

IEEE ICUS 2022
Invited Session Summary

Title of Session

Intelligent Unmanned Aerial Vehicles Swarm System

Name, Salutation and Affiliation of Organizers

1. Prof. Yanjie Zhao

Information Science Academy, CETC, China

2. Dr. Yi Yang

Information Science Academy, CETC, China

3. Dr. Wanmai Yuan

Information Science Academy, CETC, China

4. Assoc. Prof. Chen Wei

School of Automation Science and Electrical Engineering, Beihang University

Biosketches of Organizers



Yanjie Zhao received the B.Sc. degree from Tsinghua University, China in 2006 and the Ph.D. degree from Purdue University, United States in 2012, all in Physics. From 2012 to 2014, he was a Post-Doctoral Researcher with Purdue University. He is currently the associate dean of CETC Information Science Academy. He is the leader of CETC Intelligent UAVs swarm system, who has presided over more than 30 research projects, breaking through a number of key core technologies in this field. He is also a member of advisory board of Chinese National Next-Generation AI Project, committee of Intelligent Unmanned Systems of Chinese Institute of Electronics, committee of Navigation Guidance and Control of Chinese Society of Aeronautics and Astronautics, committee of UAVs Autonomous Control of Chinese Association of Automation, and the board of directors of Chinese Institute of Command and Control. He had won the second prize of National Technology Invention in 2021.



Yi Yang received the Ph.D. degree from Beihang University and Université Lille 1 (Double Ph.D. degree). Now he is the deputy director (presiding over the work) of the Unmanned System Center of CETC Information Science Academy. As the deputy chief engineer of the CETC unmanned swarm, he led the team to break through many key technologies, which are of great

significance to the leap-forward development of national defense science and technology. His research fields include intelligent unmanned swarm formation control, distributed swarming control, and UAV swarm integration applications.



Wanmai Yuan received a double Ph.D. degree in electronics and information engineering from Hong Kong Polytechnic University in Sep. 2019, and communication engineering from Harbin Institute of Technology in Jul. 2019. He had been funded by Chinese government as a joint doctoral student at the University of Toronto, Canada in 2018. He has received Young Elite Scientist Sponsorship by China Association for Science and Technology (CAST) in 2021. Currently, he is the director of the Advanced Algorithm Office of the Unmanned System Center of CETC Information Science Academy. His research fields include intelligent unmanned swarm formation control, distributed swarming control, UAV swarm game confrontation and integrated applications. He has published more than 10 academic papers and applied for 20 Chinese patents including 6 authorized patents.



Chen Wei received the B.Sc. degree from the department of Mathematics of Shandong University in 1991 and received her Ph.D. degree from the Institute of Systems, Chinese Academy of Sciences in 1997. From 1998 to 1999, she worked as a postdoctoral researcher at the Hong Kong University of Science and Technology. She is currently an associate professor at the School of Automation Science and Electrical Engineering, Beihang University. She received the funds sponsored by the National Natural Science Foundation of China, Equipment Advance Research Project, and Aviation Science Foundation. She served as a member of the Unmanned Autonomous Control Professional Committee of the Chinese Society of Automation. She had won the second prize of National Defense Science and Technology Award and the second prize of China Aeronautical Society Science and Technology Award.

Details of Session

With the enhancement of big data, cloud computing, next-generation communication and artificial intelligence, human society has accelerated into an era of deep integration of digitization, networking, and intelligence. An intelligent

unmanned aerial vehicles (UAVs) swarm system is composed of a large number of autonomous nodes. This system is based on the emergence of swarm intelligence, which relies on the collaborative interaction between nodes and the unmanned autonomy of a single node. Furthermore, the intelligent UAVs swarm system has several advantages, such as capability multiplication, function distribution, peer-to-peer network, robust self-healing, low cost, and the emergence of swarm intelligence. This system can be widely applied in geographic exploration, communication reconstruction, emergency rescue, urban security, area reconnaissance, and security defence. At present, the research of intelligent UAVs swarm system in the fields of swarm intelligence emergence mechanism, swarm system control, dynamic communication networking, swarm collaborative navigation has developed rapidly. Nevertheless, there are many problems that need to be further considered and solved in this research direction.

The invited session invites original papers of innovative ideas and concepts, new discoveries and improvements, and novel applications relevant to the following selected topics of Intelligent UAVs Swarm System.

- Unmanned Autonomous System
- Unmanned Swarm
- Multi-UAVs system
- Swarm intelligence
- Collaborative control
- Swarm control
- Formation control
- Self-organizing networks
- Collaborative navigation