International Journal of Future Generation Communication and Networking

Foreword and Editorial

We are very happy to publish this issue of an International Journal of Future Generation Communication and Networking by Science and Engineering Research Support Society.

This issue contains 24 articles. Achieving such a high quality of papers would have been impossible without the huge work that was undertaken by the Editorial Board members and External Reviewers. We take this opportunity to thank them for their great support and cooperation.

The paper “An Extensible Performance Evaluation Framework for Cloud Computing Systems” deals with design and implementation of the framework which is highly extensible and re-useable in most existing cloud systems. Currently, the prototype of our implementation is examined by a series of experiments, and the results indicate that its configurable feature is very useful when users are conducting performance comparing under different contexts.

In the paper “A Survey on MIH vs. ANDSF: Who Will Lead the Seamless Vertical Handover through Heterogeneous Networks?”, overviewed two mechanisms which were proposed independently by IEEE and 3GPP, namely; Media Independent Handover (MIH) and Access Network Discovery and Selection Function (ANDSF), respectively that enable seamless VHO between the different types of technologies (3GPP and non-3GPP). It survey the VHO approaches proposed in the literature and classify them into three main categories based on these mechanisms for which it present their objectives, issues and evaluate their complexity of implementation. Finally, a conclusion about who will lead RATs through VHO is given.

The paper “Derivation of Analytical Closed Expression for the Normalized Propagation Constant of the Multimode Buried Rectangular Optical Waveguide” presents a proposed technique to give a simple and accurate analysis of the rectangular waveguide. The driven equations and the proposed technique show very good accuracy with respect to the finite element method, finite difference method and vectorial boundary element method.

In the paper “On the Equivalence of the PA-SLNR and PA-SINR MU-MIMO Precoding Design Criteria”, developed an average relationship between the Per-Antenna Signal to Interference plus Noise Ratio (PA-SINR) and the Per-Antenna Signal to Leakage plus Noise Ratio (PA-SLNR) performance metrics. Simulation results confirm the equivalence between the two metrics which opens up the door to use PA-SLNR instead of PA-SINR to construct simple Multi-user Multiple Input Multiple Output (MU-MIMO) precoding algorithm.

The paper “Secure Hash-based SearchProtocols for RFID Systems” propose a set of secure and private Hash-based RFID search protocols that can meet all known major attacks in RFID systems, and especially it can protect the privacy of mobile reader users.

Paper “Study of a Printed Small Size Trisul Shape UWB Antenna for Indoor Communication” presented an ultra-wideband (UWB) antenna with a narrow frequency notch. The antenna has been fabricated on a FR4 substrate and occupies an area of only $25 \times 25$
mm2. Starting from a Circular planar patch exhibiting a VSWR smaller than 2.5 in the 3.5–10 GHz band, a frequency notch at 5.65 GHz is introduced by two open slots above the coplanar waveguide feeding. The measured return loss shows a good agreement with the simulation results and proves that this kind of antenna is suitable for reducing the detrimental interference effects of WLAN, operating around 5.5 GHz, on UWB radio link for indoor communication.

In the paper “Min-Sum Algorithm with Maximum Average Mutual Information Quantization”, analyzed and deduced the specific methods of the maximum average mutual information quantization. With this method to quantify the initial message, the variable messages and check messages are converted into integers. Then the min-sum decoding algorithm based on integer arithmetic is implemented. Simulation results demonstrate that the decoding performance of min-sum algorithm based on integer with 7-bit maximum average mutual information quantization is almost the same as that of min-sum algorithm based on integer with 8-bit uniform quantization. Meanwhile, all the variables in the algorithm are fixed-length integers, so it is convenient for hardware implementation. Although the decoding performance is slightly worse than that of the sum-product decoding algorithm, the decoding time is greatly reduced. So it is very convenient for future generation communication.

The paper “A Distributed Energy-efficient Clustering Algorithm based on Weighted Probability for Wireless Sensor Networks” proposed a new clustering scheme after a comprehensive analysis on existing protocols. In our algorithm, named WPCA (Weighted Probabilistic Clustering Algorithm), every node independently decides whether to be a cluster head according to a weighted probability, which is related to the ratio between node’s residual energy and average remaining energy. The nodes with more residual energy are assigned larger weight value to further increase the chances to be elected as cluster heads. In addition, the rotation procedure of cluster heads in previous algorithms is totally abandoned. Simulation results show that WPCA achieves longer lifetime than previous probabilistic-based clustering algorithms and gets a very close approximation compared with a deterministic clustering method.

In the paper “Performance Analysis of MIMO Systems using TCM and Comparison with OSTBC” presents a detailed study of space-time block coding (STBC) schemes including orthogonal STBC for 3×4 antennas and high-coding rate STBC. In this paper the performance of OSTBC along with TCM is evaluated using QPSK.

The paper “Content Delivery Mechanism for ISP” proposes novel decentralized content delivery architecture, ISP Manage Content Delivery Network (IMCDN). For more effectively improving the performance of IMCDN, it proposes a cooperative dynamic caching strategy based on the dleft Record Counters Bloom Filter (dl-RCBF). It uses the dl-RCBF to improve the remote hit rate and adopt optimistic synchronization to restrict the broadcast traffic. The experiments show that our dynamic caching strategy outperforms state-of-the-art models in hit rate for multiple cache sizes and inter-ISP traffic reduction.

In the paper “Call Admission Control of Machine-to-Machine Communications for satisfying Delay Constraint in LTE-Advanced” propose a method that is free from such limitation. Furthermore it can decrease the computational overhead under the condition that the transmission interval and the delay meet certain conditions. Through a set of simulations, it
shows the improvement in the call blocking probability when using the proposed method. It also provides the theoretical proofs that the proposed method can satisfy the delay constraint.

The paper “A Novel Scheduler Design for Wireless Video over 802.11aa Networks Using Priority Weighting and Dropping” recommends a novel cross-layer design for the scheduler between AC_VI and AAC_VI, which combines a real-time video importance scheme in the Application layer and a priority weighting and dropping algorithm (PWD) in the MAC layer, where priority weighting is applied only to AC_VI and priority dropping to both AC_VI and AAC_VI. The results show that the proposed design outperforms the conventional ones, including IACP-RR, ICAP-WRR, and SCS-WRR, with substantial performance gains for both real-time and non-real-time video streams via AC_VI and AAC_VI. Such a win-win game, not possibly achieved by the conventional designs, shows the true power of PWD.

In the paper “Gait Recognition Method Based on Lower Leg under 45 Degree Viewing Angle of Video” suggests a method which uses the relative velocity of ankle joint motion trajectory and the bending angle of foot relative to lower leg as gait feature. The support vector machine (SVM) classifier is used for classification. In order to verify the algorithm performance, Nearest Neighbor (NN) classifier and K-Nearest Neighbor (KNN) classifier are used for validation test. The experimental results demonstrate that the approach has an encouraging recognition performance. But this method has some limitations such as the small database and simple background etc. Future research will consider at in large scale database and complex background for gait recognition to improve the recognition rate and enhance the robustness.

The paper “Dynamic Spectrum Access Strategy for Multi-Channel Cognitive Radio Networks” presents a dynamic spectrum access strategy to reduce the average overall system time of secondary users (SUs) in multi-channel cognitive radio networks. Before transmitting a packet, SU senses the spectrum environment. If there are free channels in the system, SU randomly selects one for transmitting. If all the channels are busy, it consider a probability-based spectrum selection scheme in which the access channel is chosen based on the predetermined probabilities for saving the sensing power and reducing the overall system time of SU. When the transmission of SU is preempted by the primary user (PU), SU will stay on the operating channel and retransmit the whole data after PU leaves the channel. SU may undergo multiple interruptions before finishing a successful transmission. The interruptions and retransmissions inevitably increase the overall system time of SU. It proposes an analytical model by applying the preemptive repeat identical priority M/G/1 queueing theory. Based on the model, it obtain the overall system time expression of SU packets under different spectrum environment and find the optimal distribution vector for the probability-based spectrum access scheme to minimize the average overall system time for SU.

In the paper “An Adaptive Compressed Sensing Algorithm of Optical Fiber Pipeline Pre-warning Data” presented an adaptive compressive sensing method for compression and reconstruction of distributed optical fiber pipeline data. First, partial reconstruction based detection method is used to detect whether a hazardous event happened, then different compression ratios are taken for different classes of signal thereby increasing the compression ratio. In signal reconstruction phase, a sparsity determination algorithm is used to determine the sparsity of different segment of the signal, and then wavelet tree combined with CoSamp algorithm is adopted to reconstruct the signal. The adaptive compression algorithm improves
the compression ratio and the sparsity determination in reconstruction phase can determine the sparsity of each segment when the signal varies without prior knowledge of the sparsity of the signal. Experimental results show that, the proposed algorithm can obtain higher reconstruction accuracy at a relatively high compression ratio. Furthermore, location simulation shows that the reconstructed signal by the proposed method is effective for danger signal positioning.

The paper “Evaluation Indicators and Model of Network Technical Anonymity” made evaluation of the network technical anonymity of several network applications that are commonly used now in China. The evaluation indicators and model can be applied to the evaluation of how anonymous a network user is in various kinds of network applications, and serve as references for management and design of web services.

In the paper “Novel Admission Control Scheme in Multi-priority Multimedia Network Based on Bandwidth Throughput Evaluation Algorithm” proposed a multi-priority delay reservation CAC scheme. A novel connection admission control (CAC) scheme based on bandwidth throughput evaluation algorithm is studied in multi-priority multimedia network. In the new scheme, bandwidth throughput evaluation algorithm is introduced to obtain the delay threshold of different priority traffic. Through bandwidth throughput evaluation algorithm, the delay threshold result of different traffic class is derived. The admission of different priority traffic was controlled by the delay threshold so as to guarantee network quality of service. Numerical results show that not only the service of high priority traffic or the service of low priority traffic is guaranteed in the new scheme, but also the network utilization is promoted.

The paper “Research on Control Method for Time Delay of Internet-Based Tele-Operation Manipulators” proposed a parameters self-learning PID controller algorithm based on modified BP neural network to eliminate the influence of time delay on the stability and maneuverability of tele-operation manipulators. This control algorithm adjusts the three parameters of PID controller on line through BP neural network. Conjugate gradient method is used for real-time adjustment of weighted coefficient of BP neural network so as to adjust the output parameter of PID controller. The model of three-joint manipulator with three degrees of freedom (3-DOF) was established. The simulation results show that force tracking performance of master and slave manipulators is good, the maximum error is 0.15. The position tracking performance of slave manipulator is stable, the amplitude decay can be ignored, the maximum error is 3.9 and time delay is 0.3s. This control algorithm has fine self-learning capability and robustness. It had better time delay control effect and could improve the operability of internet-based tele-operation manipulators.

In the paper “Application of Algorithm used in Community Detection of Complex Network” projected a new algorithm named Differential Evolution Algorithm for Community Detection (DEACD). DEACD used DE as its search engine and used the network modularity as the fitness function to search for an optimal community partition of a network. In this algorithm, there is a modified binomial crossover mechanism to transmit some important information about the community structure in evolution effectively. In addition, a biased process and clean-up operation were employed in DEACD to improve the quality of the community partitions detected in evolution. Experimental results showed that DEACD has very competitive performance compared with other state-of-the-art community detection algorithms. In the process of evolution, the colony evolution was conducted under DE scheme,
the network modularity was used to evaluate the fitness of individuals in the colony. The performance of DECD was analyzed by computer generated network and real-world network examples. The algorithm was implemented using matlab Genetic Algorithm Optimization Toolbox (GAOT), and the parametric analysis was performed in the experiment.

The paper “Patent Application Behavior of China own 3G Standard: An Example of TD-SCDMA” shows that patent applications of their own technology by standard developers provide technological basis for the establishment of standards. The leading enterprises of technical standard proposals are the core in the correlation relationship of standard developers and play key roles in the standards establishment. The patents of standard developers are the foundation in the early stage, and also decide in the standards future evolution.

In the paper “Query-Privacy-Aware Location Cloaking for Mobile P2P System” proposes a novel privacy protection method which combines K-anonymity and L-diversity to protect both location privacy and query privacy. Two effective query-privacy-aware methods are introduced into the cloaking algorithm. One is the history sharing scheme which confuses history queries within tolerance time. Another is the batch query scheme which confuses real queries presented by the peers. Our technique is suitable for P2P mobile networks, which can effectively eliminate the bottleneck of system brought by the anonymizer. In addition, it develops an imprecise location scheme to prevent the inference attack of few malicious peers. The experiments show that the proposed algorithms are effective to protect users’ location privacy and query privacy in the mobile P2P system.

The paper “The Addressing of Distributed FBG Based on FMCW” studied the addressing principle of distributed optical fiber Bragg grating (FBG) sensor based on frequency modulation continuous wave (FMCW) multiplexing technology and carried out the theoretical analysis of FBG multiplex distance. In order to analyze the impact on the spectrum signal, the effect of grating position information, scanning time and scanning frequency range on the spectrum signals were analyzed by simulation. When the FBG multiplex distance is integer or non-integer multiple of system minimum resolution distance, for the FMCW multiplexing scheme was simulated. The grating distance, the scan time and the scanning frequency range significantly affect the signal strength and the signal-to-noise ratio. Finally, the related experimental system was established and the results are consistent with the theory.

In the paper “An Improved Buffer Scheme in Delay Tolerant Networks” proposed a new buffer scheme in Epidemic Routing, named Location and Direction Aware Drop Scheme (LDDS). LDDS utilizes the location and moving direction information of nodes to determine the drop sequence. A node can get the location and moving direction information of other nodes by receiving beacon packets periodically from anchor nodes and referring to received signal strength indicator (RSSI) for the beacon. In particular, LDDS is able to guarantee the high packet delivery ratio under small buffer size.

The paper “Performance Analysis of MIMO Multi Band OFDM System for UWB Communication” shows the range improvement achieved using Multiple-Input Multiple-Output (MIMO) in line with jointly encoding the data over subcarriers or across OFDM symbols for Multiband Orthogonal Frequency Division Multiplexing (MB-OFDM) ultra wideband (UWB) System. The framework adopted can be for any coding scheme such as Space-Time-Frequency Codes (STFC), Space Time or Space Frequency code. Theoretical derivations are provided based on Saleh-Valenzuela fading model which characterize the
random clustering property of UWB channels. The range and pairwise error probability (PEP) improvement obtained from the diversity gain regardless of any type of coding scheme using MIMO-OFDM system through increasing the number of jointly encoded subcarriers, jointly encoded OFDM symbols, or the number of Antennas is investigated and compared with that of conventional Multiband OFDM UWB system. The relation between coding gain and channel model parameters of UWB channels is also discussed.

August, 2013

Wai-Chi Fang, National Chiao Tung University, Taiwan

Editor of the August Issue on
International Journal of Future Generation Communication and Networking