

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

极区科考无人机智能作业技术与应用

组织者

1. 杨丽英，研究员，中国科学院沈阳自动化研究所
2. 魏阳杰，教授，东北大学
3. 易正琨，研究员，中国科学院深圳先进技术研究院
4. 王硕仁，正高级工程师，中国极地研究中心（中国极地研究所）
5. 邵振洲，研究员，首都师范大学
6. 梁潇，副教授，南开大学
7. 孙荣川，副教授，苏州大学

个人简介



杨丽英，中国科学院沈阳自动化研究所，博士，研究员。2011年毕业于中科院沈阳自动化研究所获工学博士学位。主要从事无人机控制、规划以及系统应用研究工作。主导研发了云鹞100号无人直升机和云雀多旋翼无人机，其中云雀系统是国内首款面向高海拔科考应用的无人机系统。上述无人机系统面向农业、电力、海洋观测、高原科考等多个行业开展了应用示范。作为项目负责人主持国家自然科学基金青年基金、973专题、国家重点研发计划课题等多项项目。在国内外知名期刊及会议发表EI/SCI检索论文20余篇，EI/SCI检索20余篇，作为主要编著者，参编专著1部，发表专著章节3篇，申请无人机相关专利10余项。



魏阳杰，东北大学，教授，博士生导师。主要从事机器人多模态感知、机器视觉、语音识别、故障诊断等相关领域的研究。2013年毕业于中国科学院大学，2010年-2012年受中欧联合培养博士奖学金资助，在德国的弗劳恩霍夫无损检测研究所（Fraunhofer IZFP-D）学习。作为项目负责人承担国家重点研发计划青年科学家项目、国家自然科学基金青年基金项目、面上

项目、国家自然科学基金重点项目课题和重点研发计划课题/子课题项目 10 余项。曾获得中国科学院院长优秀奖、中国科学院优秀博士论文奖、辽宁省自然科学学术成果奖一等奖。共发表高水平的学术论著 100 余篇，其中，英文的书刊章节 3 篇、SCI 检索论文 40 余篇。



易正琨，中国科学院深圳先进技术研究院，博士，研究员。2017 年获得新加坡南洋理工大学与德国达姆斯塔特工业大学联合博士学位。研究方向是机器人感知与学习方向。以第一作者/通讯作者发表学术论文三十余篇，包括 IEEE 汇刊 IEEE-TIE、IEEE-TSMC、IEEE-TASE、IEEE-TMECH 等机器人方向重要期刊。申请及授权国际国内专利十余项。主持项目包括国家自然科学基金优秀青年科学基金项目（海外）、国家重点研发计划课题，广东省自然科学基金重点等多项目。担任国际 SCI 期刊 IEEE Robotics and Automation Letters 编委。所指导学生获得 IEEE RCAR 2022 最佳学生论文奖。



王硕仁，现任中国极地研究中心极地重大工程与装备研究院院长、自然资源部极地工程技术创新中心副主任、正高级工程师。太原理工大学双聘教授，清华大学苏州汽车研究院特聘专家，中国海洋工程咨询协会极地分会秘书长。参加过 15 次南极科学考察、5 次北极科学考察和 1 次中山站越冬任务，先后担任“雪龙”号电气工程师、实验室主任、政委和“雪龙 2”号政委，2020 年担任中国第 37 次南极考察中山站站长，曾立 2 次国家集体 3 等功和中国极地考察 30 周年先进工作者。在国家重大科学装置极地科考破冰船“雪龙 2”号建造项目中担任总工艺师和科考系统主要负责人。在国内核心刊物以第一作者或通讯作者发表论文 10 余篇，授权专利 10 余项。



邵振洲，首都师范大学，博士，研究员。2013 年毕业于美国田纳西大学诺克斯维尔分校获工学博士学位，主要从事智能机器人控制与技能学习工作，入选北京市科技新星计划，先后获得北京市科学技术二等奖、机械工业科技进步二等奖等。主持国家自然科学基金、国家重点研发计划子课题等项目 10

余项，制定国际标准 1 项，国家标准 7 项，在国内外知名期刊及会议发表论文 40 余篇，授权国际 PCT 专利 1 项，国家发明专利 7 项，专利转化 1 项。



梁潇，南开大学人工智能学院，博士，副教授。2018 年毕业于南开大学人工智能学院获工学博士学位。主要从事飞行吊运、飞行机械臂等无人系统智能控制与感知，多机器人协作，机器人视觉控制等研究。入选天津市青年人才托举工程，获天津市知识产权创新创业发明与设计大赛一等奖等奖励。作为项目负责人主持国家自然科学基金面上及青年项目、国家重点研发计划子课题、天津市自然基金等多项项目。在国内外知名期刊发表论文 20 余篇，其中 IEEE 汇刊 10 余篇。获授权发明专利 14 项。



孙荣川，苏州大学，副教授，硕士生导师。主要从事移动机器人 SLAM、路径规划、仿生（类脑导航）、极限环境下无人机自主探索等相关领域研究。2011 年毕业于中国科学院沈阳自动化研究所，获得工学博士学位，2017 年-2018 年在新加坡国立大学生物医学工程系担任访问学者。以项目负责人身份承担国家自然科学基金面上项目、国家自然科学基金青年基金、机器人学国家重点实验室开放基金资助项目、江苏省高校自然科学基金项目等。担任 ROBIO2016、CCC2019 程序委员会委员，IROS2025 高级编辑，《自动化学报》、《机器人》、RA-L 等知名期刊审稿人。获得 IEEE ROBIO 2024 最佳海报论文奖，ICIRA 2019 最佳论文提名奖。在国内外高水平期刊和知名国际会议发表 SCI/EI 检索论文 20 余篇，授权中国发明专利 20 余项，美国发明专利 1 项，实现 2 项专利成果转化。

特邀专题简介

随着无人机应用领域和环境的不断拓展，飞行机器人已经在青藏高原和南极逐步开展科考应用，例如大气监测、冰川测绘、水体采样等。随着科考应用的不断深入，极区环境的高海拔、低温、气流干扰以及科考作业任务的多样性，给无人机的系统构型、导航与定位、环境感知、无人机智能控制与决策以及主动作业等技术与应用提出了新的挑战。面向极区科考典型环境和作业任务，极

区科考无人机需要更智能、更灵活、更稳定和更强的环境适应性与作业能力。

本特邀专题邀请以下与“极区科考无人机智能作业技术与应用”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。

- 无人机新构型设计
- 无人机高精度定位与导航
- 无人机多传感器环境感知与探测
- 无人机智能控制与决策
- 无人机主动作业技术
- 面向典型科考任务的无人机主动作业技术
- 无人机/多无人机极区科考应用与技术挑战

IEEE ICUS 2025
Invited Session Summary

Title of Session

Intelligent Operational Technologies and Applications for Polar Expedition UAV

Organizers

1. Prof. Liying Yang

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

2. Prof. Yangjie Wei

Northeastern University, China

3. Prof. Zhengkun Yi

Shenzhen Institute of Advanced Technology, Chinese Academy of Sciences

4. Prof. Shuoren Wang

Polar Research Institute of China

5. Prof. Zhenzhou Shao

Capital Normal University, China

6. Assoc. Prof. Xiao Liang

Nankai University, China

7. Assoc. Prof. Rongchuan Sun

Soochow University, China

Biosketches of Organizers



Liying Yang is currently a Research fellow at the State Key Laboratory of Robotics (SKLR) in Shenyang Institute of Automation (SIA), Chinese Academy of Sciences. She received her Ph.D. degree in pattern recognition and intelligent system from SIA in 2011. She has been engaged in the research of autonomous control, planning and the related applications of Unmanned Aerial Vehicles (UAVs). She led the research and development of Yunxiao-100 unmanned helicopter system and Yunque multiple rotor UAV, which is applied firstly in the survey of Qinghai-Tiber Plateau. Both of the two UAVs have carried out the application demonstration in the fields of precision agriculture, power industry, oceanic observation and Qinghai-Tiber Plateau survey. She has hosted numbers of projects such as National Natural Science Foundation of China, sub-task of National Defense 973 Project, Sub-task of National Key R & D Programs, etc. She

has published more than 30 SCI/EI indexed academic papers and applied more than 10 patents in the related fields.



Yangjie Wei is currently a Professor and Doctoral Supervisor at Northeastern University, China. Her primary research focuses on robotic multimodal perception, machine vision, speech recognition, and fault diagnosis. She received her Ph.D. degree from the University of Chinese Academy of Sciences in 2013. From 2010 to 2012, she was awarded the Sino-European Joint Ph.D. Training Scholarship and conducted research at the Fraunhofer Institute for Nondestructive Testing (IZFP-D) in Germany. She has led over 10 major research projects, including the National Key R&D Program Young Scientists Project, National Natural Science Foundation (NSFC) Youth Program, NSFC General Program, NSFC Key Project sub-topic, and Key R&D Program sub-projects. Her notable awards include the CAS President's Outstanding Award, CAS Outstanding Doctoral Dissertation Award, and First Prize of the Liaoning Provincial Natural Science Academic Achievement Award. She has published more than 100 high-quality academic papers, including 3 English book chapters and over 40 SCI-indexed journal articles.



Zhengkun Yi is currently a full professor at the Shenzhen Institutes of Advanced Technology (SIAT), Chinese Academy of Sciences, holding a Ph.D. degree jointly obtained from Nanyang Technological University (Singapore) and TU Darmstadt (Germany) in 2017. His research focuses on robotic perception and learning. He has published over 30 academic papers as first author or corresponding author in top-tier robotics journals including IEEE-TIE, IEEE-TSMC, IEEE-TASE, and IEEE-TMECH. He has applied for and authorized over ten international and domestic patents. He has led multiple research projects, including the National Natural Science Foundation of China's Excellent Young Scientists Fund (Overseas), sub-task of National Key Research and Development Program projects, and Key Program of Guangdong Provincial Natural Science Foundation. He currently serves as an Editorial Board Member of the IEEE Robotics and Automation Letters (RA-L), an SCI-indexed international journal. His supervised student won the Best Student Paper Award at IEEE RCAR 2022.



Shuoren Wang is currently the director of the Institute of Polar Major Engineering and Equipment of , PRIC, deputy director of the Polar Engineering Technology Innovation Center of the Ministry of Natural Resources, and Professor-level Senior Engineer. Professor of Taiyuan University of Technology, the Operation Expert of Polar Technology of Suzhou Automotive Research Institute, Tsinghua University, Secretary-General, Polar Branch of China Ocean Engineering Consulting Association (COECA-Polar). With 15 Antarctic Expeditions, 5 Arctic Expeditions, and 1 overwintering mission at Zhongshan Station, Wangshuoren has served as Electrical Engineer, Laboratory Director, Political Commissar on Xuelong, and Political Commissar on Xuelong 2. In 2020, they assumed the role of Station Chief for China's 37th Antarctic Expedition at Zhongshan Station. Recognized with two Third-Class National Collective Merit Citations, honored as an Advanced Worker for China's 30th Anniversary of Polar Expeditions, and awarded for technical leadership, they played a pivotal role as Chief Technologist and Principal-in-Charge of Scientific Research Systems in the construction of Xuelong 2, China's first domestically built polar icebreaker and a national key scientific infrastructure project. As a prolific researcher, they have published 10+ peer-reviewed papers as first or corresponding author in domestic core journals and hold 10+ authorized patents in polar engineering technologies



Zhenzhou Shao, Ph.D., Research Fellow at Capital Normal University. He obtained his Ph.D. degree from the University of Tennessee, Knoxville, USA in 2013. His research primarily focuses on intelligent robot control and skill learning. He has been selected for the Beijing Nova Program and has received awards including the Beijing Science and Technology Award (Second Prize) and the Machinery Industry Science and Technology Progress Award (Second Prize). He has hosted over 10 research projects, such as National Natural Science Foundation of China, sub-projects under the National Key R&D Program, etc. He has contributed to the development of 1 international standard and 7 national standards. More than 40 papers are published in renowned domestic and international journals and conferences. 1 international PCT patent and 7 national invention patents are authorized, in which 1 patent has successfully been commercialized.



Liang Xiao is currently an Associate Professor at College of Artificial Intelligence, Nankai University. He received his Ph.D. in Control Science and Engineering from the College of Artificial Intelligence at Nankai University in 2018. His research primarily focuses on intelligent control and perception for unmanned systems, including aerial lifting systems and aerial manipulator systems, as well as multi-robot collaboration and vision-based robotic control. Dr. Liang was selected for the Tianjin Young Talent Support Program and won the First Prize in the Tianjin Intellectual Property Innovation & Entrepreneurship Invention and Design Competition. He has led multiple research projects, including: National Natural Science Foundation of China (NSFC) General & Youth Programs, Sub-task of National Key R & D Programs, Tianjin Natural Science Foundation. He has published over 20 papers in renowned international journals, including more than 10 IEEE Transactions papers, and holds 14 authorized invention patents.



Rongchuan Sun is an Associate Professor and Master's Supervisor at Soochow University. He mainly engaged in research in the fields of mobile robot SLAM, path planning, biomimetic (brain-like) navigation, and autonomous exploration of unmanned aerial vehicles in extreme environments. He graduated from Shenyang Institute of Automation, Chinese Academy of Sciences in 2011 and obtained a doctor's degree in engineering. From 2017 to 2018, he served as a visiting scholar in the Department of Biomedical Engineering, National University of Singapore. As the project leader, he undertook the general projects of the National Natural Science Foundation of China, the Youth Fund of the National Natural Science Foundation of China, the Open Fund of the State Key Laboratory of Robotics, and the Natural Science Foundation of Jiangsu Universities. He served as a member of the ROBIO2016 and CCC2019 program committees, senior editor at IROS2025, and reviewer for well-known journals such as Automation Journal, Robotics, and RA-L. He received IEEE ROBIO 2024 Best Poster Paper Award and ICIRA 2019 Best Paper Nomination Award. He has published over 20 SCI/EI indexed papers in high-level journals and well-known international conferences both domestically and internationally, authorized over 20 Chinese invention patents and 1 US invention patent, and achieved the transformation of 2 patent achievements.

Details of Session

With the continuous expansion of drone applications in various fields and environments, UAVs have gradually been deployed for scientific research in the Qinghai-Tibet Plateau and Antarctica, performing tasks such as atmospheric monitoring, glacier mapping, and water sampling. As these research applications deepen, the extreme conditions of polar regions—including high altitude, low temperatures, airflow disturbances, and the diversity of scientific tasks—pose new challenges for UAV system configurations, navigation and positioning, environmental perception, intelligent control and decision-making, as well as active operations. To meet the demands of typical polar research environments and operational tasks, polar expedition UAVs require greater intelligence, flexibility, stability, and enhanced environmental adaptability and operational capabilities.

This special issue invites original papers related to the theme of '*Intelligent Operational Technologies and Applications for Polar Expedition UAVs*,' including innovative ideas, concepts, new discoveries, improvements, and novel applications.

Novel Configuration Design for UAVs

- High-Precision Positioning and Navigation for UAVs
- Multi-Sensor Environmental Perception and Detection for UAVs
- Intelligent Control and Decision-Making for UAVs
- Active Operation Technology of UAVs
- Active Operation Technology of UAVs for Typical Scientific Expedition Tasks
- Polar Scientific Expedition Applications and Technical Challenges of UAVs/Multi-UAV Systems