drones

MDPI

Editorial

Advances in Drone Communications, State-of-the-Art and Architectures

Vishal Sharma

Department of Information Security Engineering, Soonchunhyang University, Asan-si 31538, Korea; vishal_sharma2012@hotmail.com

Received: 21 February 2019; Accepted: 21 February 2019; Published: 23 February 2019

Unmanned aerial vehicle (UAV)-enabled networks and drone communications are emerging areas of research with a key focus on attaining high throughput, elongated range, and enhanced coverage over the existing networks. With the facility of autonomous operations, these vehicles can be specifically configured to support mission-critical tasks. Currently, these systems are observing a keen interest from industry, as well as academic, researchers who predominately aim at integrating drone systems with the traditional networks while resolving several aspects related to the quality of service/experience, deployment strategies, and reliable communications. Additionally, drones play a key role to distribute critical information at the edge of the battlefield and for deploying Long-Term Evolution (LTE) networks in remote locations. Drones are considered as an integral part of 5G and beyond deployments, where these vehicles will be acting as a major role player in coverage and capacity enhancements. Thus, it is desired to understand the limits of existing solutions and fixate the models which can support high-capacity communication systems with drones.

In this special issue, different researchers who are working on the communications aspects of drones contributed with their high-quality papers that further advance the understanding of these networks. After a rigorous review process, five articles were accepted in this special issue and we hope that, being a core journal, these articles will reach a wide audience.

With the networking capabilities of UAVs, ad hoc formations are seen as one of the key advancements with these vehicles. Advancing from single UAVs to multi-UAVs, such networks are dominatingly studied as flying ad hoc networks (FANETs). In the last few years, FANETs were a hot topic with many researchers focusing on issues related to the performance aspects of UAVs. Selection of communication setup, architecture, and core technology for operating FANETs is really a tedious issue. Thus, to understand this, Muhammad Asghar Khan et al. [1] proposed a hybrid wireless communication scheme which utilizes the features of the high data transmission rate of 802.11 and the low-power consumption of 802.15.1 for efficient communications over FANETs. As availed through simulations, the proposed scheme significantly improves the network performance and lowers the communication cost.

Drones can be helpful in timely delivering of services especially during/after a disaster by increasing surge capacity for public safety communications. Such an application allows temporary setup of the communication network at a comparable capacity with the traditional setups. Saeed H. Alsamhi et al. [2] stated that the drone-based wireless communication can save people and ecosystems by managing crises in an efficient manner. The authors focused their work on integrating smart wearable devices and drone technology to form an effective public safety setup. Performance enhancement in terms of better QoS, including fewer delays, higher throughput, and information accuracy are presented as a part of simulation studies.

Integrated network formations are other examples of drone-assisted communications. Such coordination can be observed between UAVs and wireless sensor networks (WSNs). Both of these networks can support a large set of civilian and military applications, which include search, navigation,

control, and reconnaissance. One such approach is discussed by Mohd. Abuzar Sayeed and Rajesh Kumar [3]. In their approach, the authors discussed the coverage issues in WSN-enabled UAV systems and argued that multiple UAVs can resolve the coverage problem through an efficient selection of the waypoints. The authors proposed a novel mobility model, which takes into account the attraction factor for setting up the way-points for UAV movements. The authors used NS-3 based simulations to present the effectiveness of their proposed solution and compared their results with the existing mobility models on the basis of coverage, throughput, latency, and the allocated UAVs.

In spite of providing a large set of applications and wide coverage, data dissemination in FANETs remains a concern because of the high dynamics of aerial vehicles. Additionally, frequent topology changes and 3D space movement make routing a tedious task in FANETs. To highlight this issue and understand the limits of routing in FANETs, Muhammad Asghar Khan et al. [4] presented studied existing routing protocols for FANETs. The authors suggested that topology-based routing protocols are generally better than the other rival protocols in terms of throughput, end-to-end delay, and network load when applied to UAV ad hoc system. From their study, it can be highlighted that the topology-based routing protocols can be used as a base for developing applications served by FANETs.

As discussed earlier, surveillance has been one of the major applications of UAVs. Such an application requires efficient deployment model for setting up the communication between the UAVs and the ground station. To address this issue, Maik Basso et al. [5] proposed a network infrastructure to support the operation of multiple surveillance drones. Their proposed model uses the existing MAVLink protocol, which is considered as a strong benchmark for UAVs to ground communications. The authors demonstrated the effectiveness of their proposed setup by using STIL simulations as well as on-field testing. Their work can be helpful in understanding the limits of UAV-deployment and follow-ups for user-interface aspects.

Finally, we are happy with the acceptance ratio, technical depth, and reach of this special section, and also hope that it will further advance the understanding of drone communications. At last, we want to extend our sincere thanks to all the authors and reviewers for the tremendous efforts, and the Editor-in-Chief and staff members of Drones-MDPI for their collective efforts in supporting this special issue.

References

1. Khan, M.A.; Qureshi, I.M.; Khanzada, F. A Hybrid Communication Scheme for Efficient and Low-Cost Deployment of Future Flying Ad-Hoc Network (FANET). *Drones* **2019**, *3*, 16. [CrossRef]
2. Alsamhi, S.H.; Ma, O.; Ansari, M.S.; Gupta, S.K. Collaboration of Drone and Internet of Public Safety Things in Smart Cities: An Overview of QoS and Network Performance Optimization. *Drones* **2019**, *3*, 13. [CrossRef]
3. Sayeed, M.A.; Kumar, R. An Efficient Mobility Model for Improving Transmissions in Multi-UAVs Enabled WSNs. *Drones* **2018**, *2*, 31. [CrossRef]
4. Khan, M.A.; Khan, I.U.; Safi, A.; Quershi, I.M. Dynamic Routing in Flying Ad-Hoc Networks Using Topology-Based Routing Protocols. *Drones* **2018**, *2*, 27. [CrossRef]
5. Basso, M.; Zacarias, I.; Tussi Leite, C.E.; Wang, H.; Pignaton de Freitas, E. A Practical Deployment of a Communication Infrastructure to Support the Employment of Multiple Surveillance Drones Systems. *Drones* **2018**, *2*, 26. [CrossRef]