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

异构无人集群系统协同控制

组织者

1. 王庆，助理研究员，北京航空航天大学

2. 王和，副研究员，东南大学

3. 许文盈，教授，东南大学

4. 王玉峰，助理研究员，北京航空航天大学

5. 阚梓，“卓百”博士后/助理研究员，北京航空航天大学

个人简介

王庆，男，北京航空航天大学助理研究员。2024 年 6 月获得北京航空航天大学博士学位，研究方向为：无人集群系统协同控制、复杂网络无源性与同步、耦合反应扩散神经网络的无源性与同步问题研究。在相关领域发表高水平 SCI 学术论文 20 余篇，其中以第一作者或学生第一作者身份发表 IEEE 汇刊上发表学术论文 12 篇。受理或授权发明专利 4 项，软件著作权 3 项。以技术骨干与项目负责人身份参与或主持包括科技部 2030-新一代人工智能重大项目等在内科研项目 10 余项。

王和，男，东南大学副研究员、博士生导师、至善青年学者。分别于 2013 年 6 月和 2019 年 6 月在东南大学获得理学学士学位和理学博士学位。求学期间曾先后访问香港城市大学、加州大学河滨分校（国家联合培养博士，为期一年）、皇家墨尔本理工大学等。博士毕业后，在澳大利亚国立大学工程与计算机科学学院担任为期一年的客座研究员。共发表接受杂志和会议文章十余篇。主持国家和省部级项目多项。曾获江苏省优秀博士学位论文、双创博士等荣誉。

许文盈，东南大学教授，博士生导师，德国洪堡学者。2017 年获香港城市大学博士学位；2017 年 7 月至 2018 年 6 月，在新加坡南洋理工大学从事博士后；2019 年 3 月至 2021 年 2 月，任德国洪堡大学 PIK 研究所 Research Fellow。在国际重要学术期刊和会议发表论文 60 余篇，其中 Automatica 及 IEEE 系列汇刊 27 篇，以第一作者出版英文专著 1 部(Springer 出版社)。ESI 高被引论文 6 篇，申请/授权国家发明专利 4 项。主持国家级项目 4 项，应邀在 ICAISC 国际会议和全国复杂网络会议作大会报告，任国际权威期刊 IEEE Trans. Syst. Man Cybern. Syst.、Syst. Control Lett.等期刊编委，获江苏省数学成就奖，首届江苏省自动化学会青年科技奖，国际会议 ICNSC2021 最佳论文奖等。

王玉峰，博士，北京航空航天大学助理研究员、硕士生导师。分别获得西北工业大学学士学位和北京航空航天大学博士学位，2018 年美国加州大学默塞德分校公派访问学者。研究方向包括遥感影像处理、计算机视觉、智能无人系统等方面，以第一/通讯作者身份在 IEEE Trans.、AAAI、ECCV 等高水平期刊和会议上发表学术论文 14 篇，担任相关领域多个顶级期刊及会议的专业审稿人，获授权发明专利 7 项。目前研究兴趣为大规模场景感知与理解、端侧模型轻量化部署、无人集群协同感知与控制等技术。

阚梓，博士，现任北京航空航天大学卓百博士后/助理研究员。长期从事飞行器设计、无人机动力学及控制技术研究。在 Aerospace Science and Technology、Chinese Journal of Aeronautics 等期刊发表 SCI 论文 18 篇，入选 F5000 顶尖学术论文 1 篇，授权国家发明专利 20 余项，获得省部级科技进步二等奖 1 项、省部级技术发明三等奖 1 项、中国航空学会优秀博士学位论文奖等。

特邀专题简介

集群系统中的个体通过局部感知和简单邻居信息交互，克服个体能力上

的不足，有效地完成单个个体难以完成的任务，使得整个集群在宏观上涌现出复杂、强大的智能行为，即集群智能。通过不同类型的智能体的合理搭配，可以弥补同类智能体的不足，大幅提升集群系统的协同作业效能。但由于异构集群协同的工作环境具备高动态、干扰因素多等特点，这给异构集群系统的协同控制性能带来了很大的挑战。为了提升复杂环境下异构集群系统的协同控制效能，近几年来，越来越多的学者针对复杂环境下异构集群系统的协同控制问题进行了深入地探讨并得到了一些比较重要的结果。

本特邀专题邀请以下与“异构无人集群系统协同控制”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。

- 多源干扰下异构集群系统协同控制
- 网络攻击下异构集群系统弹性协同控制
- 异构集群系统智能决策与规划
- 异构集群系统仿真与试验

IEEE ICUS 2024
Invited Session Summary

Title of Session

Cooperative Control of Heterogeneous Swarm System

Organizers

1. Dr. Qing Wang

Beihang University, China

2. Dr. He Wang

Southeast University, China

3. Prof. Wenying Xu

Southeast University, China

4. Dr. Yufeng Wang

Beihang University, China

5. Dr. Zi Kan

Beihang University, China

Biosketches of Organizers

Qing Wang is an Assistant Professor at School of Automation Science and Electrical Engineering, Science and Technology on Aircraft Control Laboratory, Beihang University. He received the Ph.D. degree from Beihang University, Beijing, China, in 2024. His current research interests include cooperative control of multiagent systems.

He Wang received the B.Sc. and Ph.D. degree from Southeast University, Nanjing, China, respectively in 2013 and 2019. In 2016, he was a Visiting Scholar with the Department of Electronic Engineering, City University of Hong Kong for three months. From 2017 to 2018, he was a joint Ph.D. student with the Department of Electrical and Computer Engineering, University of California at Riverside, supported by China Scholarship Council. In 2019, he was a Visiting Research Student with the School of Engineering at RMIT University for three months. From 2019 to 2020, he was a Visiting Fellow with the College of Engineering and Computer Science, Australian National University, Canberra, Australia. Currently, he is an associate researcher in Southeast University. His current

research interests include multi-agent systems, cooperative antidisturbance control, finite-time control, distributed average tracking control, and UAV formation control.

Wenying Xu is a Professor in the Department of System Science, Southeast University. She received her Ph.D. from City University of Hong Kong in 2017, and her M.S. degree from Southeast University, China, in 2014. Prior to her current position, She was a Research Fellow in the School of Electrical and Electronic Engineering, Nanyang Technological University from 2017 to 2018 and was an Academic Visitor in the Department of Computer Science, Brunel University London, from May 2015 to Aug. 2015 and from Oct. 2019 to Dec. 2019. She was a Post-Doctoral Fellow in Potsdam Institute for Climate Impact Research, Potsdam, Germany from 2019 to 2021, and an Associate Professor in the Department of System Science, Southeast University from 2020 to 2023. Her research interests include cyber-physical system, game theory in networks, distributed event-triggered control, and distributed cooperative control. Dr. Xu was a recipient of an Alexander von Humboldt Fellowship in 2018.

Yufeng Wang is an Assistant Professor and Master's Supervisor at the Institute of Unmanned System, Beihang University. He received the B.S. degree from Northwestern Polytechnical University, Xi'an, China, in 2015, and the Ph.D. degree in Information and Communication System from Beihang University, Beijing, China, in 2021. In 2018, he was appointed as a visiting scholar by the University of California, Merced, USA. His research directions include the remote sensing image processing, computer vision, intelligent unmanned systems, etc. He has published 14 academic papers as the first and corresponding author in high-level journals and conferences, such as journals of IEEE Transaction, AAAI, and ECCV, and served as professional reviewers for multiple top journals and conferences in related fields. He was granted 7 Chinese patents. His current research interests focus on large-scale scene perception and understanding, edge-end deployment of lightweight models, and collaborative perception and control of unmanned swarm, etc.

Zi Kan, Ph.D., currently serves as an Outstanding Postdoctoral Fellow/Assistant Researcher at Beihang University. He has extensive experience in aircraft design, unmanned aerial vehicle dynamics, and control research. He has published 18 SCI papers in journals such as Aerospace Science and Technology and the Chinese Journal of Aeronautics, with one paper selected in the F5000 Top Academic Papers. He holds over 20 national invention patents. He has been awarded the second prize for Provincial Level Science and Technology Advancement Award and the third prize for Provincial Level Technological Innovation Award, as well as the Excellent Doctoral Dissertation Award from the Chinese Society of Aeronautics and Astronautics.

Details of Session

The agent in the swarm system overcome individual shortcomings through local perception and simple neighbor information interaction, effectively completing tasks that are difficult for single agent to complete, resulting in complex and powerful intelligent behaviors emerging in the entire cluster at a macro level, namely swarm intelligent system. By reasonable combination of different types of agents, the shortcomings of identical agents can be compensated for, and the collaborative work efficiency of swarm systems can be greatly improved. However, due to the high dynamics and multiple interference factors in the cooperative work environment of heterogeneous swarm systems, it poses great challenges to the cooperative control performance of heterogeneous swarm systems. In order to improve the cooperative control efficiency of heterogeneous swarm systems in complex environments, many scholars have paid their attention to investigating the cooperative control problem of heterogeneous swarm systems in complex environments in recent years, and have obtained several important results.

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 “Cooperative Control of Heterogeneous Swarm System”.

- Cooperative control of heterogeneous swarm system under multi-source disturbances
- Resilient cooperative control of heterogeneous swarm system under network attack
- Intelligent decision and planning of heterogeneous swarm system

- Simulation and experiment of heterogeneous swarm system