IEEE ICUS 2022
Invited Session Summary

Title of Session

Intelligent Perception, Planning and Control for Swarm Unmanned Systems

Name, Salutation and Affiliation of Organizers

1. Prof. Hongjun Ma
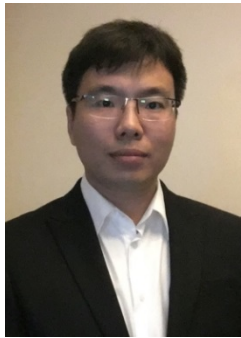
South China University of Technology, China

2. Asst.Prof. Chao Deng

Nanjing University of Posts and Telecommunications, China

3. Dr. Yuhua Qi

Sun Yat-sen University, China

Biosketches of Organizers

Dr. Hongjun Ma is a Professor at the School of Automation Science and Engineering, South China University of Technology. Prior to this, he was a Professor at the College of Information Science and Engineering, Northeastern University. He was a Visiting Professor at the Department of Electrical and Computer Engineering, University of Alberta, Edmonton, Canada (2017-2018). His aspiration is to develop cutting-edge, low-cost and reliable solutions for unmanned systems,i.e., diverse autonomous mobile vehicles with smart terminals and manipulators, fulfilling a wide variety of guidance-navigation-action missions that make decision and operate in a complex and distributed environment with sensing capability.
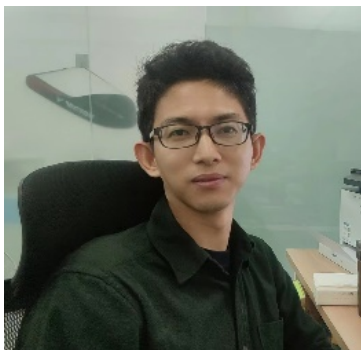
Chao Deng received his Ph. D. degree in Control Science and Engineering from Northeastern University in 2018. From May 2018 to April 2021, he was a Postdoctoral Fellow at Nanyang Technological University, Singapore. Since June 2021, he has been with the Carbon Neutral Advanced Technology Research Institute of Nanjing University of Posts and Telecommunications, China, where he is currently an Assistant Professor, a Master's Instructor, and a candidate of the National Youth Talent Program. He has published more than 20 papers in IEEE Transactions and IFAC journals including IEEE Transactions on Automatic Control and Automatica as the first author and

corresponding author. He is currently the Associate Editor of the Journal of Control and Decision. He was the recipient of the Best Paper Award of the International Conference (ICCAR) in 2022. His research interests include distributed fault-tolerant control, security control of cyber-physical systems, and secondary control of smart microgrid systems.

Dr. Yuhua Qi is a post-doctoral at the School of Systems Science and Engineering, Sun Yat-Sen University. He received his Ph. D. degree in Aeronautical and Astronautical Science and Technology from the Beijing Institute of Technology, Beijing, China, in 2020. He has published more than 10 papers in journals, like Robotics and Autonomous Systems and Control Engineering Practice, as the first author and corresponding author. His research interests include collaborative SLAM, multi-agent path planning, and autonomous unmanned systems.

Details of Session

As an important development direction in the field of robotics, swarm unmanned systems have a wide range of practical needs in some application scenarios that are difficult for humans to reach, harsh working environments, or highly repetitive. The unmanned system operation has the advantages of high reliability, high safety, and repeatability. Compared with the operation of a single unmanned system, the swarm unmanned system is more efficient and more in line with the needs of the actual scene. In recent years, in the fields of perception, planning and control, advances in advanced sensors, computing equipment, and intelligent learning algorithms have greatly driven the technological development of swarm unmanned systems and made high-level autonomy possible.

The purpose of this invited session is to create a forum for scientists, engineers and practitioners throughout the world to present the latest theoretical and technological achievements relevant to the following selected topics of "Intelligent Navigation, Planning and Control for Swarm Unmanned System". Papers presenting newly emerging fields and applications are especially welcome. Topics to be covered in this invited session include, but not limited to, the following:

· Intelligent perception and detection for swarm unmanned system

· Multi-sensor fusion for swarm unmanned system

- Localization and mapping for swarm unmanned system
- Path planning and trajectory optimization for swarm unmanned system
- Control theory and analysis for swarm unmanned system
- Learning-based method for swarm unmanned system
- Swarm unmanned system applied in construction, agricultural, rescue，exploration tasks and so on