Editorial

Hybrid Wireless Ad Hoc Networks

Hybrid Wireless Ad Hoc network is formed by wireless Ad Hoc Networks and base stations. Due to the lack of infrastructure, wireless ad hoc network data is forwarded to the destination via a multi-hop fashion. In other scenarios, a set of base stations are connected by wired links and placed within the ad-hoc networks to form a wired infrastructure, aiming to enhance the whole network performance. This resulting network is referred to hybrid wireless ad hoc networks. This special issue contains 31 papers selected from submissions to the open call for papers on hybrid wireless ad hoc networks. These papers highlight some of the current research interests and achievements in this area.

The explosion of mobile traffic and highly dynamic property often make it increasingly stressful for a cellular service provider to provide sufficient cellular spectrum resources to support the dynamic change of traffic demand in a day. The paper, "Reverse spectrum auction algorithm for cellular network offloading," by F. Zhao et al considers the dynamic characteristics of the cellular network traffic demands, and proposes an optimal, truthful reverse auction incentive framework, which can minimize the leasing costs sustained by the mobile network operator at the premise of meeting the traffic demand of each time period.

The paper, "Approaching the capacity of K-user MIMO interference channel with interference counteraction scheme," by Z. Li et al studies the general K-user MIMO interference channel with M antennas at each transmitter and N antennas at the corresponding receiver. Interference counteraction scheme is proposed to improve the entire achievable rate of such channel under the assumption that the global channel state information (CSI) is available to the receivers.

Distribute antenna system (DAS) can provide high date rate transmission to satisfy the service requirements for the rapid growing wireless applications. Besides, the increasing deployment of wireless applications make the demand for spectrum resource grow rapidly, thus cognitive radio (CR) has emerged as a promising technology to improve spectrum utilization, and spectrum auction is a promising approach to allocate spectrum bands in CR. A few existing works considered the combination of DAS and CR to get better system performance, but they have never studied the spectrum auction in these systems. The paper, "A spectrum auction algorithm for cognitive distributed antenna systems," by F. Zhao et al studies the spectrum auction problem for cognitive DAS to improve spectrum utilization.

As the future Internet architecture, information centric networking(ICN) can also offer superior architectural support for mobile ad hoc networking. Therefore, information-centric mobile ad hoc networks (ICMANET), a new cross-cutting research area, is gradually forming. The paper, "Information-centric mobile ad hoc networks and content routing: A survey," by X. Liu et al introduces the current advances in ICN and analyze its development trends, and interprets the formation of ICMANET and sketch an overview of it.

Fractional frequency reuse (FFR) can not only coordinate inter-cell interference (ICI), but also improve communication quality of cell-edge users, whose key idea is to make a tradeoff between frequency utilization efficiency improvement and ICI suppression. In terms of the fact that conventional spectrum auction neglects the inter-cell and intra-cell interference and wireless spectrum has become scarce resources in cognitive radio networks, the paper, "Group buying spectrum auction algorithm for fractional frequency reuse cognitive cellular systems," by F. Zhao et al introduces FFR technology into the field of spectrum auction and a group reuse spectrum auction mechanism for FFR (GRSAF) is proposed in cognitive cellular systems to achieve higher spectrum allocation and usage efficiency. A Lagrangian relaxation (LR) algorithm is developed to solve the optimal sum utility maximization spectrum allocation problem.

Full-duplex relaying (FDR), which can receive and transmit simultaneously over the same frequency band, enables a significant enhancement of spectral efficiency and has attracted much attention. The paper, "Performance analysis of multi-hop full-duplex decode-and-forward relaying," by L. Han et al investigates the performance of multi-hop decode-and-forward (DF) FDR systems, in which the relay nodes suffer not only from self-interference but also from inter-relay interference (IRI).

Satellite communication networks composed of various satellites with different heights can be regarded as cooperative primary users in the space segment. Cooperative spectrum sensing as the key techniques of cognitive radio has been paid more attention to the application of satellite communications. To fully explore the potentials of the mobile satellite communication networks based on the concept of satellite cluster in supporting of heterogeneous applications, a trust-weighted cooperative spectrum sensing to primary satellite system is proposed in the paper, "Joint cooperative spectrum sensing and spectrum opportunity for satellite cluster communication networks," by M. Jia et al.

Vehicular ad hoc networks (VANETs) have drawn great attention in wireless communications. Prompt and reliable vehicular communication is a must to provide a good service. Routing is the key problem in information transmission of VANETs. The paper, "A micro-artificial bee colony based multicast routing in

vehicular ad hoc networks," by X. Zhang et al studies quality of service (QoS) constrained multicast routing problem. This problem has been proved to be NP-complete problem, and swarm intelligence algorithms are more suitable than classical algorithms. A micro artificial bee colony (MABC) algorithm is proposed to deal with the problem.

The paper, "Local connectivity for heterogeneous overlaid wireless networks," by Y. Liu et al studies the local connectivity, i.e., the node isolation probability of two coexisting wireless ad hoc networks (a primary network vs. a secondary network), where two users can communicate if the signal-to-interference ratio (SIR) at the receiver is larger than a threshold. Assuming the primary users are distributed as a Poisson point process (PPP) and the secondary users are distributed as a Matern cluster process (MCP), it investigates the impact of network parameters on the node isolation probability. Upper and lower bounds for the node isolation probability of the heterogeneous overlaid networks are presented.

Human target characteristic parameter extraction is an important approach of behavior monitoring. The extraction of the characteristic can be applied in various backgrounds, such as sanatorium and hospital. Therefore, this technology is widely studied. Towards extracting physiological characteristic parameters and motion characteristic features of human target, a novel human parameter extraction algorithm is proposed in the paper, "A novel method of micro-Doppler parameter extraction for human monitoring terahertz radar network," by K. Tian et al.

Aiming at the user quality of experience (QoE) problem in the LTE-A heterogeneous network integrating IEEE802.11ad, a layered admission control strategy is proposed for heterogeneous network based on QoE in the paper, "Layered admission control algorithms with QoE in heterogeneous network," by Z. Zhang and Y. Zhang. The core of the strategy is vertically layering the access categories priority and horizontally layering the resource allocation based on the layered access categories priority. A dynamic access categories priority scheme is introduced centering on the admission control strategy to build the power allocation model for minimizing the transmit power of base station as well as maximizing the overall QoE.

It has been well recognized that coordinated multi-point transmission (CoMP) is a promising technique to achieve high spectral efficiency. However, few works have considered the system utility maximization problem for spectrum allocation in CoMP systems. Motivated by optimizing the system utility, the paper, "Joint beamforming and power control for auction-based spectrum allocation in CoMP systems," by F. Zhao et al combines auction theory with joint beamforming and power control techniques for spectrum allocation in CoMP systems. Since the system utility maximization problem can be formulated as a non-cooperative game, Nash equilibrium is considered as the solution of this game.

To accomplish reliable and efficient information routing, strong paths connecting all nodes are required in vehicular ad hoc networks (VANETs). Classical algorithms in graphic theory could find only one minimum spanning tree (MST) in VANETs. Swarm intelligence paradigms are able to obtain several alternatives to MST, which is useful for improving reliability of VANETs. The paper, "A binary artificial bee colony algorithm for constructing spanning trees in vehicular ad hoc networks," by X. Zhang and X. Zhang proposes a binary coded artificial bee colony (BABC) algorithm for tackling the spanning tree construction problem. A two-element variation technique is designed to keep the consistence of binary coded solutions.

In the paper, "HRRP recognition in radar sensor network," by C. Mao and J. Liang, several high-resolution range profile (HRRP) recognition approaches in radar sensor network (RSN) are investigated. First, it studies HRRP target recognition in a radar. A decision rule based on the minimum resistor-average (MRA) distance criterion is established for HRRP sequence recognition. Simulation results show that comparing with the maximum correlation coefficient-template matching method (MCC-TMM) and the minimum Kullback-Leibler (MKL) distance criterion, the proposed MRA distance criterion can provide higher recognition ratio for different flight targets.

Fuzzy clustering has been an efficient tool for data science. In the paper, "Fuzzy clustering in radar sensor networks for target detection," by J. Liang et al, two fuzzy clustering schemes in radar sensor networks (RSN) data processing for target detection are presented. It designs cluster-head (CH) election for both intra-cluster single-hop and multi-hop data transmission on a basis of constant false alarm rate (CFAR) under fading environment. Small scale fading is considered in our fuzzy logic system (FLS) design (FLS with three-antecedents, F3) to compute the likelihood to be a CH for each radar sensor (RS) at the first stage.

With the advances in information and communication technology, the unstructured mobile peer-to-peer (MP2P) system based on a hybrid mobile ad-hoc network (hybrid MANETs), where the membership between mobile nodes is more dynamic and the energy on each node is limited, becomes a trend. Since different mobile nodes may store copies of shared information, data synchronization on an MP2P system is crucial for providing the latest information. Nevertheless, the node mobility makes the communication links disconnected and the network topology changed frequently. The maintenance on data consistency in an MP2P system thus becomes challenging. In the paper, "A heuristic data update mechanism in unstructured mobile P2P systems," by C. Liu, and C. Lai, a heuristic data update mechanism (HDUM) is proposed to effectively maintain the data consistency in an MP2P system with less overhead.

The maintainability of connectivity in multi-hop mobile wireless networks is a complex task to achieve, for which various factors must be taken into account in order to avoid link failures. In addition to the bandwidth limitation, node mobility and interference are two aspects that impact directly the reliability of the communication link, leading generally to loss of wireless link connectivity. In the paper, "Analytical framework for the characterization of the link properties in multi-hop mobile wireless networks," by N. Mesbahi and H. Dahmouni, an analytical framework is developed which determines the link and path lifetime in multi-hop mobile wireless networks.

With the wide deployment of Wireless Local Area Network (WLAN), the WLAN Received Signal Strength (RSS) based indoor mapping has attracted significant attention for various of Location-based Services (LBSs). In the paper, "Simultaneous pathway mapping and behavior understanding with crowdsourced sensing in WLAN environment," by M. Zhou et al, a new simultaneous pathway mapping and behavior understanding approach was proposed by crowdsourced sensing of WLAN RSS.

Future wireless system meets the requirements of high network capacity but is suffering from the problems of high interference and resource shortage. In the paper, "Hybrid precoding for heterogeneous cloud radio access network based on nested array," by N. Chen and S. Sun, a hybrid precoding solution was proposed by applying the heterogeneous cloud radio access network (H-CRAN) with remote radio heads (RRHs) equipped with nested arrays for a better system control and higher efficiency.

With advances in sensing technologies and wireless sensor networks, energy consumption is a key factor for data collection in sensor network. Compressive sensing has attracted more attention for reducing energy cost due to its enabled sub-Nyquist sampling rate. In the paper, "Energy efficient distributed compressed data gathering for sensor networks," by W. Wang et al, the JSM-2 model was introduced for data compressed collection for sensor network based on distribution compressive sensing theory.