

2024 第七届 IEEE 国际无人系统大会 特邀专题简介表

特邀专题名称

无人集群系统分布式弹性优化决策与协同控制

组织者

- 1.温广辉，教授，东南大学
- 2.付俊杰，副教授，东南大学
- 3.周佳玲，副教授，北京理工大学
- 4.万颖，副教授，东南大学

个人简介



温广辉，东南大学教授（青年首席），博士生导师（数学，网络空间安全），国家杰出青年科学基金、优秀青年科学基金获得者，教育部青年长江学者。担任 IEEE Transactions on Industrial Informatics, IEEE Transactions on Neural Networks and Learning Systems, IEEE Transactions on Intelligent Vehicles, IEEE Journal of Emerging and Selected Topics in Industrial Electronics, IEEE Transactions on Systems, Man and Cybernetics: Systems, IEEE Open Journal of the Industrial Electronics Society, 和 Asian Journal of Control 等国际期刊编委，CICC 副秘书长，CAA 大数据专委会副主任，CICC 青工委副主任，CAA 机器人智能专业委员会委员，CAA 环境感知与保护自动化专业委员会委员；担任国际 20 余个 IEEE Trans. 期刊审稿人、5 个国际 SCI 期刊客座编辑，3 个国际期刊客座主编，国家自然科学基金委、科技部国家重点研发计划、澳大利亚研究理事会、瑞士国家科学基金会、德国洪堡学者项目等通讯评议专家。主持基金委联合重点项目、中船重工集团横向项目等 20 余项科研项目；授权国家发明专利 18 项，美国发明专利 1 项。获 ARC DECRA Fellow，亚太神经网络学会青年杰出研究奖，中国指挥与控制学会青年科学家奖、创新奖一等奖等学术荣誉称号。



付俊杰，副教授，博士生导师，江苏省双创博士，东南大学至善青年学者，仲英青年学者。2011年毕业于北京大学工学院理论与应用力学系，获学士学位。2016年至2017年期间，于澳大利亚墨尔本大学联合培养。2017年毕业于北京大学工学院力学系统与控制专业，获博士学位。2017年至今在东南大学任教。在 *Automatica*, *IEEE Trans.*等控制领域知名期刊已发表SCI论文40余篇，申请并受理国家发明专利7项。主持国防类重点项目1项，装备预研教育部联合基金1项，国家自然科学基金面上、青年项目各1项、江苏省自然科学基金青年基金1项，国家重点研发计划项目子课题1项。曾获中国指挥与控制学会科技进步一等奖（排2），2023 APNNS Young Researcher Award, 2022 ICUS 最佳论文奖等。目前为IEEE工业电子学会工业信息学技术委员会（中国）副主席，中国指挥与控制学会网络科学与工程专委会副总干事，中国自动化学会控制理论专业委员会多自主控制分委会委员，IEEE Senior Member。



周佳玲，北京理工大学特别研究员，中国科协青托。长期从事无人自主系统协调分布式控制与决策研究，发表学术论文50余篇。主持国家自然科学基金、国家重点研发计划项目课题等国家级项目/课题6项，获中国指挥与控制学会科学技术进步一等奖、IEEE SMC 学会 Zadeh 最佳论文奖、日内瓦国际发明展金奖等。担任IEEE工业电子学会工业信息学技术委员会（中国）副秘书长，中国指挥与控制学会集群智能与协同控制专委会、网络科学与工程专委会委员，《系统工程与电子技术》青年编委，《IEEE Systems, Man, and Cybernetics Magazine》、《控制工程》等期刊客座编委。



万颖，东南大学数学学院系统科学系副研究员，博士生导师，德国洪堡学者，入选中国工业与应用数学学会青年人才托举工程，江苏省双创博士，东南大学“至善青年学者”A层次。2018年毕业于东南大学数学学院应用数学专业，获理学博士学位。2019-2020于新加坡南洋理工大学计算机科学与工程学院从事博士后研究。主要研究方向包括神经网络与群体智能，信息物理系统安全控制与优化决策等，在IEEE汇刊等国际重要学术期刊和会议上发表

论文 40 余篇，其中 ESI 高被引论文 3 篇，现主持和参与多项国家和省部级项目。担任 IEEE IES 工业信息学技术委员会副秘书长，中国指挥与控制学会网络科学与工程等专委会委员，ICACI2022 等会议程序委员会委员，ICISCI2022 等会议邀请组主席。

特邀专题简介

随着新一代信息技术的飞速发展，由多个无人平台通过网络互联形成的无人集群系统正在经济、社会、国防等各个领域广泛出现。无人集群系统通过各子平台间的相互协作，可以完成许多传统单平台无法完成的任务，如协同观测、协同跟踪等。此外，对于目标搜索、货物搬运、区域防御等任务，无人集群系统可通过合理分工大大提高任务完成效率。然而，要发挥无人集群系统协作优势，满足灵活性与鲁棒性的实际应用需求，需为无人集群系统设计高效的分布式优化决策方案以及协同控制方法。同时，由于实际环境的复杂性和多变性，无人集群系统通信面临着诸多干扰及可能的网络攻击，集群系统平台可能发生故障及损坏。如何在动态变化的集群通信关系以及集群个体组成环境下实现无人集群系统分布式弹性优化决策与协同控制已成为其进一步实际应用面临的关键问题。相关问题研究将对于各类无人集群系统在协同搜索、协同建图等任务中实际应用提供理论支撑和技术保证。

本特邀专题邀请以下与“无人集群系统分布式弹性优化决策与协同控制”主题相关的包含创新思想、概念、新发现、改进以及新应用的原创论文。

- 分布式弹性一致性优化理论
- 通信受限下分布式一致性优化决策
- 弹性分布式任务分配
- 信息物理攻击下协同优化决策
- 无人集群系统分布式连通性检测
- 分布式连通保持协同控制
- 弹性一致性与编队控制
- 通信受限分布式目标定位与跟踪
- 通信受限无人集群系统安全避障协同控制
- 分布式自适应协同控制

IEEE ICUS 2024

Invited Session Summary

Title of Session

Distributed Resilient Decision Making and Control of Unmanned Swarm
Systems

Organizers

1. Prof. Guanghui Wen

Southeast University, China

2. Prof. Junjie Fu

Southeast University, China

3. Prof. Jialing Zhou

Beijing Institute of Technology, China

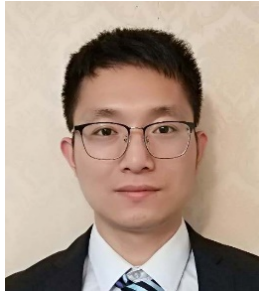
4. Prof. Ying Wan

Southeast University, China

Biosketches



Guanghui Wen received the Ph.D. degree in mechanical systems and control from Peking University, Beijing, China, in 2012. Currently, he is a Young Endowed Chair Professor with the Department of Systems Science, Southeast University, Nanjing, China. His current research interests include autonomous intelligent systems, complex networked systems, distributed control and optimization, resilient control, and distributed reinforcement learning. Prof. Wen was the recipient of the National Science Fund for Distinguished Young Scholars, and Australian Research Council Discovery Early Career Researcher Award. He is a reviewer for American Mathematical Review and is an active reviewer for many journals. He currently serves as an Associate Editor of the *IEEE Transactions on Industrial Informatics*, the *IEEE Transactions on Neural Networks and Learning Systems*, the *IEEE Transactions on Intelligent Vehicles*, the *IEEE Journal of Emerging and Selected Topics in Industrial Electronics*, the *IEEE Transactions on Systems, Man and Cybernetics: Systems*, the *IEEE Open Journal of the Industrial Electronics Society*, and the *Asian Journal of Control*. Prof. Wen has been named a Highly Cited Researcher by Clarivate Analytics since 2018. He is an IET Fellow.



Junjie Fu received the B.S. degree in 2011 and the Ph.D. degree in 2017, both from Peking University, Beijing, China. From 2016 to 2017, he was a Visiting Research Student with the Department of Electrical and Electronic Engineering at The University of Melbourne for six months. Since 2017, he has been with the Southeast University, Nanjing, China, where he is currently an Associate Professor. His research interests include consensus and coordination in multi-agent systems, input saturation control and distributed optimization. He has published more than 40 SCI journal papers and is an active reviewer for many research journals and conferences.



Jialing Zhou received the B.S. degree in automation from Beijing Jiaotong University, Beijing, China in 2012, and the Ph.D. degree in mechanical systems and control from Peking University, Beijing, China, in 2017. She is currently an associate professor with the Advanced Research Institute of Multidisciplinary Science, Beijing Institute of Technology, Beijing, China. She was selected for the Young Elite Scientist Sponsorship Program of the China Association for Science and Technology. Her research interests include distributed control and optimization, guidance and control of flight vehicles, reinforcement learning, and networked games.



Ying Wan, associate professor, doctoral supervisor in the Department of Systems Science at the School of Mathematics, Southeast University. She holds the Humboldt Research Fellowship and has been selected young elite scientist support program by CSIAM. She is the Double Innovation Doctor of Jiangsu Province and is ZhiShan Young Scholar at Southeast University. She graduated from the School of Mathematics at Southeast University in 2018 with a Ph.D. in Applied Mathematics. In the years 2019-2020, she conducted postdoctoral research at the School of Computer Science and Engineering, Nanyang Technological University, Singapore. Her primary research areas include neural networks and cooperative intelligence, security control of cyber-physical systems. She has published over 40 papers in international prestigious journals and conferences such as IEEE Transactions, including three ESI highly cited papers. Currently, she is leading and participating in several

national and provincial-level projects. Ying Wan holds the position of Deputy Secretary-General of the IEEE Industrial Electronics Society (IES) Industrial Informatics Technical Committee. She also serves as a committee member for conference program committees such as ICACI2022 and as an invited session chair for ICISCI2022.

Details of Session

With the rapid development of the new generation of information technology, unmanned swarm systems formed by multiple unmanned platforms interconnected through networks are widely emerging in various fields such as economy, society, and national defense. Unmanned swarm systems can accomplish many tasks that traditional single platforms cannot accomplish, such as cooperative observation and tracking, through the mutual cooperation between various sub platforms. In addition, for tasks such as target search, cargo handling, and regional defense, unmanned swarm systems can greatly improve task completion efficiency through reasonable division of labor. However, in order to leverage the cooperative advantages of unmanned swarm systems and meet the practical application needs of flexibility and robustness, it is necessary to design efficient distributed optimization decision-making schemes and cooperative control methods for unmanned swarm systems. At the same time, due to the complexity and variability of the real environment, the communication of unmanned swarm systems faces many interferences and possible network attacks, and the swarm platforms may malfunction and be damaged. How to achieve distributed resilient optimal decision-making and cooperative control of unmanned swarm systems in a dynamically changing communication and composition environment has become a key issue for its further practical application. The research on related issues will provide theoretical support and technical guarantee for the practical application of various unmanned swarm systems in cooperative search, cooperative mapping and other tasks.

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 “Distributed Resilient Decision Making and Control of Unmanned Swarm Systems”.

- Distributed resilient consensus optimization theory

- Distributed consensus optimal decision-making under communication constraints
- Resilient distributed task allocation
- Cooperative optimal decision-making under Cyber-physical attacks
- Distributed connectivity detection of unmanned swarm systems
- Distributed connectivity maintenance cooperative control
- Resilient consensus and formation control
- Communication restrained distributed target localization and tracking
- Communication restrained unmanned swarm systems collision avoidance cooperative control
- Distributed adaptive cooperative control