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Editorial: Future Wireless Internet Technology and its Applications

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1 Editorial

The rapid evolution of wireless communications and wireless networking technologies has made wireless Internet become a reality. The trend has been much augmented by the ever-increasing popularity of the latest smart phones and devices, and the availability of Internet access through WiFi, hotspot and cellular data. People are now able to communicate and connect with each other when on the move. In future, the wireless Internet may consist of all types of wireless networks and will connect a large number of users and huge number of devices. There is a strong need to reflect the technology advances in different areas in wireless networks, ranging from medium access control protocol design, channel assignments, resource allocation, to routing and data forwarding, and to the overall system level design issues for mobility management on the Internet.

This special issue features six selected high-quality research articles on future wireless Internet and its applications. The first article, "e-LBT: an Enhanced Listen Before Talk Mechanism for Collision Avoidance in an LTE-U and WiFi Coexistence System", authored by Jun Zheng et al., studies the hidden-node problem in downlink transmission of an LTE-U and WiFi coexistence system operating in unlicensed bands. An enhanced LTE-U node structure is first presented, followed by the refinement of the RRC and MAC functional blocks in both LTE-U eNB and LTE-U UE. An enhanced listen-before-talk (e-LBT) mechanism, which incorporates an RTS/CTS handshaking procedure in the basic LBT mechanism, is introduced to enhance this process.

The second article titled "An Adaptive Bi-Threshold-Based On-Demand Energy-Efficient Multicast Routing Protocol for Wireless Ad Hoc and Sensor Networks", authored by Huang and Zhang, proposed an adaptive bi-threshold-based on-demand energy-efficient multicast routing protocol to achieve reduced energy consumption and prolonged network lifetime. The approach is based on two thresholds: the link power threshold, which is to avoid use of over-long links in a multicast tree so as to reduce the total power for multicasting data packets; and the energy protection threshold, which is used to discourage energy critical nodes from joining a multicast tree as relay nodes. On-demand energy-efficient multicast tree constructions can be effectively achieved and be adaptively updated as network evolves.

In the third article "Precoding Design for Full-Duplex Transmission in Millimeter Wave Relay Backhaul", Shuai Han et al. consider an full-duplex (FD) mmWave relay backhaul system and study the self-interference (SI) problem of FD communication. Considering the special mmWave MIMO structure limitation, two SI cancellation precoding algorithms are proposed to eliminate the SI in the system and achieve high spectral efficiency. The decoupled analog-digital algorithm eliminates the SI by utilizing the zero space of the channel, and the enhanced algorithm achieves higher performance.

Underwater communication and networking presents an increasingly interested field of research with the advent of the Internet of Underwater Things. The fourth article titled "Integrating Localization and Energy-Awareness: A Novel Geographic Routing Protocol for Underwater Wireless Sensor Networks", authored by Hao Kun et al., presents a new energy-efficient localization-based geographic routing protocol, which uses location information and residual energy of sensor nodes to greedily forward data packets to sink nodes. The proposed scheme periodically updates the location information of nodes in an underwater sensor network and effectively adapt to the dynamic topological changes of the network. The normalized advancement of sensor nodes are considered to determine their transmission priority levels. It has been shown through the work that the proposed method can effectively locate sensor nodes while improving the packet delivery ratio and reducing the energy consumption.

Efficient resource access in cognitive radio networks, where a large number of secondary users present, is a challenging problem. In the article titled "A New Energy Efficiency/

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Spectrum Efficiency Model for Cooperative Cognitive Radio Network", Sara Gmira *el. al*. propose a model based on channel access process to allow primary users (PU) access channel when active and take secondary users (SU) as positive potential cooperators. SUs negotiate with PUs for the acquisition of underutilized channels with exceeded interference caused to the PU. The PU supports additional interference but will benefit from the cooperation of SUs to relay its data. Such cooperation is modeled as coalitional game, where a distributed coalition formation algorithm is proposed to decide whether to join or leave a coalition. The proposed scheme is able to enhance the network throughput while increasing the opportunity that SUs can access the licensed spectrum owned by PUs.

In the last article "Research on the Energy Allocation Scheme Based on SWIPT Relaying System", Jiangxiong Li et al. investigated simultaneous wireless information and power transfer (SWIPT) for energy-constrained wireless network. The scheme of interference energy harvesting (IEH) can compensate for the loss of the SWIPT relay system rate caused by the interference. The effect of IEH on the relay system rate is investigated by using two existing operation strategies, namely time switching and power splitting. The optimal points are investigated in the different interference factors and interference power.

It is our hope that the papers included in this special issue present a good snapshot of the latest research progress in wireless Internet and its applications. We sincerely hope that those papers are informative and can become important references for researchers and practitioners in the area.

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