

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

高速飞行器集群协同

组织者

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

个人简介



白成超，哈工大航天学院拔尖教授，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，荣获中国发明协会发明创新奖二等奖（排1）。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》《空天技术》《无人系统技术》《导航定位与授时》期刊青年编委，2019-2023 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 TNLS、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。



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。



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。



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向的研究。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。



颜鹏，哈尔滨工业大学航天学院助理教授。2023 年博士毕业于哈尔滨工业大学，研究方向为多智能体深度强化学习、安全学习、集群协同控制、无人系统行为认知与决策等。作为骨干参与国家重点研发计划、装备预研项目、军科委重点项目等 10 余项，以第一作者或主要完成人申请专利 10 余项，在 IEEE TVT、IEEE TCYB、IEEE TITS、PR 等期刊及国际会议上发表学术论文 10 余篇。

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 2024

Invited Session Summary

Title of Session

High Speed Aircraft Cluster Collaboration

Organizers

1. Prof. Chengchao Bai

Harbin Institute of Technology, China

2. Prof. Haiyin Piao

SADRI Institute, China

3. Prof. Weijia Wang

Xi'an Flight Automatic Control Research Institute, AVIC, China

4. Dr. Hongxing Zheng

Harbin Institute of Technology, China

5. Dr. Peng Yan

Harbin Institute of Technology, China

Biosketches of Organizers



Chengchao Bai, professor of the School of Aeronautics and Astronautics of Harbin Institute of Technology, has been selected into the Young Elite Scientists Sponsorship Program by CAST and the Young Talents Selection Program of HIT. 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.



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.



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.



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.



Peng Yan, an assistant researcher at the School of Astronautics, Harbin Institute of Technology. He graduated from Harbin Institute of Technology with a Ph.D. in 2023. His research directions are multi-agent deep reinforcement learning, safe learning, swarm collaborative control, unmanned system behavior cognition and decision-making, etc. As a backbone, he participated in the research of more than 10 projects including the National Key R&D Program, the Equipment Pre-Research Projects, and the Key Projects of the Military Science and

Technology Commission. He has published more than 10 academic papers in journals such as IEEE TVT, IEEE TCYB, IEEE TITS, PR and international conferences.

Details of Session

The evolution of robotics has enabled today's robots to operate in a variety of unstructured and dynamically changing environments in addition to traditional structured environments. Robots have thus become an important element in our everyday life. One key approach to develop such intelligent and autonomous robots is to draw inspiration from biological systems. Biological structure, mechanisms and underlying principles have the potential to feed new ideas to support the improvement of conventional robotic design and control. Such biological principles usually originate from animal or even plant models for robots that can sense, think, walk, swim, crawl, or fly. Thus it is believed that these bio-inspired methods are becoming increasingly important in the face of the complex applications. Biologically inspired intelligent robots and systems are leading to the study of innovative structures and computing with sensory-motor coordination and learning to achieve intelligence, flexibility, stability and adaptation for the emergent robotic application, such as manipulation, learning, and control.

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 "Biologically Inspired Intelligent Robots and Systems".

- Biomimetic robots
- Bio-inspired manipulation
- Humanoid robots
- Bio-inspired learning and control
- Bio-inspired robot design and application
- Bio-inspired robotic locomotion