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Advanced Air Mobility

Advanced air mobility (AAM) aims at shifting a major part of today's ground-based urban transportation of people and goods into the third (vertical) dimension. Aerial transport routes lead to shorter transport times and relieve ground traffic. Opening up the third dimension for transport in densely populated urban areas requires reliable and always-available communication to coordinate the multitude of unmanned aerial vehicles (UAVs) to optimize flight trajectories and avoid collisions. As the industry is enthusiastically making progress toward unmanned air transportation, further research and development are needed in this domain.

This special issue of *IEEE Vehicular Technology Magazine* is the second in the series edited by our team on the topic of unmanned air transportation. The previous special issue focused on communication support for unmanned air transportation and was published in June 2020. The current special issue contains four articles focused on recent developments in AAM. The articles address the new challenges and propose heterogeneous communication networks that include a terrestrial component and the integration of high-altitude platforms (HAPs) and satellites to form an integrated, absolutely reliable, highly available, high-capacity, and low-latency communication network.

The first article, by Cui et al., proposes integrated communications networks consisting of fully connected satellites, HAPs, and ground-based elements. It presents the multilayer architecture to provide seamless internetworking with the overall goal to provide high capacity and the highest connectivity. The optimal design of such a network is a challenge since various parameters need to be optimized. The article also presents open issues for future research.

The second article, by Wang et al., also treats multilayer networks consisting of satellites, HAPs, and terrestrial elements as part of a future 6G communication network. In the article, several examples are investigated. The authors provide guidelines for the identification of optimal working points where the key is to find a balance between system flexibility and network performance (highest availability, largest coverage, and lowest latency).

In the third article, Kurt and Yanikomeroglu present a communication architecture that is centered around HAPs acting as key entities for the control of autonomously flying UAVs. The article also treats computing and caching strategies enabling a high degree of flexibility for aerial fleet management with fast changing user demands. Furthermore, the feasibility of applying artificial intelligence methods is discussed.

The fourth article, by Rong et al., is more application-oriented and gives an overview about advances in UAV-borne human vital sign detection techniques. The article focuses on applications in disaster management such as the detection of humans through buildings. The article also presents a radar configuration to be applied in a UAV swarm and shows how through-material imaging with UAV radars allows for the detection of vital signs of humans who are not directly visible to a UAV.

These articles focus on recent developments for future AAM where communication is the key for safety and efficiency. We hope that you enjoy reading these articles and profit from the new directions and findings they present.

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(continued on p. 164)

FROM THE GUEST EDITORS (continued from p. 87)

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