IEEE ICUS 2022
Invited Session Summary

Title of Session

Integrated Optimization of Control and Communications for UAVs

Name, Salutation and Affiliation of Organizers

1. Prof. Yuhua Xu

Army Engineering University

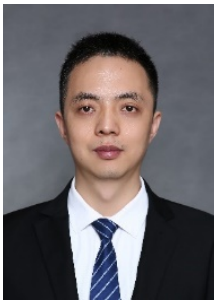
2. Assoc. Prof. Zhiyong Du

National University of Defense Technology, China

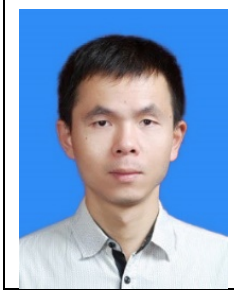
3. Assoc. Prof. Yirui Cong

National University of Defense Technology, China

Biosketches of Organizers



Yuhua Xu is currently a professor and doctoral supervisor with the College of Communications Engineering, Army Engineering University of PLA. He was selected to receive the Defense Technology Science Foundation for Outstanding Young Scholars and the Funds for Distinguished Young Scholars of Jiangsu Province. He was selected as a Youth Talent of Ten-Thousand Talents Program and a Young and Middle-aged Chief Scientist of "333" Project of Jiangsu Province. He serves on the member of Electromagnetic Spectrum Security and Control Committee of Chinese Institute of Command and Control. His research interests focus on cognitive radio networks, communications in unmanned swarms, and intelligent anti-jamming techniques for wireless communications. He has held 9 national and defense research projects. He has published over 70 articles in IEEE journals and 2 academic monographs. He has won 5 science and technological rewards, including the First Award of National Science and Technology Progress of China and the First Award of Natural Science of Chinese Institute of Electronics. He also won the IEEE Signal Processing Society Young Author Best Paper Award and the Outstanding Doctoral Dissertation of the Army and Jiangsu Province.



Zhiyong Du received his Ph.D. degree in communications and information systems in College of Communications Engineering, PLAUST, Nanjing, China, in 2015. He is currently an Associate Professor in National University of Defense Technology, China. His research interests include intelligent decision-making and

online optimization in wireless communications, quality of experience (QoE) and UAV communications. He has published a monograph in Springer Nature and 30+ IEEE TWC/TVT/COM and related communication journal and conference papers. He is also a reviewer of related journals and TPC members of several conferences. He received 2020 Marie Curie fellowship.

Yirui Cong is an associate professor with National University of Defense Technology, Changsha, China. He received the Ph.D. degree from Australian National University in 2018. His research interests include distributed control and filtering theory, multi-UAV cooperative localization, set-membership filtering theory and applications, and networked control under communication constraints. He has published over 20 refereed papers in top journals such as IEEE Transactions on Automatic Control and IEEE Transactions on Wireless Communications.

Details of Session

Unmanned aerial vehicle (UAV) systems have attracted considerable attentions recently, due to their broad applications and the increasing demands. Flight control and wireless communication are two fundamentally important functions of UAVs, which are generally coupled in nature. The remote control, collision avoidance and formation control of UAVs rely on the low-latency control message exchange via wireless communication interfaces. On the other hand, control algorithms determine the trajectory, attitude and inter-UAV relative position, which, in turn, affects their wireless link quality and formation networking performance. The integrated analysis and optimization of control and communications provides a new perspective on tackling the complex and dynamic environment, uncertain noise and large-scale network challenges in practical applications. In mission planning stage, constructing UAV formation according to their communication capability could enhance the robustness and scalability of formation. In mission execution stage, the mobility and control advantage could be exploited to achieve communication-oriented formation topology adjustment, promoting the environment adaptability of the UAV network. In addition, the multi-UAV cooperation under communication constraints is also a very interesting topic. Related theoretical and engineering application challenges, such as the coupling of complex dynamics and information

constraints, are still far from being completely solved and further study is required.

The invited session calls for original papers relevant to the following selected topics of "Integrated Optimization of Control and Communications for UAVs" and provides a platform for researchers to exchange new ideas and methods, and discuss related challenges and problems.

- Coupling mechanism between control and communication of UAVs
- UAV control theory under communication constraint
- Robust UAV formation control algorithms
- Communication-oriented UAV control optimization
- Control driven UAV network resource management
- UAV swarm networking
- Deployment and trajectory optimization in UAV relay communications