of these properties such as bubble-point pressure and oil formation volume factor is important in the primary and subsequent development of an oil field. In this work, we develop Sensitivity Based Linear Learning maintainability prediction model for PVT properties using three distinct databases, while comparing forecasting performance, using several kinds of evaluation criteria and quality measures, with neural network and the three common empirical correlations. Empirical results from simulation show that the newly developed SBLLM based model produced promising results and outperforms others, particularly in terms of stability and consistency of prediction.

pp. 77-80

#### *Anticipation the Consumed Electrical Power in Smart Home Using Evolutionary Algorithms*

Ahmed Mustafa Elmahalawy (Minufiya University, Egypt); Nawal El Fishawy (Menoufia University, Egypt); Mohamed Nour El-dien (Minufiya University, Egypt)

One of the leading technologies is the Smart Home, where the home itself recognizes certain changes in home environment and provides adequate services to residents. Also, the Smart Home can anticipate the any dangerous state so it can adapt itself for this future case. Our goal is to anticipate states with too large power take-off; it means to eliminate power spikes. Program allows starting of simulation also without anticipation. The results are suitable for comparison with simulations with the block of anticipation. Anticipation based on evolutionary algorithms. So, we can see the quality of anticipation in the best way.

pp. 81-84

#### *Segmentation of Low Quality Fingerprint Images*

Hasan Fleyeh (Dalarna University, Sweden); Diala Jomaa (Dalarna University, Sweden); Mark Dougherty (Dalarna University, Sweden)

This paper presents a new algorithm to segment fingerprint images. The algorithm uses four features, the global mean, the local mean, variance and coherence of the image to achieve the fingerprint segmentation. Based on these features, a rule based system is built to segment the image. The proposed algorithm is implemented in three stages; pre-processing, segmentation, and post-processing. Gaussian filter and histogram equalization are applied in the pre-processing stage. Segmentation is applied using the local features. Finally, fill the gaps algorithm and a modified version of Otsu thresholding are invoked in the post-processing stage. In order to evaluate the performance of this method, experiments are performed on FVC2000 DB1. Segmentation of 100 images is performed and compared with manual examinations of human experts. It shows that the proposed algorithm achieves a correct segmentation of 82% of images under test.

pp. 85-88

#### *Optimizing the K-NN Metric Weights Using Differential Evolution*

Akram AlSukker (University of Technology, Sydney, Australia); Rami N Khushaba (University of Technology, Sydney, Australia); Ahmed Al-Ani (University of Technology, Sydney, Australia)

Traditional k-NN classifier poses many limitations including that it does not take into account each class distribution, importance of each feature, contribution of each neighbor, and the number of instances for each class. A Differential evolution (DE) optimization technique is utilized to enhance the performance of k-NN through optimizing the metric weights of features, neighbors and classes. Several datasets are used to evaluate the performance of the proposed DE based metrics and to compare it to some k-NN variants from the literature. Practical experiments indicate that in most cases, incorporating DE in k-NN classification can provide more accurate performance.

pp. 89-92

#### *Multimodal Biometric Recognition Inspired by Visual Cortex and Support Vector Machine Classifier*

Zohreh Yaghoubi (Islamic Azad University, Qazvin Branch, Iran); Karim Faez (Amirkabir University of Technology, Iran); Morteza Eliasi (Islamic Azad University, Qaemshahr Branch, Iran); Ardalan Eliasi (Islamic Azad University, Qaemshahr Branch, Iran)

Biometrics based personal identification is regarded as an effective method for automatic identification, with a high confidence coefficient. A multi modal biometric system consolidates the evidence presented by multiple biometric sources and typically provides better recognition performance compared to systems based on a single biometric modality. So in this paper we use combination of Face and Ear characteristic to individuals authentication. In our approach, features extracted using HMAX model are translation and scale invariant. Then we applied Support vector machine and K-nearest neighbor classifiers to distinguish the classes. In fusion stage we use matching-score level. Experimental results showed 96% accuracy rate on ORL Face database and 97% accuracy rate on USTB Ear database; however we achieve 98.5% accuracy rate on Face and Ear multi modal biometric.

pp. 93-96

11:15 - 12:00

### Multimedia II

Chair: Zaher Aghbari (University of Sharjah, UAE)

#### *A Streaming Implementation of HD H.264/AVC Encoder on STORM Processor*

Wei Wu (National University of Defense Technology, Chang Sha, Hunan, P.R. China); Wu Nan (National University of Defense Technology, P.R. China)

H.264/AVC significantly outperforms the previous video coding standards at the expense of a higher computational complexity. The complexity is even higher when H.264/AVC is used in applications with high bandwidth and high quality like real-time encoding of HD (High-Definition) video. However, the stream architecture such as STORM processor provides a powerful mechanism to achieve high performance in media processing and signal processing. In this paper, we describe a streaming implementation of HD H.264/AVC encoder on STORM processor. Based on the reference code's features, we proposed a suitable streaming method for every major process in H.264/AVC encoder. The experimental results show that our streaming implementation on STORM-SP16 G220 achieves the performance of 30.6 fps (frames per second) for a HDTV 1080P (1920x1080) sequence, satisfying the real-time requirement.

pp. 97-100

#### *Qualitative Comparison of Audio and Visual Descriptors Distributions*

Stanislav Barton (CNAM, France); Valerie Gouet-Brunet (Conservatoire National des Arts et Metiers, France); Marta Rukoz (Paris-Dauphine University, France); Christophe Charbuillet (IRCAM, France); Geoffroy Peeters (IRCAM, France)

A comparative study of distributions and properties of datasets representing public domain audio and visual content is presented. The criteria adopted in this study incorporate the analysis of the pairwise distance distribution histograms and estimation of intrinsic dimensionality. In order to better understand the results, auxiliary datasets have been also considered and analyzed. The results of this study provide a solid ground for further research using the presented datasets such as their indexability with index structures.

pp. 101-104

#### *A Novel DWT-SVD Based Watermarking Scheme*

Vijay Ayangar (Nagpur University, India); Sanjay Talabar (Shri Guru Gobind Singhji Institute of Engineering and Technology, Nanded, India)

As watermarking is identified as a major technology to achieve copyright protection, the relevant literature includes several distinct approaches for embedding data into a multimedia element. Because of its growing popularity, the Discrete Wavelet Transform (DWT) is commonly used in recent watermarking schemes. In a DWT-based scheme, the DWT coefficients are modified with the data that represents the watermark. In this paper, we present a scheme based on DWT and Singular Value Decomposition (SVD). After decomposing the cover image into four bands (LL, HL, LH, and HH), we apply the SVD to watermark, and modify DWT coefficients of the cover image with the singular values of the visual watermark. Modification in all frequencies allows the development of a watermarking scheme that is robust to a wide range of attacks.

pp. 105-108

**12:05 - 13:15**

#### **Network II**

Chair: Abdallah Shami (The University of Western Ontario, Canada)

#### *Performance Improvement of Ad Hoc Networks Using Directional Antennas and Power Control*

Wessam Ajib (Université du Québec à Montréal, Canada); Qilei Bian (Université du Québec à Montréal, Canada)

To improve the system performances of wireless ad hoc networks, researchers have proposed many approaches including the use of directional antennas and power control mechanisms. However, most of these works consider only directional transmission, while directional antennas could be used for both transmitting and receiving. Moreover, there is a lack of work that evaluates the impact of power control in heterogeneous ad hoc networks where directional antennas are partially deployed. In this paper, we propose a power controlled directional MAC protocol which enables both directional transmission and reception of all control and data packets. We evaluate our protocol in heterogeneous ad hoc scenario and show how much performance enhancement can be achieved as a result of using both directional antennas and power control.

pp. 109-112

#### *Power Allocation for Layered Multimedia Transmission Via Broadcast Over Rayleigh Fading Channels*

Mohammad Shaqfeh (Texas A&M University at Qatar, Qatar); Wessam Mesbah (Texas A&M University at Qatar, Qatar); Hussein Alnuweiri (Texas A&M University, Qatar, Qatar)

We consider a multimedia transmission scheme that is based on the combination of layered source coding with successive refinement and on using a broadcast strategy to send the layers over Rayleigh fading channels. We optimize the power allocated to each layer in order to maximize the average user satisfaction defined by a utility function of the total decoded rate. This optimization problem is non-convex, and hence difficult to solve. However, in this paper, we build up on our recently proposed mathematical framework, and we describe, as the main contribution, an efficient algorithm to solve this problem. Using numerical examples, we show that significant gains in the outage probability can be achieved by applying our proposed algorithm.

pp. 113-116

#### *Multi-Connection TFRC Video Streaming in a WiMAX Environment*

Salah M Saleh AL-MAJEED (University of Essex, United Kingdom); Martin Fleury (University of Essex, United Kingdom)

Dedicated WiMAX multimedia services are proposed for areas that lack networked infrastructure. This paper proposes multi-connection uplink video streaming for mobile WiMAX. Establishing multiple TFRC connections for a single video stream has emerged as a promising lightweight way of coping with wireless channel losses in a congestion-controlled tandem network. This study shows the impact (in terms of video quality and latency) on multi-connection streaming performance in the presence of burst errors on the wireless link. It also establishes how many connections are feasible.

pp. 117-120

#### *Quantifying Quality of Service Differentiation for WiMAX Networks*

Amir Esmailpour (University of Guelph, Canada); Nidal Nasser (University of Guelph, Canada)

Quality of Service (QoS) differentiation in WiMAX networks is a critically important part of QoS support that has not been properly addressed in the literature. Radio Resource Management (RRM) techniques such as packet scheduling and admission control have been studied by many research groups, and although they claim to provide QoS differentiation in their schemes, no studies have truly evaluated and measured the QoS differentiations among various service classes. In this study, we propose quantifying QoS differentiation using a new parameter called Fairness, which could measure QoS differentiation among various service classes. By simulation results, we show that Fairness values could provide detailed information about QoS differentiation, where throughput and delay fall short of comparison analysis for QoS support among Real Time (RT) versus Non-RT (NRT) applications.

pp. 121-124