Foreword by Guest Editors for the Special Issue on the 2015 ICUFN (Ubiquitous and Future Networks)

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Welcome to this special issue of Wireless Personal Communications. This special issue constitutes a selection of best papers from the 2015 ICUFN (International Conference on Ubiquitous and Future Networks). All the papers have been extended and reviewed again by three independent reviewers. ICUFN is an annual international conference co-sponsored by IEEE Communications Society and organized by the KICS (Korean Institute of Communications and Information Sciences).

The first paper entitled “Distributed Fair Resource Allocation for Cognitive Femtocell Networks” proposes a distributed fair resource allocation scheme in a cognitive femtocell network while mitigating the inter-cell interference. The proposed distributed fair resource allocation (DFRA) algorithm guarantees fairness by applying channel state difference ranks and satisfaction degrees of femtocells. Additionally, the DFRA algorithm works in a fully distributed manner reducing the signal overhead compared to centralized schemes. It was shown that the proposed DFRA algorithm is able to significantly improve fairness among femtocells while maintaining considerable throughput performance.

The second paper entitled “Probability-based Multi-hop Diffusion Method for Influence Maximization in Social Networks” proposes a new heuristic algorithm which considers the propagation probabilities of nodes in the network individually and takes into account the effect of multi-hop neighbors, and thus it can achieve higher influence spread. A realistic network model with non-uniform propagation probabilities between nodes is assumed in the algorithm. It also examines the optimal number of hops of neighbors to be considered

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in the algorithm. Experiments using real-world social networks shows that the proposed method outperforms the previous heuristic-based approaches.

The third paper entitled “Mathematical Characteristics of Uplink and Downlink Interference Regions in D2D Communications Underlying Cellular Networks” analyzes mathematical characteristics of uplink and downlink interference regions in device-to-device (D2D) communications underlying cellular networks. It considers that one CUE and one pair of D2D user equipment (DUE) coexist and share uplink and downlink resources of cellular networks. The DUE pair consists of a D2D transmitting user equipment (DTUE) and a D2D receiving user equipment (DRUE). Therefore, an additional interference between the CUE and the DUE pair is introduced. In the paper, the uplink and downlink interference regions are defined and described, and the mathematical characteristics of the uplink and downlink interference regions are derived. Then the blocking probability is formulated based on the mathematical characteristics values. The analysis results show that uplink resources are more suitable to be shared for the CUE and DUE pair.

The fourth paper entitled “Performance Improvement of Sub 1 GHz WLANs for Future IoT Environments” proposes a sequential transmission scheme, which provides an efficient way of source management in the Sub 1 GHz (S1G) WLANs by considering the traffic loads and allocated channel access times of the devices. Through conducting mathematical analysis and performing simulations, it was shown that the proposed protocol can enhance the performance of the S1G WLANs for the IoT environments.

The fifth paper entitled “An Energy-Efficient Data Reporting Scheme based on Spectrum Sensing in Wireless Sensor Networks” proposes an energy-efficient data reporting scheme based on spectrum sensing. In the proposed scheme, each sensor device senses the spectrum over the air and then determines the transmission time of the access signal and the number of repetitions of access signal transmission. Also, the sink node resolves the collisions by detecting the variation of the received signal power. The simulation results show that the proposed scheme increases the total energy efficiency of the sensor devices, and moreover it decreases the access failure probability of the sensor devices.

The sixth paper entitled “Capture-aware Couple-Resolution Blocking Protocol in RFID Systems” proposes a new capture-aware anti-collision protocol based on the couple-resolution blocking (CRB) protocol that efficiently identifies tags repeatedly. It demonstrates that the CRB protocol suffers from the capture effect in which some tags may not be identified in practical environments. To solve the problem of the capture effect, the CRB protocol was modified by adopting the state-of-the-art capture-aware anti-collision protocol known as the multi-round collision tree (MRCT) protocol. Through computer simulation, it was shown that the proposed protocol with MRCT can reduce the number of slots required by approximately 50% in a random topology where most tags remain in the communication range of the reader.

The seventh paper entitled “Modulation and Coding Scheme (MCS) for Indoor Image Sensor Communication System” proposes an indoor image sensor communication (ISC) system comprising an attentive indoor environment in which rolling-shutter cameras (including smartphone cameras) are used to receive data from light sources. The challenges of the intended system mainly come from the receiver side including its rolling shutter mechanism, its low and time-variant frame rate (e.g. no greater than 30fps), and the narrow bandwidth response (i.e. several kHz baseband). Also, the requirements for flicker-free modulation enabling the dimming capacity and indoor distance (i.e. up to 10 m) are unmitigated challenges. To resolve all mentioned challenges, the paper proposes new hybrid modulation schemes including M-ary Frequency-Shift Keying (M-FSK) modulation and a hybrid modulation of M-FSK and phase-shift keying (2-PSK) for image sensor

communication (ISC). Simulation, numerical analysis and experiment results are given to illustrate the feasibility of the intended system.

The eighth paper entitled “Adaptive Multi-Fuzzy Engines for Handover Decision in Heterogeneous Wireless Networks” studies handover decision in heterogeneous wireless networks. Wireless mobile devices require a sufficiently intelligent handover decision system to achieve seamless mobility in heterogeneous wireless networking environment. One of the intelligent techniques known as fuzzy logic is utilized to enhance the intelligence of handover decision system (HDS) in such environment. Most existing fuzzy decision engines for HDS are based on an inflexible design philosophy using a fixed set of decision rules and fuzzy membership functions. Such design leads to an unacceptable algorithm execution time if there are a large number of decision parameters involved in a decision making process. Additionally, the design also gives a degraded network selection performance when a decision engine needs to handle different traffic types. In the paper, a modular and an adaptive design philosophies are presented to address the said issues. The proposed design yields a lower algorithm execution time and at the same time improves the network selection capability.

The ninth paper entitled “An efficient MOP decision method using hop interval for RPL-based underwater sensor networks” proposes a hop interval based MOP decision method for intermediate Nodes. In underwater wireless sensor networks (UWSNs), not only data packets but also sensor nodes can be lost due to ocean current, running out of battery, and etc. Among various routing protocols, Routing Protocol for Low Power and Lossy Networks (RPL) is a promising routing protocol to overcome this problem since it provides multiple upward path establishments and path repair methods. However, unlike upward paths, downward routing paths in RPL have low reliability. In order to increase the reliability of downward paths, RPL standard defines two operational modes (Mode Of operation, MOP) for intermediate nodes, i.e., storing mode and non-storing mode. A node which operates in storing mode can increase the reliability, however it cannot be operated in storing mode for the all instances due to the limited memory. The paper proposes a hop interval based MOP decision method for intermediate nodes. In the proposed method, the sink calculates the hop interval between storing nodes based on the number of application and each intermediate nodes decide their MOP according to the calculated hop interval. In addition, it proposes a QoS-based initial storing node decision scheme to reflect differences between shallow water and deep water.

The tenth paper entitled “Smartphone Image Receiver Architecture for Optical Camera Communication” proposes a new image sensor architecture for smartphone-based optical camera communications (OCC) that incorporates three primary functions: motion stabilization, frame rate control, and autoexposure control. The motion stabilization function combines image sensor data and gyroscope motion information in order to select accurate pixel data. The frame rate control function increases the frame rate using an over-scan scheme and contributes to the data throughput and motion compensation in the time domain. Both the auto-exposure and focus functions are controlled to avoid blurring effects and variations in the frame rate. Experimental results are given to show that the proposed receiver architecture with adaptive frame rates and motion stabilization holds a great promise for OCC.

The eleventh paper entitled “Performance of Android Cluster System Allowing Dynamic Node Reconfiguration” presents an android cluster system that can reconfigure the system’s scale dynamically. The proposed system can automatically detect the change in the number of computation nodes and reconfigure the cluster’s nodes, even while parallel and distributed application is running. Furthermore, the paper shows preliminary

performance results of the system. The results show that the cluster provides the scalable performance to the number of nodes in parallel computation. It was shown that the mechanism of load balancing per process basis and the mechanism of switching to efficient data communication method can reduce the execution time of parallel applications. It was also shown that the execution time can be reduced up to 11.8% by load balancing per process basis compared to the load balancing per node basis, and that the execution time can be reduced 68% at maximum, by switching the communication method between processes to efficient one.

The final one entitled “Enhanced Signal Detection in 3GPP LTE System with Successive Interference Cancellation” introduces interference cancellation (IC) in the cell search and the detection of physical downlink shared channel (PDSCH) in the long term evolution (LTE) of the 3rd generation partnership project (3GPP). In the synchronous network system, since every cell sends its synchronization channel (SCH) using shared resource allocation, it is inevitable that two or more neighboring cells can interfere each other in some situation. The cell specific reference signal (CRS) is used for channel estimation in downlink reception. The CRS from neighbor cells may overlap with the resource of PDSCH of the target cell. Hence, the collision of SCH and CRS from the neighbor cells can degrade both the performance of cell search and PDSCH reception at the same time. The paper analyzes the improved performance of the cell search and PDSCH reception by using successive interference cancellation (SIC). Simulation results are given to show that the proposed scheme can effectively reduce the mutual interference and improve the performance of the signal detection in view of the cell search and PDSCH reception, respectively.

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