2026 第九届 IEEE 国际无人系统大会
特邀专题简介表

特邀专题名称

无人系统的定位建图与路径规划

组织者

1.邵士亮，研究员，中国科学院沈阳自动化研究所

2.李　亮，研究员，浙江大学

3.张雪波，教授，南开大学

4.张振兴，讲师，空军工程大学

个人简介

邵士亮，中国科学院沈阳自动化研究所研究员，机器人与智能系统全国重点实验室成员，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。主要从事特种机器人环境感知与自主导航技术研究，围绕多机器人协同定位建图、协同路径规划与协同探索决策等方向开展应用基础研究。以第一/通讯作者在 IJRR、IEEE Transactions 等期刊和会议发表学术论文 30 余篇，申请发明专利 40 余项。主持科技委项目、国家自然科学基金项目、国家重点研发计划“智能机器人专项”课题、中国科学院重点部署青年人才项目、辽宁省自然科学基金、辽宁省应用基础研究计划项目等 10 余项。

李亮，浙江大学百人计划研究员、博士生导师，国家级青年人才。2019-2022 年在荷兰埃因霍温理工大学和英国伦敦大学学院从事博士后研究。主持国家重点研发计划课题、国家自然科学基金及 CCF-腾讯犀牛鸟基金等项目多项，研究方向为移动机器人、无人驾驶及具身智能，以第一作者在 IEEE T-RO、TPAMI、TIP 等权威期刊和会议发表论文 40 余篇，担任 IEEE Transactions on Intelligent Transportation Systems 副编辑及 ICRA、IROS 等机器人领域顶级会议 AE。

张雪波，南开大学机器人与信息自动化研究所教授、系主任，工学博士，入选国家高层次青年人才计划。其主要研究方向为移动机器人学、视觉伺服、运动规划、无人车自主导航等，重点围绕地面与空中机器人多模态感知自主导航、人机交互与智能操作、强化学习与智能博弈开展应用基础研究。他以第一/通讯作者在 IEEE Transactions 系列顶级期刊及 ICRA、IROS 等机器人领域顶级会议发表学术论文多篇，申请相关专利若干，主持国家自然科学基金重大项目课题、国家重点研发计划课题等各类项目 10 余项，担任 IEEE/ASME Transactions on Mechatronics 等多个 SCI 期刊编委，以及 ICRA、IROS 等顶级会议编委，兼任多个国际学术会议程序或组织主席。

张振兴，空军工程大学讲师，获荷兰格罗宁根大学人工智能博专业士学位，并开展为期 1 年的博士后研究。入选国家级高层次青年人才（海外）和西安市科协青年人才托举计划，主持科技委基金、某预研项目、科技重大专项某重点项目子课题、西安市科协青托等项目 10 余项。研究兴趣包括无人系统集群和多模态机器学习等，出版学术专著 3 部，以第一/通讯作者发表高水平论文 25 篇，担任 10 余个国际知名期刊和会议的邀请审稿专家，授权/受理专利 4 项。

特邀专题简介

随着无人系统技术的持续发展，移动机器人、无人车、无人机、无人艇、无人潜航器等各类无人平台在应急救援和公共服务等领域展现出广阔的应用前景。定位建图与路径规划作为无人系统实现自主运行的核心关键技术，直接关系到系统对环境的认知能力、任务执行效率以及运行安全性。同步定位与建图技术通过融合激光、视觉、惯导等多源传感信息，实现无人系统对自身位姿和环境地图的实时估计；路径规划技术则面向复杂任务需求，在环境约束、运动学约束和动态障碍条件下生成安全、高效、可执行的运动路径。如何提升无人系统在复杂、未知、动态环境中的建图精度、定位鲁棒性、路径规划实时性与自主决策能力，已成为当前学术界和工业界关注的重要研究方向。尤其是在多平台协同、自主探索与任务优化不断发展的背景下，如何实现无人系统高效、可靠、智能的定位建图与路径规划，仍面临诸多挑战。

为此，本特邀专题征集与“无人系统的定位建图与路径规划”相关的原创论文，欢迎围绕该方向提出创新性理论、方法、技术与应用成果。同时，也欢迎综述性文章，对该领域的前沿进展进行系统梳理、总结与展望。

- 无人系统同步定位与建图
- 无人系统多传感器融合定位
- 无人系统路径规划与轨迹优化
- 无人系统自主导航与避障控制
- 复杂环境下的地图构建与场景理解
- 多无人系统协同定位建图与协同规划

IEEE ICUS 2026
Invited Session Summary

Title of Session

Localization, Mapping, and Path Planning of Unmanned Systems

Name of Organizers

1. Prof. Shiliang Shao
Shenyang Institute of Automation (SIA), Chinese Academy of Sciences, China
2. Prof. Liang Li
Zhejiang University, China
3. Prof. Xuebo Zhang
Nankai University, China
4. Dr. Zhenxing Zhang
Air Force Engineering University, China

Biosketches of Organizers

Shiliang Shao is a Researcher at the Shenyang Institute of Automation, Chinese Academy of Sciences, a member of the State Key Laboratory of Robotics and Intelligent Systems, a committee member of the Youth Working Committee of the Chinese Society of Command and Control, and a member of the Hybrid Intelligence Technical Committee of the Chinese Association of Automation. His research focuses on environmental perception and autonomous navigation technologies for specialized robots, with application-oriented fundamental studies in multi-robot collaborative localization and mapping, collaborative path planning, and collaborative exploration decision-making. He has published over 30 academic papers as first or corresponding author in journals and conferences such as IJRR and IEEE Transactions, and holds more than 40 invention patents. He has led more than ten projects, including those funded by the Science and Technology Committee, the National Natural Science Foundation of China, the "Intelligent Robot" special program of the National Key R&D Program, the Chinese Academy of Sciences Key Deployment Youth Talent Project, the Liaoning Provincial Natural Science Foundation, and the Liaoning Applied Basic Research Program.

Liang Li is a Hundred Talents Program Researcher and PhD supervisor at Zhejiang University, selected for the National High-Level Young Talent Program and recognized as a Qi-Zhen Outstanding Young Scholar of Zhejiang University. From 2019 to 2022, he conducted postdoctoral research at Eindhoven University of Technology, the Netherlands, and University College London, UK. He has led multiple projects funded by the National Key R&D Program, the National Natural Science Foundation of China, and the CCF-Tencent Rhino-Bird Fund, and has participated as a core member in autonomous vehicle and robotics projects such as Drive4All, FAST, and GIFT-Surg. His research focuses on mobile robots, autonomous driving, SLAM, and multi-sensor fusion, with long-term interests in feature extraction, matching, and pose graph optimization for mapping and localization. He has published multiple first-author papers in authoritative journals including IEEE T-RO, RAL, and TIP, serves as Associate Editor for IEEE Transactions on Intelligent Transportation Systems, and as an Area Editor for top robotics conferences such as ICRA and IROS.

Xuebo Zhang is a Professor and Department Head at the Institute of Robotics and Intelligent Automation, Nankai University, holding a PhD in Engineering, and is selected for the National High-Level Young Talent Program. His primary research areas include mobile robotics, visual servoing, motion planning, and autonomous navigation for unmanned vehicles, with a focus on application-oriented fundamental studies in multimodal perception and autonomous navigation for ground and aerial robots, human–robot interaction and intelligent manipulation, as well as reinforcement learning and intelligent game theory. He has published numerous papers as first or corresponding author in top-tier IEEE Transactions journals and at leading robotics conferences such as ICRA and IROS, and holds several related patents. He has led over ten projects, including major programs funded by the National Natural Science Foundation of China and the National Key R&D Program. He serves on the editorial boards of multiple SCI journals, including IEEE/ASME Transactions on Mechatronics, and as a program or organizing committee member for top conferences such as ICRA and IROS, also acting as chair for several international academic conferences.

Zhenxing Zhang is a Lecturer at the Air Force Engineering University, holding a PhD in Artificial Intelligence from the University of Groningen, the Netherlands, and has completed a one-year postdoctoral research. He was selected for the National High-Level Young Talent Program (Overseas) and the Xi'an Youth Talent Support Program of the Association for Science and Technology. He has led more than ten projects, including those funded by the Science and Technology Committee, pre-research programs, key subprojects of major science and technology initiatives, and the Xi'an Youth Talent Support Program. His research interests include unmanned system swarms and multimodal machine learning. He has published three academic monographs, authored 25 high-level papers as first or corresponding author, served as a reviewer for more than ten internationally recognized journals and conferences, and holds four granted or pending patents.

Details of Session

With the continuous development of unmanned system technologies, various unmanned platforms—including mobile robots, autonomous vehicles, unmanned aerial vehicles, unmanned surface vessels, and unmanned underwater vehicles—have demonstrated broad application prospects in areas such as emergency response and public services. Localization, mapping, and path planning are core technologies enabling autonomous operation of unmanned systems, directly affecting their environmental perception, task execution efficiency, and operational safety. Simultaneous localization and mapping techniques fuse multi-source sensor information from LiDAR, vision, inertial measurement, and other modalities to provide real-time estimates of the system's pose and environmental map. Path planning techniques, on the other hand, generate safe, efficient, and executable motion paths under environmental constraints, kinematic limitations, and dynamic obstacles, tailored to complex task requirements. Enhancing mapping accuracy, localization robustness, path planning real-time performance, and autonomous decision-making capabilities of unmanned systems in complex, unknown, and dynamic environments has become a key research focus in both academia and industry. In particular, with the ongoing development of multi-platform collaboration, autonomous exploration, and task optimization, achieving efficient, reliable, and intelligent localization, mapping, and path planning for unmanned systems remains a significant challenge.

Accordingly, this invited session solicits original papers related to "Localization, Mapping, and Path Planning of Unmanned Systems," and encourages contributions proposing innovative theories, methods, technologies, and applications in this area. Review articles that systematically summarize and provide outlooks on

the state-of-the-art in this field are also welcome.

- Simultaneous localization and mapping for unmanned systems
- Multi-sensor fusion-based localization for unmanned systems
- Path planning and trajectory optimization for unmanned systems
- Autonomous navigation and obstacle avoidance control for unmanned systems
- Map construction and scene understanding in complex environments
- Collaborative localization, mapping, and planning for multi-unmanned systems