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Editorial

Cognitive Networking for Next-G Wireless Communications

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With the development and the promising future of next-generation wireless communications, cognitive networking has emerged as a promising technology to address spectrum scarcity and achieve higher data rate. Despite of its benefit, the employment of cognitive techniques at different layers brings nontrivial design challenges to many networking functionalities.

In such context, this special issue is aimed at investigating and seeking potential solutions to various challenges in cognitive networking for next-generation (Next-G) wireless communications, such as cognitive communication architecture and topology control, spectrum sensing, sharing, and management mechanisms, cognitive techniques and networking for Next-G wireless communications, and security and privacy in Next-G wireless communications.

Specifically, the special issue is composed of the following papers. Here we present a high-level overview of them.

(i) With the popularization of location-based service (LBS), location privacy security has become an increasingly serious problem. High quality of service (QoS) will cause location privacy disclosure easily. However, most of existing methods pay less attention to trade-off between location privacy protection and QoS. The paper entitled "A New Distributed User-Demand-Driven Location Privacy Protection Scheme for Mobile Communication Network" by W. Jin et al. presents a new distributed user-demand-driven (DUDD) location privacy protection scheme, which combines k-anonymity-based cloaking technique and obfuscation method. The feasibility of the proposed method is valid by a set of experiments.

(ii) Recent years have witnessed the development of the cooperative communication technique to improve spectrum efficiency due to utilizing the spatial diversity of multiple wireless nodes. N. Zhao et al. investigates in the presence of the asymmetric information scenario of the incentive issue between relay nodes (RNs) service and source's relay selection in the paper entitled "Cooperative Communication in Cognitive Radio Networks under Asymmetric Information: A Contract-Theory Based Approach." The optimal contract design under both symmetric information and asymmetric information is proposed according to contract theory. They also perform to depict that the optimal contract design scheme is effective in enhancing system performance for cooperative communication.

(iii) Smart grid can lead to the convenient operation and management for the power provider with the convergence of traditional power system engineering and information technology. However, the rap development of smart grid will result in poor data security and privacy preservation. The paper entitled "PAS: An Efficient Privacy-Preserving Multidimensional Aggregation Scheme for Smart Grid" by H. Zhu et al. represents an efficient privacy-preserving multidimensional aggregation scheme for

smart grid, called PAS. This method addresses the user's privacy-sensitive information (e.g., identity and power consumption) disclosure when the operation center is obtaining the number of users and power consumption at each step in different dimensions. The results of the performance evaluations via extensive simulations show that PAS can fulfill the main purpose of secure communication.

(iv) In OFDM-based cognitive radio networks, minimizing the interference is facing challenges in the substantial amount of out-of-band (OOB) emission. The paper entitled "Dynamic Interference Control in OFDM-Based Cognitive Radio Network Using Genetic Algorithm" by H. Khan et al. proposes a dynamic interference control method using the additive signal side lobe reduction technique and genetic algorithm (GA) in CROFDM systems. Based on a complex array added, additive signal side lobe reduction technique is introduced to modulated data symbols in the constellation plane for side lobe reduction in OFDM system. The simulation results show that their proposed method can reduce the side lobes of the OFDM-based secondary user signal remarkably and the PU interference tolerable limit can be met at the expense of a minor addition in bit error rate (BER).

(v) Heterogeneous networks with usage of small cells can take full advantage of available spectrum resources when utilizing cognitive features efficiently. Cooperative spectrum sensing is designed to increase the accuracy of the sensed signal in terms of shadowing and multipath fading in sensing channels because spectrum sensing has significant effect on cognitive radio. A cooperative spectrum sensing for cognitive heterogeneous is presented by H. Hosseini et al. in the paper entitled "Cooperative Spectrum Sensing for Cognitive Heterogeneous Networking Using Iterative Gauss-Seidel Process." Simulation results demonstrate that their proposed method is superior to the conventional topologies and decision rules.

(vi) The paper entitled "Stackelberg Game Based Power Control with Outage Probability Constraints for Cognitive Radio Networks" by H. Yang et al. investigates the problem of uplink power control in cognitive radio networks (CRNs) with multiple primary users (PUs) and multiple second users (SUs) given channel outage constraints and interference power constraints, where PUs and SUs compete with each other to maximize their utilities. A Stackelberg game approach is introduced to model hierarchical competition. The improved performance with this method is confirmed by simulation results.

(vii) The paper entitled "Sustainability Enhancement Multihop Clustering in Cognitive Radio Sensor Networks" by J.-H. Park et al. proposes a cognitive radio based hybrid data type clustering (CR-HDC) algorithm with the purpose of maximizing network energy efficiency of cognitive radio (CR) sensor networks (CRSNs). They perform analysis and performance comparison and demonstrate that the performance is enhanced.

We hope that the readers of the above-introduced papers will get some insights into the cognitive networking paradigm in the context of Next-G wireless communications.

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