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

无人系统的智能感知与协同决策

组织者

1. 邵士亮，副研究员，中国科学院沈阳自动化研究所
2. 江　涛，副教授，重庆大学
3. 张振兴，讲师，空军工程大学
4. 白小山，研究员，深圳大学

个人简介

邵士亮，博士、副研究员，中国科学院沈阳自动化研究所，机器人学国家重点实验室成员，中国指挥与控制学会青年工作委员会委员、中国自动化学会混合智能专委会委员。主要研究方向为地面特种机器人关键技术研究，涉及多机器人协同、环境感知、自主决策、人机协同控制等方面的应用基础研究工作。共发表学术论文 30 余篇，申请发明专利 20 余项，主持国家重点研发计划课题、子课题、国家自然科学基金、辽宁省自然科学基金、辽宁省应用基础研究计划项目、国家重点实验室自主课题等 10 余项。

江涛，重庆大学自动化学院副教授，入选中国科协青年人才托举工程、重庆市博士后创新人才计划，主持/参与国防科技创新特区项目、国家自然科学基金、科技部重点研发计划、重庆市自然基金项目等 10 余项国家级/省部级重点项目。面向无人系统的控制与自主的关键问题，以第一/通讯作者身份在 IEEE 汇刊等国际权威期刊发表 SCI 论文 10 余篇。瞄准无人系统领域国内/外顶级赛事，于 2017 年和 2020 年获得阿布扎比“世界智能无人系统挑战赛”冠军、于 2017 年“无人争锋”挑战赛冠军、于 2020 年获得“智创杯”前沿挑战赛季军等行业重要挑战赛。

张振兴，博士，讲师。获荷兰格罗宁根大学人工智能博士学位，并在荷兰格罗宁根大学开展为期 1 年的博士后研究。2024 年在空军工程大学空管领航学院担任讲师。研究兴趣包括图像生成、视觉问答、多模态机器学习、大语言模型、无人机集群控制等，致力于缩小不同模态之间的差距，构建一套成熟的多模态系统。在深度学习、智能控制等领域发表 20 余篇同行评审的期刊和会议论文，担任 10 余个国际知名期刊和会议的邀请审稿专家，参与荷兰国家重点项目、国防科技重大项目、国家自然科学基金、陕西省自然科学基金等 10 余项。

白小山，博士，研究员。荷兰格罗宁根大学博士，代尔夫特理工大学博士后，现任深圳大学机电与控制工程学院自动化系特聘研究员，深圳大学自主无人系统与智能操作（西工大）联合实验室副主任。主要研究方向为多机器人/无人系统协同决策与控制：包括多机器人/无人车辆在复杂环境下的任务分配、路径规划和运动规划，智能仓储，决策控制，运筹学，智能优化算法，启发式算法等。担任 IEEE Transactions on Automatic Control 、IEEE Transactions on Industrial Electronics、IEEE Transactions on Robotics 等多个著名 SCI 期刊的评审专家。作为项目负责人主持国家自然科学基金面上项目、青年项目各一项，并主持教育部中国高校产学研创新基金一项。在 IEEE Transactions on Cybernetics，IEEE Transactions on Automation Science and Engineering 和 Information Sciences 等著名国际期刊会议上发表论文 50 余篇，荣获 2024 年度国际电气与电子工程协会自动化科学与工程汇刊唯一最佳论文奖 (IEEE Transactions on Automation Science and Engineering Best Paper Award) 和 2024 年第五届低空经济与无人系统行业金翼奖-低空经济杰出贡献奖。

特邀专题简介

随着无人系统技术的迅速发展，各类无人平台在多个领域得到了广泛应用。环境感知作为无人系统与外界环境交互的重要环节，通过高精度传感器实时获取并解析环境信息，为无人系统的决策、控制和行动提供基础。如何

利用智能化技术提升无人系统在环境感知、目标识别、定位与建图、路径规划、自主导航与避障等方面的能力，已成为学术界和工业界的研究热点。尤其是在复杂和动态环境下，如何实现无人系统的协同决策与任务优化，保障其高效、安全地执行任务，是当前的重要挑战。

为此，本特邀专题征集与“无人系统智能感知与协同决策”相关的原创论文，欢迎提出创新性观点、技术、应用及理论突破。同时，也欢迎综述性文章，对该领域的最新进展进行系统回顾、总结，并展望未来发展趋势。

- 无人系统的环境感知
- 无人系统的同步定位与建图
- 无人系统的自主导航
- 无人系统路径规划与轨迹跟踪
- 多无人系统协同决策/任务分配
- 多无人系统协同编队

IEEE ICUS 2025
Invited Session Summary

Title of Session

Intelligent Perception and Collaborative Decision-Making of Unmanned Systems

Organizers

1. Prof. Shiliang Shao

Shenyang Institute of Automation (SIA), Chinese Academy of Sciences

2. Prof. Tao Jiang

Chonqqing University, China

3. Dr. Zhenxing Zhang

Air Force Engineering University, China

4. Prof. Xiaoshan Bai

Shenzhen University, China

Biosketches of Organizers

Shiliang Shao is an Associate Researcher at the State Key Laboratory of Robotics, Shenyang Institute of Automation, Chinese Academy of Sciences. He is also a member of the Youth Working Committee of the Chinese Association of Automation and the Youth Working Committee of the Chinese Society of Command and Control. His primary research focus is on the key technologies of ground special robots, involving applied fundamental research in robot environment perception, robot autonomous decision-making, and human-robot cooperative control. He has published over 30 academic papers and has filed more than 20 invention patents. Dr. Shao has been involved in over 10 projects, including the National Key Research and Development Program, the National Natural Science Foundation of China, the Innovative Special Zone Rapid Response Project, the Natural Science Foundation of Liaoning Province, the Applied Basic Research Program of Liaoning Province, and autonomous projects of the State Key Laboratory.

Tao Jiang is an Associate Professor at the School of Automation, Chongqing University. He was selected for the China Association for Science and Technology's Youth Talent Support Program and the Chongqing Postdoctoral Innovation Talents Program. He has led or participated in over 10 national/provincial-level key projects, including the Defense Science and Technology Innovation Special Zone Project, the National Natural Science Foundation, the Key Research and Development Program of the Ministry of Science and Technology, and the Chongqing Natural Science Foundation. Focusing on the control and autonomy of unmanned systems, he has published over 10 SCI papers in internationally recognized journals such as IEEE Transactions. In the field of unmanned systems, he has achieved significant recognition, winning the championship in the Abu Dhabi "World Intelligent Unmanned Systems Challenge" in 2017 and 2020, the championship in the 2017 "Unmanned Combat" Challenge, and the third place in the "Intelligence Cup" Frontier Challenge in 2020, among other important industry competitions.

Zhenxing Zhang is a lecturer. He obtained his Ph.D. in Artificial Intelligence from the University of Groningen in the Netherlands and conducted postdoctoral research there for one year. In 2024, he served as a lecturer in the School of Air Traffic Control and Navigation, Air Force Engineering University, Xi'an, China. His research interests include image generation, visual question answering, multimodal machine learning, large language models, and swarm control of drones, dedicated to narrowing the gap between different modalities and constructing a mature multimodal system. He has published over 20 peer-reviewed journal and conference papers in the fields of deep learning and intelligent control. He served as an invited expert reviewer for more than 10 internationally renowned journals and conferences, and participated in over 10 projects including the Key National Project in the Netherlands, the Major Defense Science and Technology Project, the National Natural Science Foundation of China, and the Natural Science Foundation of Shaanxi Province.

Xiaoshan Bai is a Professor at Shenzhen University. He holds a Ph.D. from the University of Groningen in the Netherlands and completed postdoctoral research at Delft University of Technology. Currently, he is a distinguished researcher at the Department of Automation, School of Mechatronics and Control Engineering, Shenzhen University, and the Deputy Director of the Joint Laboratory for Autonomous Unmanned Systems and Intelligent Operations (Xi'an University of Technology) at Shenzhen University.His primary research interests focus on multi-robot/unmanned system collaborative decision-making and control, including task allocation, path planning, and motion planning for multi-robot/unmanned vehicles in complex environments, intelligent warehousing, decision control, operations research, intelligent optimization algorithms, and heuristic algorithms. He serves as a reviewer for several prestigious SCI journals, including IEEE Transactions on Automatic Control, IEEE Transactions on Industrial Electronics, and IEEE Transactions on Robotics.As the principal investigator, he has led a National Natural Science Foundation of China General Project and a Youth Project, as well as a project funded by the Ministry of Education's Industry-University-Research Innovation Fund. He has published more than 50 papers in renowned international journals and conferences, such as IEEE Transactions on Cybernetics, IEEE Transactions on Automation Science and Engineering, and Information Sciences. He has won the Best Paper Award of the IEEE Transactions on Automation Science and Engineering in 2024, and the 5th Golden Wing Award for Low-Altitude Economy and Unmanned Systems Industry - Outstanding Contribution Award for Low-Altitude Economy in 2024.

Details of Session

With the rapid development of unmanned system technologies, various unmanned platforms have been widely applied across multiple fields. Environmental perception, as a key link in the interaction between unmanned systems and the external environment, provides the foundation for decision-making, control, and action by real-time acquisition and analysis of environmental information through high-precision sensors. How to leverage intelligent technologies to enhance the capabilities of unmanned systems in environmental perception, target recognition, localization and mapping, path planning, autonomous navigation, and obstacle avoidance has become a research hotspot in both academia and industry. In

particular, in complex and dynamic environments, how to achieve collaborative decision-making and task optimization for unmanned systems to ensure efficient and safe task execution is a major challenge.

Therefore, this special issue invites original papers related to "Intelligent Perception and Collaborative Decision-Making of Unmanned Systems," welcoming innovative ideas, technologies, applications, and theoretical breakthroughs. Additionally, review articles that provide a systematic overview of the latest advancements in this field, summarize key research findings, and forecast future development trends are also encouraged.

- Environmental Perception of Unmanned Systems
- Simultaneous Localization and Mapping (SLAM) of Unmanned Systems
- Autonomous Navigation of Unmanned Systems
- Path Planning and Trajectory Tracking of Unmanned Systems
- Collaborative Decision-Making/Task Assignment of Multiple Unmanned Systems
- Collaborative Formation of Multiple Unmanned Systems