

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

挑战性空间场景下无人系统协同导航与控制

组织者

1. 缪志强，副教授，湖南大学
2. 王祥科，教授，国防科技大学
3. 张雪波，教授，南开大学
4. 王元哲，助理教授，新加坡南洋理工大学

个人简介



缪志强，湖南大学电气与信息工程学院副教授，博士生导师，机器人视觉感知与控制技术国家工程研究中心研究员，中国指挥与控制学会(湖南)青年科学家俱乐部主席，湖南省自动化学会副秘书长，中国仿真学会智能无人系统建模与仿真专业委员会副秘书长，入选中国科协青年人才托举工程、湖湘青年英才。主要从事多机器人系统、跨域无人系统、机器人自主导航与控制等研究，获 2020 年湖南省科学技术创新团队奖(3/15)、2023 年中国自动化学会科技进步一等奖、湖南省优秀博士学位论文奖、中国自动化学会优秀博士学位论文提名奖、期刊 IEEE Robotics and Automation Letters 2020 最佳论文荣誉奖、最佳会议论文奖/提名奖 5 次、IEEE ICUS 2023 优秀组织者奖和 IEEE Journal of Oceanic Engineering 2022 年度杰出审稿人等。近年来，承担国家级项目 6 项，以第一/通讯作者发表高水平论文 50 余篇，申请/授权国家发明专利 20 余项。担任机器人领域旗舰会议 ICRA、IROS Associate Editor, IEEE RCAR 2024 Program Co-Chair、IEEE RCAR 2023 Organizing Co-Chair。

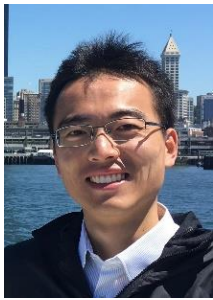


王祥科，国防科技大学智能科学学院教授、博导，“无人系统技术”湖南省重点实验室主任，IEEE 高级会员；国家级青年人才、湖南省杰青，获中国指挥学会科技进步一等奖(1/15)。主要从事无人机集群相关教学科研工作。以提升复杂环境集群系统自主任务能力为目标，承担国家级重点项目 10 余项，构

建具有任务能力的规模化固定翼无人机蜂群侦察搜索系统，发表高水平论文 150 余篇，出版专著/译著 6 部，获湖南省优秀导师团队奖（2）。



张雪波，南开大学教授，博导，人工智能学院副院长，天津市智能机器人技术重点实验室副主任，入选国家级青年人才、天津市杰青。研究兴趣为机器人与人工智能，包括定位建图与场景理解、运动规划与伺服控制、强化学习与智能博弈。承担国家重点研发计划课题、国家自然科学基金重大项目课题、天津市杰青等 20 多项，推动特殊服役环境下机器人技术的发展，如高海拔科考机器人、灾难救援机器人、配网带电作业机器人等。获天津市科技进步一等奖，天津市自然科学一等奖与二等奖、吴文俊人工智能自然科学一等奖。担任 IEEE/ASME Trans. on Mechatronics 等多个国际学术期刊编委。



王元哲，新加坡南洋理工大学电机与电子工程学院研究助理教授。主要从事移动机器人、多机协同、人机交互、机器人安全等方向的研究工作。承担新加坡国家机器人计划，海事业转型计划等新加坡国家级重点项目课题 5 项。担任 IEEE Transactions on Intelligent Vehicles (2023 - 今) 和机器人领域旗舰会议 IROS (2020 - 今) 编委。

特邀专题简介

空间是人类赖以生存和发展的载体，出于扩大人类活动范围和发展国家利益的需要，人类探索陆、海、空、天等领域的脚步从未停止，新域新质力量是被寄予厚望的“游戏规则改变者”。无人车、无人机、无人艇、水下航行器等无人系统通过协同合作可涌现出单个主体难以实现的智能水平，将在如室内、城市、丛林、极地、深海、地下等挑战性空间场景中发挥关键作用。然而，无人系统在这些挑战性场景下面临环境复杂、导航拒止、通信退化等挑战，亟需突破复杂环境态势感知、遮蔽场景信息交互、无卫星导航定位、不同地形敏捷控制、恶劣场景群体协作等关键技术，使得无人系统在退化环境中具备分布式信息共享和自主协作能力。开展面向挑战性空间场景的无人系统协同关键技术研究具有重要意义。

本特邀专题邀请以下与“挑战性空间场景下无人系统协同导航与控制”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。

- 广域鲁棒感知
- 多模态融合定位
- 自主探索
- 多域无缝导航
- 弹性协同导航
- 分层任务规划
- 实时运动规划
- 高机动敏捷控制
- 弹性分布式控制

IEEE ICUS 2024
Invited Session Summary

Title of Session

Collaborative Navigation and Control for Unmanned Systems in Challenging Scenes

Organizers

1. Prof. Zhiqiang Miao

Hunan University, China

2. Prof. Xiangke Wang

National University of Defense Technology, China

3. Prof. Xuebo Zhang

Nankai University, China

4. Prof. Yuanzhe Wang

Nanyang Technological University, Singapore

Biosketches of Organizers



Zhiqiang Miao received the B.S. and Ph.D. degrees in electrical and information engineering from Hunan University, Changsha, China, in 2010 and 2016, respectively. From 2014 to 2015, he was a Visiting Scholar with The University of New Mexico, Albuquerque, NM, USA. From 2016 to 2018, he was a Post-Doctoral Fellow with the Department of Mechanical and Automation Engineering, The Chinese University of Hong Kong, Hong Kong, China. He is currently an Associate Professor with the College of Electrical and Information Engineering, Hunan University. His research interests include multi-robot systems, unmanned systems, visual navigation, and nonlinear control. He is (was) an Associate Editor for ICRA and IROS, the Program Co-Chair of the IEEE RCAR 2024, and the Organizing Co-Chair of the IEEE RCAR 2023.

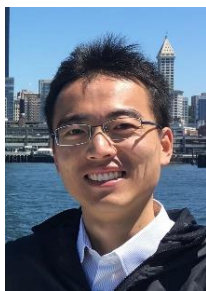


Xiangke Wang received the B.S., M.S., and Ph.D. degrees in Control Science and Engineering from National University of Defense Technology, China, in 2004, 2006 and 2012, respectively. From 2012, he served as a Lecture, Associate professor and Professor with the College of Intelligence Science and Technology, National University of Defense Technology, China. He was a visiting student at the Research School of Engineering, Australian National

University from 2009 to 2011. His current research interests focus on the control of multi-agent systems and its applications on unmanned aerial vehicles. He has authored or coauthored 6 books and more than 100 publications in peer reviewed journals and international conferences, including IEEE Transactions, CDC, IFAC, ICRA. etc.



Xuebo Zhang received the B.Eng. degree in Automation from Tianjin University in 2006, China, and the Ph. D. degree in Control Theory and Control Engineering from Nankai University in 2011, China. From July 2011, he joined the Institute of Robotics and Automatic Information Systems (IRAIS), Nankai University, China. Currently, he is a full professor of Nankai University, serving as vice dean of College of Artificial Intelligence, and deputy director of Tianjin Key Laboratory of Intelligent Robotics. His research interests focus on robotics and AI, including SLAM and scene understanding, motion planning and control, reinforcement learning and intelligent game. Prof. Zhang is the PI of more than 20 projects across both academic and industrial fields. He is a Technical Editor of the IEEE/ASME Transactions on Mechatronics and the Associate Editor for ASME Journal of Dynamic Systems, Measurement and Control.



Yuanzhe Wang is currently a Research Assistant Professor in the School of Electrical and Electronic Engineering at Nanyang Technological University, Singapore. His current research interests include mobile robotics, multi-robot coordination, human–robot interaction, and robot safety & security. He has led 5 subprojects in the National Robotics Programme and the Maritime Transformation Programme of Singapore. Dr. Wang is an Associate Editor for IEEE Transactions on Intelligent Vehicles (2023 - now) and IROS (2020 - now).

Details of Session

Spatial domain is the basic requirements for human survival and development. Due to the needs of expanding the scope of human activities and the development of national interests, human explorations have never stopped in the fields of land, sea, air, and space. Unmanned systems can emerge in the intelligent level that a single agent is difficult to achieve through cooperation. Unmanned systems will play a key

role in challenging spatial scene such as indoor, city, jungle, polar, deep sea, subterranean domains. However, in these challenging scene, unmanned systems are facing challenges such as complex environments, deny of navigation signals, and degradation of communication. It is urgent to break through the complex environmental situation perception, blocking scene information interaction, satellite-denied navigation positioning, agile control in various terrains, and group collaboration in harsh scenes, so that unmanned systems have distributed information sharing and autonomous collaboration capabilities in the degraded environments. It is of great significance to develop key technologies for unmanned systems for challenging space scenes.

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 “Collaborative Navigation and Control for Unmanned Systems in Challenge Scenes”.

- Wide-area robust perception
- Multi-modal fusion localization
- Autonomous exploration
- Multi-domain seamless navigation
- Resilient collaborative navigation
- Hierarchical task planning
- Real-time motion planning
- Aggressive and agile control
- Resilient distributed control