

2025 第八届 IEEE 国际无人系统大会 特邀专题简介表

特邀专题名称

导航通信拒止环境下的无人系统集群协同技术

组织者

1. 白成超，教授，哈尔滨工业大学
2. 颜 鹏，助理教授，哈尔滨工业大学
3. 朴海音，研究员，航空工业沈阳飞机设计研究所
4. 郑红星，助理研究员，哈尔滨工业大学
5. 王维嘉，高工，航空工业西安飞行自动控制研究所

个人简介



白成超，哈工大航天院长聘教授，国家级高层次青年人才，哈工大青年科学家工作室负责人。荣获黑龙江省科技进步一等奖，中国发明协会发明创新二等奖，中国指挥与控制学会青年科技奖。曾先后入选中国科协青年人才托举工程，黑龙江省高层次人才，黑龙江省优青，哈尔滨工业大学青年拔尖人才选聘计划。主要从事智能无人系统、多智能体安全强化学习、大规模集群协同、智能博弈对抗与决策等方向研究。担任《Space: Science & Technology》《宇航学报》《空天技术》《无人系统技术》《导航定位与授时》期刊青年编委，2019-2025 IEEE ICUS 程序委员会成员，2020 IEEE ICUS 出版主席；IEEE RAS Technical Committee on Multi-robot Systems 专委会委员；中国指挥与控制学会无人系统专委会委员/青工委委员；中国指挥与控制学会黑龙江省青年科学家俱乐部负责人；中国自动化学会混合智能专委会委员；中国图像图形学会机器视觉专委会委员。主持及参与科技创新 2030“新一代人工智能”重大项目、国家自然科学基金重大研究计划等多项纵向项目。累计在 IEEE TCYB、IEEE TNNLS、IEEE TITS、IEEE TVT、PR、IEEE TAES 等顶级期刊发表学术论文四十余篇，申请发明专利四十余项。



颜鹏，哈尔滨工业大学航天学院助理教授，主要研究方向为智能无人系统行为认知与决策，无人系统集群智能协同控制。累计在 IEEE TNLS、IEEE TVT、IEEE TCYB、PR、IEEE TITS、宇航学报等国际国内顶级学术期刊上发表学术论文 20 多篇，授权专利 10 余项。入选 2024 黑龙江省青年人才托举工程，2024 中国指挥与控制学会博士学位论文激励计划，获 2023 中国发明协会发明创新奖二等奖，IEEE ICUS 2020 最佳论文奖，2024 研究生教育学会学术年会优秀论文奖。



朴海音，航空 601 所智能中心办副主任，国家级人才工程入选者，集团一级专家，吉林大学兼职教授，中共沈阳市第十四届党代表，中国航空学会人工智能技术分会委员，中国指控学会空中多智能体专委会委员。在 IEEE TCYB/IEEE TCDS/IEEE TITS/IEEE TCSVT/NeurIPS/ICAPS/AAAI 等具有重要影响力的期刊及会议发表论文 40 余篇，国防科技进步一等奖 1 项，国防科技创新团队奖 1 项，国防科技进步二等奖 2 项。



郑红星，哈尔滨工业大学助理研究员，主要从事无人系统运动规划、无人系统智能决策和大规模无人系统协作等方面的研究。主持及参与科技创新 2030 “新一代人工智能”重大项目、国家自然科学基金面上项目等十余项纵向项目，累计在 IEEE TAES、宇航学报等国内外顶级期刊发表学术论文十余篇，申请发明专利十余项。



王维嘉，正高级工程师，航空工业 618 所人工智能专业首席科学家，毕业于巴黎第十一大学计算机博士生院，擅长专业领域包括：多目标优化，强化学习，高性能计算，曾参加国务院第 22 届中青年侨领研讨班，入选陕西省“特支计划”青年拔尖人才，是中央军委空军人工智能装备应用专业组成员，现担任中国人工智能学会智能决策专业委员会副秘书长，中国航空学会人工智能技术分会委员等职，主持空装、军科委重点科技项目 2 项，发表学术论文 19 篇。

特邀专题简介

高速飞行器得益于其大空域、宽速域、高机动等优势，在近年来得到各国高度重视并进入了实际应用阶段，然而随着反导技术的不断发展，以及高速飞行器性能提升的限制，单个高速飞行器将难以满足未来高价值任务的执行需求，发展高速飞行器集群技术将是未来的热点趋势。针对高速飞行器气动环境剧变、动力学模型复杂、通信条件不佳等问题，如何通过集群协同策略实现高速飞行器集群已成为亟待解决的关键科学问题。虽然许多传统协同方法被逐渐改进并应用于高速飞行器集群，但由于高速飞行器缺乏真实数据，且面临环境动态变化未知，发展安全鲁棒的高速飞行器集群协同技术变得越来越重要。

本特邀专题邀请以下与“高速飞行器集群协同”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。

- 高速飞行器集群编队控制
- 高速飞行器协同制导
- 高速飞行器协同感知
- 高速飞行器协同决策
- 高速飞行器集群博弈战术
- 高速飞行器集群任务分配
- 高速飞行器集群群智涌现
- 跨域异构高速飞行器协同

IEEE ICUS 2025

Invited Session Summary

Title of Session

Swarm Coordination Technologies for Unmanned Systems in Navigation and Communication Denial Environments

Organizers

1. Prof. Chengchao Bai

Harbin Institute of Technology, China

2. Asst. Prof. Peng Yan

Harbin Institute of Technology, China

3. Prof. Haiyin Piao

SADRI Institute, China

4. Dr. Hongxing Zheng

Harbin Institute of Technology, China

5. Prof. Weijia Wang

AVIC Xi'an Flight Automatic Control Research Institute, China

Biosketches of Organizers



Chengchao Bai, tenured Professor at the School of Astronautics of Harbin Institute of Technology, is a national high-level young talent and the head of the Harbin Institute of Technology Young Scientist Studio. He has won the first prize of Heilongjiang Province Science and Technology Progress Award, the second prize of China Invention Association Invention and Innovation Award, and the Youth Science and Technology Award of Chinese Institute of Command and Control. He has been selected for the China Association for Science and Technology Youth Talent Support Project, Heilongjiang Province High level Talents, Heilongjiang Province Excellent Youth, and Harbin Institute of Technology Youth Top notch Talent Selection Plan. His research interests include intelligent unmanned systems, multi-agent safe reinforcement learning, large-scale multi-robot collaboration, intelligent game confrontation and decision-making. He served as a member for the Youth Editorial Board of the Journal Unmanned Systems Technology. He is a committee member of the IEEE RAS Technical Committee on Multi-robot Systems, CICC (Chinese Institute of Command and Control) Technical Committee

on Unmanned Systems, CAAI (Chinese Association for Artificial Intelligence) Technical Committee on Cognitive Systems and Information Processing, and CSIG (China Society of Image and Graphing) Technical Committee on Machine Vision. He has published more than 40 academic papers in top journals such as IEEE TCYB, IEEE TNNLS, Pattern Recognition, IEEE TITS, and IEEE TAES.



Peng Yan, an assistant professor at the School of Astronautics, Harbin Institute of Technology. His main research areas include intelligent behavior cognition and decision-making for unmanned systems, as well as intelligent collaborative control of unmanned system swarms. He has published over 20 academic papers in top international and domestic journals, including IEEE TNNLS, IEEE TVT, IEEE TCYB, PR, IEEE TITS, and the Journal of Astronautics, and has been granted more than 10 patents. He was selected for the 2024 Heilongjiang Province Youth Talent Support Project, the 2024 Chinese Command and Control Society Doctoral Dissertation Incentive Program. He has received several awards, including the second prize of the 2023 China Invention Association's Invention and Innovation Award, the 2020 IEEE ICUS Best Paper Award, and the 2024 Best Paper Award at the Graduate Education Society's Academic Annual Conference.



Haiyin Piao received the M.Sc. degree in computer science from the Dalian University of Technology, China, in 2010. He is currently pursuing the Ph.D. degree with the School of Electronics and Information, Northwestern Polytechnical University, China. He is also the Vice Manager of the AI Center, SADRI Institute, China. Recently, he has published more than 30 articles in international journals and conferences, including IEEE TITS, IEEE TCSVT, IEEE TETCI, ESWA, NeurIPS, ICAPS, AAAI, etc. His current research interests include deep learning, multiagent reinforcement learning, and game theory, with particular attention to aerospace applications.



Hongxing Zheng, is currently an assistant researcher with Harbin Institute of Technology. His research interests include unmanned system motion planning, intelligent decision-making and large-scale unmanned system collaboration. He participated in more than ten projects such as Technological Innovation 2030 "New

Generation Artificial Intelligence" Major Program and National Natural Science Foundation of China (General Program). He published more than ten academic papers in IEEE TAES and Aerospace Journal, and more than ten patents.



Weijia Wang received his PhD degree in Machine Learning from Paris South 11 University in 2014. He is currently a professor of engineering in the Flight Automatic Control Research Institute, Aviation Industry Corporation of China. His research interests include reinforcement learning, mathematical programming, distributed systems and high performance computing.

Details of Session

With the rapid development of unmanned systems technology, unmanned aerial vehicles (UAVs), unmanned ground vehicles (UGVs), and other unmanned system swarms have shown great potential in environmental monitoring, disaster rescue, military reconnaissance and other fields. However, in complex and changeable environments, such as underground spaces, dense jungles, electromagnetic interference areas or disaster ruins, signal attenuation, positioning failure, communication interruption and other problems occur frequently. Traditional unmanned system swarms relying on satellite navigation and stable communication face serious challenges, and there is an urgent need to break through the bottleneck of unmanned system swarms coordination technology in denied environments. Focusing on key technologies such as highly robust autonomous navigation, distributed collaborative sensing, and collaborative decision-making in weak information environments, we will explore innovative breakthroughs at the theoretical and application levels. Promote the in-depth integration of artificial intelligence, control science, communication engineering and other fields to help unmanned system technology to move towards a higher level of autonomy.

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 “Swarm Coordination Technologies for Unmanned Systems in Navigation and Communication Denial Environments”.

- Autonomous localization and mapping techniques without external navigation aids
- Distributed collaborative sensing and information exchange in communication-limited environments

- Anti-jamming communication and adaptive networking technologies
- Dynamic task allocation and collaborative decision-making for multi-unmanned systems
- Swarm coordination based on bionic intelligence
- Swarm behavior reasoning and prediction
- Cross-domain collaboration of heterogeneous unmanned systems