

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

无人系统自主导航与智能感知

组织者

1. 朱祥维，教授，中山大学
2. 庄学彬，副教授，中山大学
3. 王磊，副教授，武汉大学
4. 侯燕青，副教授，中山大学

个人简介



朱祥维，教授、博士生导师、国家重点研发计划首席科学家，中山大学电子与通信工程学院院长助理。二十年专注于北斗系统和综合定位导航授时（PNT）体系研究工作，致力于解决北斗系统工程型号关键技术瓶颈背后的科学问题，主持和作为骨干参与国家重点型号工程项目 3 项、国家科技重大专项项目 10 项、国家重点研发计划 2 项、自然科学基金项目 3 项，发表论文 100 余篇，申请发明专利 60 余项。在北斗导航系统、综合 PNT 技术、智能可信导航等方面开展了交叉创新研究。曾获得军队科技进步一等奖，测绘科学技术奖一等奖，“军队优秀专业技术人才”、国防科技大学“青年拔尖人才”，荣立个人三等功。目前担任中科院百人计划评审专家、科技部国家重点研发计划评审专家、教育部学位中心评审专家、国家自然科学基金评审专家、战略支援部队专家库专家、军委科技委创新特区专家，以及天地一体化信息技术国家重点实验室特聘教授、南方海洋科学与技术广东省实验室特聘教授，担任航空学报、全球定位系统、导航定位学报编委，IEEE TIM, TAES, 电子学报, 通信学报等 20 余个期刊审稿专家。



庄学彬，中山大学系统科学与工程学院副院长、副教授、博士生导师。2011年7月博士毕业于清华大学。长期从事卫星导航技术和无人系统自主导航技术研究。作为项目负责人、技术负责人和主要参加人，先后承担二十余项国家级、省部级等二十余项科研项目，其中主持10余项。以第一作者或主要完成人，申请专利十余项，其中7项已授权。先后发表SCI、EI等近20篇学术论文。担任了2022年第五届IEEE国际无人系统大会组织委员会副主席、第十届中国卫星导航学术年会分会主席（S11抗干扰与反欺骗技术分会）、中国卫星导航学术年会（CSNC）审稿专家（第七至十三届）、中国指挥与控制学会空天安全平行系统专业委员会委员等。



王磊，武汉大学副教授，珞珈一号，珞珈二号卫星导航增强分系统副总师，IEEE会员。2015年毕业于澳大利亚昆士兰科技大学，获博士学位，研究方向为低轨卫星导航增强，GNSS精密定位，低轨卫星精密定轨，室内定位等。目前已发表学术论文70余篇（其中SCI/EI论文50余篇），出版专著1部，申请专利15项，软件著作权4项，主持和参与国家自然科学基金，国家重点研发计划等科研项目十余项，获卫星导航定位科技进步奖1项，测绘科技进步特等奖1项，担任《无线电工程》青年编委，GSIS和Atmosphere期刊客座编辑，以及Journal of Geodesy, IEEE JIOT, IEEE TVT, IEEE TAES等三十余个期刊的审稿人。



侯燕青，中山大学副教授、博士生导师。中山大学系统科学与工程学院“百人计划”引进人才。2016年博士毕业于国防科技大学，研究方向为多源融合导航，卫星导航高精度定位技术等。主持国防科技创新特区项目1项，作为骨干参与国家863计划项目、装备预研项目等10余项，以第一作者和联合作者发表SCI学术论文10余篇，担任Survey Review、Mathematical Problems in Engineering等期刊审稿人。

特邀专题简介

随着无人系统在各领域的广泛应用，如自动驾驶汽车、无人机、智能机器人等，对其在复杂环境中的自主导航和智能感知技术提出了更高的要求。复杂环境中存在着各种挑战，如密集城市区域、室内环境、恶劣天气条件、GNSS拒止等。在这类复杂环境中，亟需无人系统能够自主导航，且能够感知环境，进而为无人系统决策提供位置和环境信息，推动无人系统在自动驾驶、智能制造、救援和勘测等领域的发展。该领域的研究内容包括惯性导航技术、多传感器数据融合技术、导航抗干扰技术、感知与环境建模、智能导航、仿生导航等关键技术。

本特邀专题邀请以下与“无人系统自主导航与智能感知”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。

- 惯性导航技术；
- 多源融合导航技术；
- 可信导航技术；
- 卫星导航在复杂环境中的应用与优化；
- 惯性导航技术在动态环境下的精确定位；
- 视觉导航算法及其在各类场景中的应用；
- 传感器融合与数据融合在智能导航中的作用；
- 机器学习与人工智能在导航系统中的应用；
- 无人系统智能路径规划与避障技术；
- 环境感知与建模在导航系统中的应用；
- 智能认知导航
- 感知与环境建模技术
- GNSS 抗欺骗与抗干扰技术
- 完好性监测与评估方法
- 增强定位系统与技术
- 地月空间无人系统导航技术
- 其他与无人系统智能导航相关的研究与应用。

IEEE ICUS 2025

Invited Session Summary

Title of Session

Autonomous Navigation and Intelligent Perception of Unmanned Systems

Organizers

1. Prof. Xiangwei Zhu

Sun Yat-sen University, China

2. Assoc. Prof. Xuebin Zhuang

Sun Yat-sen University, China

3. Assoc. Prof. Lei Wang

Wuhan University, China

4. Assoc. Prof. Yanqing Hou

Sun Yat-sen University, China

Biosketches of Organizers



Xiangwei Zhu, Professor, Doctoral Supervisor, Chief Scientist of National Key R&D Program, Assistant Dean of School of Electronics and Communication Engineering, Sun Yat-Sen University. For 20 years, he has been focusing on the research of Beidou system and integrated positioning, navigation and timing (PNT) system, and is committed to solving the scientific problems behind the key technical bottlenecks of Beidou system engineering projects. He has directed/attended 10 special projects, 2 national key research and development plans, 3 natural science fund projects, published more than 100 papers, and applied for more than 60 invention patents. Cross-innovation research has been carried out in Beidou navigation system, integrated PNT technology, intelligent and trusted navigation, etc. He has won the first prize of the Army Science and Technology Progress Award, the first prize of the Surveying and Mapping Science and Technology Award, "Outstanding Professional and Technical Talents of the Army", "Young Top Talents" of the National University of Defense Technology, and won the third-class personal merit. Currently, he serves as an evaluation expert for the Hundred Talents Program of the Chinese Academy of Sciences, an evaluation expert for the National Key R&D Program of the Ministry of Science and Technology, an evaluation expert for the Academic Degree Center of the Ministry of Education, an evaluation expert for the

National Natural Science Foundation of China, an expert for the Strategic Support Forces Expert Bank, an expert for the Innovation Special Zone of the Military Commission Science and Technology Commission, and an expert in the integration of space and earth. Distinguished professor of the State Key Laboratory of Technology, Distinguished Professor of the Guangdong Laboratory of Southern Marine Science and Technology, serving as editorial board member of Journal of Aeronautics and Astronautics, Global Positioning System, Journal of Navigation and Positioning, and reviewer of more than 20 journals such as IEEE TIM, TAES, Journal of Electronics, Journal of Communications, etc. Manuscript expert.



Xuebin Zhuang, Deputy Dean, Associate Professor and Doctoral Supervisor of the School of Systems Science and Engineering, Sun Yat-Sen University. In July 2011, he received his Ph.D. from Tsinghua University. He has long been engaged in research on satellite navigation technology and autonomous navigation technology for unmanned systems. As the project leader, technical leader and main participant, he has successively undertaken more than 20 scientific research projects at the national, provincial and ministerial levels, among which more than 10 were presided over. As the first author or the main author, he has applied for more than ten patents, of which 7 have been authorized. He has published nearly 20 academic papers in SCI and EI. Served as Vice Chairman of the Organizing Committee of the 5th IEEE International Unmanned Systems Conference in 2022, Chairman of the 10th China Satellite Navigation Academic Annual Conference Branch (S11 Anti-jamming and Anti-Spoofing Technology Branch), and China Satellite Navigation Academic Annual Conference (CSNC) Reviewer Manuscript expert (seventh to thirteenth), member of the Air and Space Safety Parallel System Professional Committee of the Chinese Society of Command and Control, etc.



Lei Wang, Fixed-term Associate Professor of Wuhan University, Master Supervisor, Deputy Chief Engineer of LuoJia-1A and LuoJia-2A Satellite Navigation Augmentation Subsystem, IEEE member. He received a Ph.D. degree from Queensland University of Technology, Australia in 2015. His research interests include LEO satellite navigation augmentation, GNSS precision positioning, LEO satellite precise orbit determination, indoor positioning, etc. He has published more than 70 research papers (including more than 50 SCI/EI papers),

published 1 monograph, applied for 15 patents, and 4 software copyrights. He has hosted and participated in ten scientific research projects such as the National Natural Science Foundation of China and the National Key R&D Program. He has won 1 satellite navigation and positioning science and technology progress award and 1 special prize for surveying and mapping science and technology progress. He serves as the young editorial board member of Radio Engineering, guest editor of GIS and Atmosphere journals, and reviewer for more than 30 journals, including Journal of Geodesy, IEEE JIOT, IEEE TVT, IEEE TAES.



Yanqing Hou, Associate Professor and Doctoral Supervisor. The "Hundred Talents Program" of the School of Systems Science and Engineering of Sun Yat-Sen University introduces talents. In 2016, he graduated from National University of Defense Technology with a Ph.D., and his research interests include multi-source fusion navigation and high-precision positioning technology for satellite navigation. Presided over 1 national defense science and technology innovation special zone project, participated in more than 10 national 863 plan projects and equipment pre-research projects as the backbone, published more than 10 SCI academic papers as the first author and co-author, and served as Survey Review, Mathematical Problems in Engineering, etc. Journal Reviewer.

Details of Session

With the widespread application of unmanned systems in various fields, such as autonomous vehicles, drones, and intelligent robots, there is an increasing demand for their autonomous navigation and intelligent perception technologies in complex environments. These complex environments present various challenges, including dense urban areas, indoor settings, adverse weather conditions, and GNSS denial. In such scenarios, it is essential for unmanned systems to navigate autonomously and perceive their surroundings, providing location and environmental information for decision-making, thereby promoting the development of unmanned systems in areas like autonomous driving, smart manufacturing, rescue operations, and surveying.

Research in this field includes key technologies such as inertial navigation technology, multi-sensor data fusion technology, anti-jamming navigation technology, perception and environmental modeling, intelligent navigation, and bionic navigation.

This special invitation calls for original papers related to the theme of

"Autonomous Navigation and Intelligent Perception of Unmanned Systems," encompassing innovative ideas, concepts, new discoveries, improvements, and new applications. The topics of interest include:

- Inertial navigation technology
- Multi-source fusion navigation technology
- Trusted navigation technology
- Applications and optimization of satellite navigation in complex environments
- Precise positioning of inertial navigation technology in dynamic environments
- Visual navigation algorithms and their applications in various scenarios
- The role of sensor fusion and data fusion in intelligent navigation
- Applications of machine learning and artificial intelligence in navigation systems
- Intelligent path planning and obstacle avoidance techniques for unmanned systems
- Applications of environmental perception and modeling in navigation systems
- Intelligent cognitive navigation
- Perception and environmental modeling technologies
- GNSS anti-spoofing and anti-jamming technologies
- Integrity monitoring and assessment methods
- Enhanced positioning systems and technologies
- Navigation technologies for lunar and interplanetary unmanned systems
- Other research and applications related to intelligent navigation of unmanned systems.