Foreword and Editorial

International Journal of Future Generation Communication and Networking

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

This issue contains 27 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.

In paper “Study on Power Control in the Cognitive AD HOC Self-organizing Network Nodes” ad hoc networks form dynamic topologies typically with scarce resources, such as energy and bandwidth. A main challenge in the operation of such networks is the efficient allocation of resources for radio communications. In this context, the presented paper proposes a power control mechanism created as a network-assisted function of ad hoc cognitive packet-based routing and aimed at reducing both energy consumption in nodes and mutual interference of adjacent communications. Simulation results in NS-2 show significant energy savings after applying the proposed algorithm. In addition, simulation results and a mathematical analysis of interference models, depict a reduction of neighboring radio interference and results in a promising increase of network throughput.

The paper “Hardware Design of Low Energy Consumption Wireless Sensor Network Node for Monitoring Mechanical Vibration Signals” is aiming at the increasing demand of the monitoring of mechanical vibration signals, by improving the existing Sensor Monitoring Network, a low-power wireless sensor network is designed. The data transmission efficiency is increased by using the compressed sensing (CS) technology to compress the mechanical vibration signals of the devices monitored by the network. To realize real-time processing of monitoring signals, the FPGA+DSP architecture is treated as the core of the equipment processing the mechanical vibration signals of wireless sensor network. The modified designs of the hardware circuit and logic circuit with regard to the data collection, sampling, transmission, processing and the store section are introduced initially. Further, the effects of the improved Sensor Monitoring Network are tested by the experimental study on the rotating equipment.

In the paper “On MIMO Channel Modeling for the Mobile Wireless Systems”, developments in the area of wireless communications have constantly aimed at providing higher data rates even under complex environments using multiple-input multiple-output (MIMO) systems. Hence it generates a huge demand to investigate and understand the MIMO channel models for mobile wireless systems. Channel models describe the communication environments and are necessary in developing efficient wireless communication networks. This paper surveys the different channel models used to characterize the wireless systems. Generally, the channel models are classified as Physical models and Analytical models. These models are analyzed here along with the discussion of popular examples from both model types. The MIMO channel models employed in the current standardization activities to evaluate the MIMO system are also reviewed. Finally, some issues regarding these channel models are highlighted.
The paper “Computer Network Fault Diagnosis Based on Neural Network” states that computer network is one of the world's most important infrastructures in twenty-first century, network fault diagnosis has become the focus of attention. With the development of artificial intelligence, using the neural network technology into the network fault diagnosis area can play an important role to the advantages of neural network in fault diagnosis. In this paper, the method is widely used, which is combined the self organizing feature map (SOM) neural network and multilayer feedforward neural network (BP): The result of the training samples using SOM neural network clustering algorithm is added to the original training samples and set a certain weight, through iterative update to the weight, in order to improve the convergence the speed of BP neural network. Using computer network fault diagnosis as a practical example for the computer simulation and analysis develops a set of computer network diagnosis system can provide reference and assistance for the work of theory research and application.

The Authors of “An Integrated Approach to ARP Poisoning and its mitigation using Empirical Paradigm” states that the primary objective of Cyber Security is to protect data in transit. If a network is vulnerable at layer two, the good fortune opens wide up for an attacker. With the easy availability of refined offensive tools that can exploit these vulnerabilities to create havoc in networks, there is a dire need of mitigative measures that can cope up with increasing threats. ARP Protocol violation is among the most hazardous onslaughts in the wireless networks today. This paper is an effort to implement the mechanism of ARP poisoning and its mitigation by enabling DHCP Snooping and Dynamic ARP Inspection. The attack has been demonstrated under test environment using Cain & Abel, Wireshark and NetworkMiner tools because of their merits. The paper also describes the mechanism of Dynamic ARP Inspection to mitigate man-in-the-middle attacks.

The paper “A kind of Cross-layer Routing Algorithm considering MAC Collision (CLRA-MC) in Multi-hop Ad-hoc Networks” states that multi-hop Ad-hoc networks is an important organization way for Internet of Things. Through the simulation and analysis in high data load conditions, it can be seen that packet loss is not mainly caused by the change of data links, but the data collisions in MAC layer. What's more, the data collisions affect the routing constructions in NET layer. Therefore, packet loss is not only related to the routing algorithm, but also closely connected with point-to-point transmission performance in MAC layer. So it proposed a cross-layer scheme between the MAC layer and the NET layer.

In paper “On the Capacity of Cognitive Radio Sensor Networks:From Physical Layer to Network Layer”, Cognitive Radio has stirred great interest recently, with its tremendous potential to further exploit the scarce spectrum resource. Among the diverse research topics, the fundamental capacity issue deserves a thorough study since it serves as a principle for future implementation and performance evaluation. Existing researches on cognitive capacity mainly fall into two categories: channel capacity and network capacity. The former can accurately portray the pairwise cognitive channel capacity, but less address the case with multiple secondary users. The latter investigates the throughput of large-scale network with respect to its size and topology, while ignoring crucial factors in physical layer. Recognizing their strengths and limitations, this paper aims to present a more comprehensive view of the cognitive capacity issue. First, it extend the information theoretic model to a special case in multi-user scenario, which well characterizes the capacity of cognitive multiple access channel (MAC). Second, it analyzes network scaling by incorporating sensing errors, and show that physical layer features may affect the throughput performance. Last but not least, the analysis not only extends the existing researches but also sheds some light on the cross-layer study of cognitive capacity.
In paper “Performance Evaluation of on Demand Energy Efficient Routing Protocol for WSN”, reactivity and artificial bee colony based protocol for a wireless sensor network has been proposed. From the survey it is found that GSTEB indicates quite significant results within the available wireless sensor network protocols. The tree based routing need shortest path between the origin and the sink, however the shortest path problem is NP-Hard in nature. Therefore, the artificial bee colony is required to raise the GSTEB protocol further to find the shortest route. The use of reactivity has been ignored in the case of GSTEB routing protocol, clustering is required to decrease the redundant data. GSTEB has been applied only on small networks the aftereffect of the dense network has been ignored in GSTEB protocol. Therefore, the proposed technique has been designed and implemented in the MATLAB tool. From various metrics, evaluation of improvement of the proposed technique over GSTEB has been found.

Authors of “Research of Book Positioning System Based on Wireless Sensor Network” states in order to meet the need of book management in smart library and achieve the positioning of perception node for book position, ZigBee wireless smart network technology is adopted to achieve the information interaction of book information and book management, and RFID technology is used to provide communication perception platform for monitoring book node. Least square method and RSSI (Received signal strength indication) are used to achieve the optimized 3d positioning for book node.

Authors of “The Research and Application of Modular Mobile Phone Web Front-end Based on MVCS Mode” state that with the popularity of mobile devices in recent years, the application of mobile phone Web front-end has become a research hotspot. This paper has constructed the MVCS (Model-View-Controller-Store) model by taking the MVC model as the framework, the ExtJS modular as the basis, and data storage (Store) as the data container, explained by taking the book information system the methods and steps of adopting such model to complete the design of modular mobile phone Wed front-end, and displayed the real-time data chart of mobile phone web front-end. Finally, it also has discussed the research trend.

In paper “Performance Evaluation of MAC Aware QOS Provisioned Hybrid Routing over VANET”, a vehicular ad-hoc network adopts some attributes of MANET and provides communication between high speed vehicles. VANET based communication can be classified into three categories i.e. Vehicle to Vehicle (V2V), Vehicle to Infrastructure and Hybrid which combines both V2V and V2I schemes. VANET has the potential of achieving goals of intelligent transport system (ITS) increasing road safety and transport efficiency. VANET though being a sub-class of MANET has distinguishing features that make routing in VANET a baffling problem. Timely and accurate information dissemination is the primary concern. QoS guaranteed routing with minimum packet collisions will increase the efficiency and throughput of the channel. Back-off algorithms are used to reduce the number of collisions when nodes try to access the channel simultaneously. In this paper, it deployed a back-off method called Modified Back-off algorithm (MBA) in the MAC layer of IEEE 802.11p.

Authors of “Research on the Multi-channel P-persistent CSMA Protocol with Monitoring Function” presents a new sensor network MAC protocol: the multi-channel p-persistent CSMA protocol with monitoring function (ACKPPCMA) from the perspective of improving the channel utilization and meeting the demand of the high QoS for high priority. Analyze the model by using the average cycle method. The Computer simulation results verify the correctness of the theory. Has some practical significance.
In paper “Communication Mode Selection and Pricing Mechanism for Relaying Based Device-to-Device Communications”, the communication mode selection issue as well as pricing mechanism in relaying enhanced device-to-device (D2D) communications is discussed. By considering the user density within the cell, the problem of “when D2D relaying mode should be selected?” is explored. Furthermore, based on game theoretical approach, the optimal pricing strategy is proposed so as to encourage D2D relaying behavior among D2D peers. Considering user’s demands and D2D devices’ constraint ability, the proposed mechanism is based on the user’s payoff model.

In paper “Estimates of the Restricted Isometry Constant in Super Greedy Algorithms”, Orthogonal Super Greedy Algorithm (OSGA) is a super greedy-type algorithm for sparse approximation. It analyzes the convergence of OSGA based on Restricted Isometry Property (RIP). The main conclusion is that if a matrix \( \Phi \) satisfies the Restricted Isometry Property of order \([sK]\) with isometry constant \(s \cdot \sqrt{s^2 + \delta^2}\), then OSGA \((s)\) can exactly recover any \(K\)-sparse signal \(x\) from \(y = \Phi x\) in at most \(K\) iterations.

Authors of “Research on the Optimization of the Performance of CTL Loop Discriminator”, states that Chip Tracking Loop (CTL) is the key to ensure the accuracy of regenerative pseudo-noise ranging in the deep space measurement and control communication system. However, due to the impact of the code imbalance, clock attenuation rate and noise, the loop locking time of CTL is prolonged and the ranging accuracy is degraded. In this paper, it proposed the discriminator optimization algorithm to address this problem. This algorithm is based on the loop discrimination performance of clock code and composite code, and the impact of the noise on the discrimination performance. In order to improve the tracking accuracy and shorten the loop locking time, this algorithm corrected the curve of discriminator’s gain by compensating discriminator’s gain.

According to paper “New Investigations of Aggressive Packet Combining Scheme to Reduce Transmission Delay and Three States Markov Model Using Multiple Routes to Increase Throughput”, Aggressive packet combining (APC) was introduced to correct error with low latency in wireless network. Wireless Network is high error prone (Bit error rate varies from \(10^{-2}\) to \(10^{-4}\)). Several modified APC have been studied elsewhere for improving throughput and error correction. In this paper it proposes new investigations of different basic protocols of APC to reduce transmission delay by checking Hamming Distance. Three state Markov model using multiple routes is studied to achieve high throughput.

In paper “The Experimental Practices of VoIP Based on the Commercial Softswitch Device”, deals with the softswitch as the central device of the next-generation network (NGN) which is the hotspot in telecommunication industry. So it’s of great significance for the students and related companies to carry out practical experiments and researches based on the commercial softswitch device. Three stage targets of the VoIP, from the elementary to the profound, are proposed according to the characters of the softswitch teaching. The hardware and the software queuing system of the NGN laboratory of Harbin University of Science and Technology, which was designed and built for the targets, are introduced. Students can be queued for experiments with commercial VoIP devices in the NGN laboratory. Three categories of experiments, IP to IP, IP to Phone, and Softphone application development, are designed to cultivate innovative talents.

According to paper “An Automatic Software Requirement Analysis Model based on Planning and Machine Learning Techniques”, in the past years, the scale of software is growing quickly as more and more organizations begin to deploy their business on
Internet. As a result, requirement analysis becomes a challenging issue and conventional approaches might significantly increase the costs of software development. Therefore, automatic requirement analysis techniques have attract more and more attentions, which allows for modeling and analyzing requirements formally, rapidly and automatically, avoiding mistakes made by misunderstanding between engineers and users, and saving lots of time and manpower. In this paper, it propose an approach to acquiring requirements automatically, which adopts automated planning techniques and machine learning methods to convert software requirement into an incomplete planning domain. By this approach, it designs an algorithm called Intelligent Planning based Requirement Analysis (IPRA), to learn action models with uncertain effects. A concrete experiment is conducted to investigate the proposed algorithm, and the results indicate that it can obtain a complete planning domain and convert it into software requirement specification.

The paper “Performance Evaluation of Two Reactive Routing Protocols for RWP Mobility Model with Different Speed” compared the performance of two reactive MANET routing protocols AODV and DSR by using random way point mobility model. Both share similar On-Demand behavior, but the protocol's internal mechanism leads to significant performance difference. We have analyzed the performance of protocols by network load, mobility model and type of traffic (CBR). A detailed simulation has been carried out in QUALNET 6.1. The metrics used for performance analysis are Throughput, Average end-to-end Delay and Average jitter.

In paper “Adaptive Network Traffic Prediction Algorithm based on BP Neural Network”, the rapid development of Internet technology, the network now has a large size and high complexity, and consequently the network management is becoming increasing difficult and complexity, so traffic forecast play a more and more role in network management. With a large amount of real traffic data collected from the actual network, an adaptive network traffic prediction algorithm based on BP neural network was proposed in this paper, it use an adaptive learning rate method to adjust the learning rate according to total error changing trend of decreased or increased and the difference of changing; and then it corrects the weights in each layers according to forward and reverse calculation. Simulation results show that, compared with the traditional BP neural network, the algorithm has better performance in the prediction results, and has smaller error.

In the paper “Reliability Evaluation of Mobile Ad-hoc Networks” designed and developed a node failure model using Constant hazard model (CHM). To incorporate the node failure model, the NetSim is customized. We have setup simulation scenarios using customized NetSim and simulated the network using DSR protocol. We find that all the routes to destination might not be available due to node failures. Also packets have to be routed through a different route when some nodes are failed. Due to all these problems the throughput decreases with increase in number of failed nodes.

Authors of “Research on PN Code Acquisition Strategy”, states that PN code acquisition is the key to synchronization in direct-sequence spread-spectrum(DSSS) systems. Aiming at the problems in the process of PN code acquisition, the block diagram of acquisition strategy is illustrated firstly. Then, with the choice of different search mode, determination mode and verification mode in the block diagram, the detection probabilities and false alarm probabilities are presented separately, and the false alarm probability of threshold detection method, the detection probability and false alarm probability of maximum-selection determination method are deduced, and all kinds of acquisition strategies are given.
The paper “Co-Centric Cell-Splitting Technique Using Frequency Reuse”, states that when a MS or mobile node (MN) moves out from a base station (BS) to another base station then it needs to perform a handoff or handover. Here it will propose a method that minimizes the handoff failure probability by increasing the total number of channel with help cell splitting process. This is Mother and child cell concept.

According to paper “Adaptive Synchronization of Chaotic Systems with Known Response System Parameters”, a kind of adaptive synchronous control method was proposed to solve a special synchronization problem between two chaotic systems, where the response system is totally known without uncertainty but the driven system contains both unknown parameters and uncertain nonlinear functions. An update law of estimation of unknown parameters of driven system by constructing a proper Lyapunov energy function and the stability of the whole system was guaranteed by Lyapunov stability theorem. What is worthy pointing out is that the chaotic systems are not required to satisfy the Lipschitz condition. At last, detailed numerical situation was done to show the rightness and effectiveness of the proposed method.

In paper “TDOA-Based and RSSI-Based Underground Wireless Positioning Methods and Performance Analysis”, wireless location has become one of the important technologies of wireless sensor network application. Due to the underground wireless location affected by various factors, the positioning system cannot meet the actual demand. In this paper, Time Difference of Arrival (TDOA) and Received Signal Strength Indicator (RSSI) location technologies have been investigated, then various impact factors on the TDOA and RSSI location systems have been discussed, multipath channel, different shapes of the roadway on the propagation loss, etc. In order to reduce the error, estimation error has been correlated and compensated.

The paper “Routing Protocol of Cognitive Ad Hoc Network”, proposes a priori cross layer routing protocol CLC-DSDV routing protocol in cognitive Ad Hoc network, the protocol will combine channel management mechanism and DSDV routing protocol in Ad Hoc network, and aiming at the existing problem of multi channel DSDV-MC routing protocol such as primary user interference, routing load imbalance, routing reconfiguration have been improved, in order to achieve the effective use of wireless spectrum of cognitive Ad Hoc networks. Concrete improvements on the routing protocol are described: joining the node load considerations in the routing process; through the information of the global routing table of each node for distribution in channel allocation; channel allocation information embedded in routing newspaper information and broadcasting timely; starting routing update packets to ensure compliance with the neighbor node information synchronization at the channel switching time.

In the paper “A Novel and Efficient Wireless Communication System” aims to construct a novel wireless communication system, in which source signals are transmitted simultaneously in the same frequency band. The transmitted signals are only required to be statistically independent or statistically distinguished. Therefore, the source signals can be recovered at the receiver by utilizing the classical algorithms of blind source separation (BSS) and independent component analysis (ICA) such as the fast fixed-point algorithm (FastICA). On the one hand, because the source signals are transmitted simultaneously in the same frequency band, the spectrum efficiency of this novel system is much higher than those of time division multiplexing (TDM), frequency division multiplexing (FDM), and code division multiplexing (CDM) systems, in which TDM, FDM and CDM signals are limited in time interval, frequency band and code. On the other hand, inspired by recently proposed reference-based schemes, the reference signals are introduced to the
classical separation algorithms of BSS and ICA, which makes this novel system much more efficient than classical ones in terms of computational speed.

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