Mobile Networks and Applications
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Editorial: Wireless Communications and Networks for Smart Cities

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1 Editorial:

The world has been facing the problems of unprecedented urbanization, especially in developing countries. At the time of writing, 54% of the world population lives in cities due to multiple economic advantages in a very efficient form of social organization, and this number is expected to reach 66% by 2050. The centralized proliferation of job opportunities and skilled citizens on a relatively small geographical area (i.e., 2% of the earth's surface), which enables scale economies on infrastructure and service provision, reducing costs in transportation, energy, communications and social interactions; poses an obvious emerging challenge of resource access and supply management that obstructs their growth and development in the context of smart cities.

Smart cities have become emerging innovation of institutions, entrepreneurs, technology enterprises, and governments. A "smart city" is established relying on both the outstanding infrastructures (e.g., buildings, transportation, and health and education systems) and modern information and communication technologies (ICT) where wireless communications and networks play an important intermediate role to connect smart things (e.g., objects, people, and sensors) together and to the Internet. Wireless communications and networks based smart cities can provide advanced services such as e-services (e.g., health, earning, commerce, and government), security and safety, real-time traffic monitoring, and resource and environment management, etc. Considering the significance of wireless communications and networks for realizing the vision of smart cities, it is still complex and far-reaching development with many challenges in terms of design, optimization, standardization, and sustainability. And thus, there is a need for conducting research on further solutions to smart cities assisted wireless communications and networks. This special issue focuses on overcoming the aforementioned challenges of wireless communications and networks for smart cities.

The special issue includes seven selected papers with high quality. In the first paper entitled "Cognitive Heterogeneous Networks with Unreliable Backhaul Connections", the authors studied the impact of cognitive spectrum sharing over multiple small-cell transmitters. Many important system performance metrics, i.e., outage probability, ergodic capacity, symbol error rate, and related asymptotic expressions, have been derived exactly to evaluate the considered system. Numerical results provide a proper framework for network designers to clearly understand the effects of unreliable backhaul links and how to enable the cognitive radio networks for those cooperative transmitters in order to efficiently utilize the spectrum.

The second paper is abo ut "A Mobility Solution for Hazardous Areas Based on 6LoWPAN". In particular, a decentralized approach for mobility management of mobile nodes in hazardous areas has been proposed to organize static nodes as a tree for an efficient routing, automatic addressing, and handling the movement of mobile nodes. The objective is to gain high coverage of monitoring area at high number mobile nodes by handling multiple failures of static nodes that disconnect a mobile node from the network. This novel decentralized scheme for monitoring safety critical environment can be applied to health care applications in many factories in smart cities.

Because the proliferation of mobile devices and base stations in wireless communication systems causes the problems of energy consumption and security capacity, the authors of the third paper "Secure Energy Harvesting Communications with Relay Selection over Nakagami-m Fading Channels" investigated an energy harvesting relay system over Nakagami-m fading. In this system, the power beacon can provide wireless energy for the source and relays which deploy time-switching-based radio frequency energy harvesting technique. Furthermore, the eavesdropper is able to wiretap to

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the signal transmitted from the source and the relays. The exact closed-form expressions of secrecy outage probability are derived. The results show that optimal relay selection outperforms partial relay selection. With the increasing number of relays, the considered system shows better security performance. The energy harvesting duration should be carefully designed to gain high system performance in terms of energy harvesting and security.

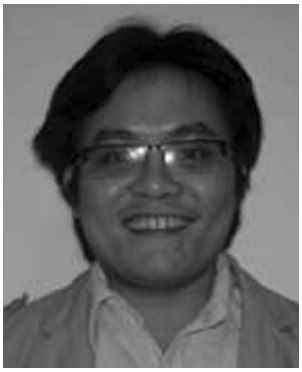
In the fourth paper entitled "ICI Mitigation by Estimation of Double Carrier Frequency Offsets in High-Speed-Railway Communication Systems for Smart Cities", the authors considered the communication aspects of high speed railway (HSR) in transportation infrastructures. The inter-carrier interference mitigation method was studied in the context of advanced communication systems to provide broadband communications services. The objective is to serve the passengers and transportation management networks high-speed data services with reliable connections. The proposed method can be considered as a promising solution for the problem of transportation infrastructures and high speed railway in digital or smart cities.

It is tremendous that due to the significantly growing number of users and wireless devices, the future 5G networks are required to support the demand for low-latency, low-cost and diversified services, yet at higher quality and a thousand-time faster data rate. In the quest for new technologies, non-orthogonal multiple access (NOMA) with energy harvesting technique has emerged as one of the most prominent candidates in meeting these requirements. In the fifth paper, namely "Outage Performance of Energy Harvesting DF Relaying NOMA Networks", the authors investigated energy harvesting decode-and-forward relaying NOMA networks. The performance was evaluated versus many parameters, e.g., power allocation factors, power splitting ratio, energy harvesting efficiency, and the location of relay nodes, to show that the use of NOMA can ensure a significant spectral efficiency as it takes advantage of the power domain to serve multiple users at the same time/frequency/code. In addition, compared with conventional multiple access schemes, NOMA offers better user fairness since even users with weak channel state information can be served in a timely manner.

In smart cities, for the purpose of surveillance and management of living environment, i.e., structural health of buildings, urban transportation, and potential locations of future crime, etc., an integrated system of wireless multimedia sensor networks (WMSNs) and mobile cellular networks (MCNs) has been studied to gain high performance of video streaming services in the sixth paper entitled "Joint Active Duty Scheduling and Encoding Rate Allocation Optimized Performance of Wireless Multimedia Sensor Networks in Smart Cities". In this paper, the authors proposed a joint active duty scheduling and encoding rate allocation (ADS-ERA) model to optimize the system performance. The ADS-ERA can minimize the capture, packetization, and transmission energy consumption while satisfying given limited bandwidth and high playback quality constraints.

The last paper is "Outage Performance Analysis for Device-to-Device Communication Underlying Small Cell Networks with Wireless Power Transfer" which exploited energy harvesting induced interference in the context of device-to-device (D2D) communications and wireless small cell networks. The results reveal that the number of interference users shows negative effect on the performance of the considered system. Besides, the primary network's peak interference constraint has significant influence on the optimal value of energy harvesting time at the D2D transmitter and the energy harvesting time fraction parameter should be carefully chosen for the best performance of the D2D link.

Trung Q. Duong received his Ph.D. degree in Telecommunications Systems from Blekinge Institute of Technology (BTH), Sweden in 2012. Since 2013, he has joined Queen's University Belfast, UK as an Assistant Professor. His current research interests include cooperative communications, cognitive radio networks, physical layer security, massive MIMO, cross-layer design, mm-waves communications, and localization for radios and networks. He is an author/co-author of more than 300 papers. Dr. Duong is currently serving as an Editor for the following journals: *IEEE Trans on Wireless Communications, IEEE Trans on Communications, IEEE Communications Letters, IET Communications.* He has also served as the Guest Editor of the special issue (SI) for the following journals: Lead Guest Editor of the *IEEE Journal in Selected Areas on Communications* (JSAC) for the SI on "Location Awareness for Radios and Network" in 2015; Lead Guest Editor of the *IET Communications* for the SI on "Secure Physical Layer Communications" in 2013 and on "Green Telecommunications Systems and Computing" in 2016; Guest Editor of the *IEEE Wireless Communications Magazine* for the SI on "Green Media: The Future of Wireless Multimedia Networks" in 2014; Guest Editor of the *IEEE Communications Magazine* for the SI on "Millimeter Wave Communications for 5G" in 2014 and "Energy Harvesting Communications" in 2015; Guest Editor of the *IEEE Access* for the SI on "Security for Wireless Communications and Networking" in 2016 and on "Exploiting the Benefits of Interference in Wireless Networks: Energy Harvesting and Security" in 2017; Guest Editor of the *EURASIP Journal on Wireless Communications and Networking* for the SI on "Cooperative Cognitive Networks" in 2013; Guest Editor of the *EURASIP Journal on Advances Signal Processing* for the SI on "Security Challenges and Issues in Cognitive Radio Networks" in 2014; Editor for *Wiley Transactions on Emerging Telecommunications Technologies* (2013–2016) and *Electronics Letters* (2015–2016). He was awarded the Best Paper Award at the IEEE Vehicular Technology Conference (VTC-Spring) in 2013, IEEE International Conference on Communications (ICC) 2014, and IEEE Global Communications Conference (GLOBECOM) 2016.



Nguyen-Son Vo received his Ph.D. degree in Communication and Information Systems from Huazhong University of Science and Technology, China, in June 2012. Since 2014, he has worked as a lecturer at the Faculty of Electrical & Electronics Engineering of Duy Tan University, Vietnam. He is currently also in charge as the head of a research group at the Research Center of New Technology (NewTech) established in April 2014. He is working on self-powered multimedia wireless communications as well as quality of experience provision in wireless networks for smart cities. He is an author of 1 book chapter, 9 journals, 21 conference papers, and 9 projects. Many of them were published by high reputable journals and conferences such as IEEE Trans. on Circuits and Systems for Video Technology, IEEE Systems Journal, IET communications, Journal of Communications, IEEE Global Communications Conference, and IEEE International Conference on Communications. Especially, he has been awarded the Best Paper Award at the IEEE Global Communications Conference (GLOBECOM) 2016.

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