Workshop/Tutorial T2 (Half Day)

TOWARDS NETWORKED AIRBORNE COMPUTING: APPLICATIONS, CHALLENGES, AND ENABLING TECHNOLOGIES

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Tutorial Summary

In recent years, Unmanned Aircraft Systems (UAS) have attracted significant attention from industry, federal agencies, and academia. Although most existing UAS applications involve a single UAS, many civilian and public domain UAS applications will require cooperative computing capabilities of multiple UAS. Such a trend leads to research challenges across disciplines, such as aerospace, control, communication, networking, and computing. The objective of this Tutorial is to explore the cross-disciplinary area of networked airborne computing. The focus is on how to design and develop future

generations of UAS-based networked airborne computing systems, which consist of a network of smart UAS with integrated communication, control, computing and storage capabilities.

Emphasis is on how existing and potential applications can be developed within the paradigm of networked airborne computing. After summarizing requirements for such applications, challenges in system design, control, communications, networking and computing are discussed. Enabling technologies such as advanced control mechanisms, long-range communication systems, software-defined networking and network function virtualization are presented, along with virtualization mechanisms in computing, and mixed reality based human machine interface technology for manned-unmanned teaming. Open issues and important future directions are discussed, before concluding the tutorial.

Tutorial Outline

- **09:00 – 9:15**: Introduction of the market trend, regulation and policy, and existing testbeds for networked airborne computing systems
- **09:15 – 9:45**: Discussion on the new applications of networked airborne computing, including emergency response, cooperative surveillance, 3D image stitching, UAS swarm, content delivery, and airborne edge computing
- **09:45-10:15**: Design challenges, open issues, and future directions for networked airborne computing on aspects such as power supply, flight control, communication, networking, and computing
- **10:15-11:45**: Enabling technologies for networked airborne computing, including cooperative control, broadband and long-range communication system, programmable medium access control, software-defined networking, network function virtualization, information-centric networking, virtualization mechanisms in computing, and manned-unmanned teaming
- **11:45-12:00**: Summary, discussion, and feedback

Intended Audience
The Tutorial is suitable for students, researchers, end-users, practitioners and developers interested in multi-UAS development and applications, with a background in aerospace, control, communication, networking, or computing.

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