IEEE ICUS 2021

Invited Session Summary

Title of Session

Cooperative Communication and Computing of
6G-Oriented Unmanned Swarm Systems

Name, Salutation, Affiliation and Email of Organizers

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Details of Session(including aim and scope)

Recently, as a new-round evolution of information communication technologies (ICT) and industries is accelerated around the world, the Internet of Things based on cellular communications and wireless local area networks have been significantly advanced. However, there are several great limitations to the information interaction and processing performance of existing connected and unmanned swarm systems (e.g., autonomous vehicle platoons, unmanned aerial vehicles, etc.). For example, cellular communications heavily rely on base stations, which will not meet the transmission demands of unmanned swarm systems in some infrastructure-less areas. Due to resource constraints, the physical nodes of an unmanned swarm system alone cannot meet the increasing computing and storage demands of various emerging applications efficiently. Besides, massive smart sensors are envisioned to be integrated with end nodes and infrastructures to realize the autonomy and intelligence of large-scale unmanned swarm systems, which requires ultra-reliable low-latency wireless communication networks with ubiquitous coverage. Therefore, to tackle the emerging demands and challenges, it is needed to investigate and develop 6G-oriented communication and computing technologies for enabling existing and envisioned unmanned swarm systems. The novel system architectures and technical paradigms will combine as well as extend existing 5G technologies. Advanced unmanned swarm systems will incorporate a wide range of radio access technologies, such as cellular communications, satellite communications, unmanned aerial vehicle-assisted communications, to form heterogeneous networks. They also depend on a space-air-ground integrated framework to provision more ubiquitous wireless connectivity and comprehensive performance enhancement in terms of transmission data rate, end-to-end latency, connection reliability, spectral efficiency, and other metrics. In addition, joining artificial intelligence (AI), swarm intelligence, and mobile edge computing into unmanned systems can achieve an elegant breakthrough in the cooperation of communication and computing and the integration of cyber and

physical components in the systems. At this point, the 6G-oriented unmanned swarm systems receive more and more attention from both academia and industries.

The scope of this session is to present and highlight the potential challenges, the theoretical and technical advances, the latest implementations and applications in the field of 6G-oriented unmanned swarm systems such that the theoretical and practical frontiers can be moved forward for a deeper understanding from both academic and industrial viewpoints. We particularly have an interest in the submissions on joining emerging communication and computing solutions together to dramatically improve the performance of existing and envisioned unmanned swarm systems. Possible topics include but are not limited to:

- Swarm intelligence (SI) models and high-reliability and low-latency mechanisms for large-scale wireless ad hoc networks
- AI-driven system architectures and resource optimization for space-air-ground integrated ubiquitous networks
- High-efficiency data transmission theories, methods, and key technologies for software-defined unmanned swarm systems
- Spatial-temporal perception and fusion methods of multi-dimensional multi-scale information for 6G-oriented unmanned swarm systems
- Cyber security-guaranteed edge computing and blockchain technologies for 6G-oriented unmanned swarm systems