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Special Issue on

UAV Communications for Safe Aerial Integration and Spectrum Coexistence

During the past few years, unmanned air transportation has come to the forefront of aviation and communication research. Aviation authorities around the world have been making progress toward integrating drones or unmanned aerial vehicles (UAVs) into their national airspaces (e.g., FAA Remote ID regulations (NPRM)). At the same time, UAVs are in the spotlight for industry developing innovative applications. Projects such as UAS traffic management (UTM) and urban air mobility demonstrate the industry's great enthusiasm for unmanned air transportation. Before large-scale unmanned air transportation becomes a reality, there is a need to improve the reliability and security of UAV communications, as they impact human safety. Indeed, the general public expresses concerns regarding safety aspects of drone use: for example, ensuring the absence of drones in no-fly zones (e.g. airports) or collisions of UAVs in the air. **This special issue aims to share the progress and efforts being made by researchers, practitioners, and regulators toward the communication support for unmanned air transportation with a special focus on the safety-related applications and issues.**

To address the safety concerns, solutions targeting UAV detection, localization, tracking in no-fly zones, drones cooperation and coordination (e.g., UTM) must be designed. It includes the design of UAV-to-UAV communication technologies and protocols (e.g. similar to ADS-B for conventional airplanes) for so-called conflict management (CM - a set of rules for avoiding physical collisions and coordinating the flight missions between drones and other aircraft). Moreover, a reliable communication link (with the pilot or the ground operational center) is a key factor for ensuring the safety of UAV-enabled solutions.

One of the promising approaches is integrating UAVs into cellular networks, e.g., 5G (and beyond) networks. The proposed solutions may rely on the 5G commercial scenarios including enhanced mobile broadband (eMBB), massive machine-type communications (mMTC), and ultra-reliable and low latency communications (URLLC) providing reliable and seamless connectivity. Some potential beyond 5G paradigms (e.g. Cell-Free MIMO for UAVs) might be of interest as well. Note that the spectrum coexistence is one of the issues that greatly affect the UAV solutions' reliability.

Inspired by a rapid development of trial facilities *(5G!Drones, AERPAW, POWDER/COSMOS, to name a few)*, this special issue particularly welcomes contributions reporting on experimental results of deployed systems.

This special issue will focus on the recent advancement in research and design of technologies related to safe UAV usage, including both communication for UAV conflict management and coexistence of aerial and ground communication nodes. Topics of interest in this special issue include, but are not limited to the following:

- Channel modeling for UAV-ground and UAV-to-UAV communications
- New architectures and communication protocols for cellular-connected UAVs
- New architectures and communication protocols for UTM systems
- New architectures and protocols for UAV-to-UAV communications
- Spectrum management and multiple access schemes for cellular-connected UAVs
- Interference mitigation for cellular-connected UAVs
- Cell-free MIMO for UAVs
- Cellular systems with coexisting aerial and ground users
- 3D beamforming for cellular-connected UAVs
- Massive MIMO/Millimeter wave communications for cellular-connected UAVs
- UAV-aided eMBB, MMTC, URLLC
- Online/offline and machine learning based UAV trajectory optimization
- Joint trajectory design and resource allocation for UAV-assisted wireless communication
- Energy-efficient UAV communications
- UAV swarm in 5G and beyond
- UAV channel estimation and pilot decontamination
- UAV detection/classification/localization/tracking (e.g., using passive RF sensing or radar-based techniques)
- Detect and avoid research and standardization
- Long-range technologies for remote identification of drones
- Physical layer security and techniques in wireless networks with UAVs
- New UAV communications trials, tools, and data

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- Final editorial decision: May 1, 2021
- Final papers due May 15, 2021

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