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

人工智能驱动的无人机系统感知、规划与控制

组织者

1.朱文武，讲　师，合肥工业大学

2.苏金亚，教　授，东　南　大　学

3.刘　陆，副教授，江　苏　大　学

4.都海波，教　授，合肥工业大学

个人简介

朱文武，男，合肥工业大学，讲师，硕士生导师。2015 年 6 月和 2018 年 6 月于合肥工业大学自动化专业、控制工程专业分别获学士学位和硕士学位，2022 年 6 月于东南大学控制科学与工程专业获博士学位，同年 7 月起加入合肥工业大学自动化系担任教师。目前，在 IEEE 汇刊、SIAM Journal on Control and Optimization 等国际刊物发表学术论文 10 余篇；授权国家发明专利 10 余件。主持国家自然科学基金项目 1 项、安徽省自然科学基金 1 项。研究方向为非光滑抗干扰控制理论及应用，无人机智能控制等。

苏金亚，男，国家级青年人才，东南大学（自动化学院）青年首席教授、博士生导师，（前）英国埃塞克斯大学、英国阿伯丁大学荣誉高级讲师，斯坦福全球前 2%科学家榜单学者，小米青年学者，国家优秀自费留学生奖学金获得者。2011 年本科毕业于山东大学（威海），2016 年博士毕业于英国拉夫堡大学。主要研究方向为 AI 赋能智能感知与抗扰控制。在此方向主持国家级青年人才基金、国家自然科学基金、英国 EPSRC、BBSRC、Innovate UK 基金等 10 余项项目/课题。发表学术论文 90 余篇，其中 SCI 论文 60 篇，获得 3 篇期刊、2 篇会议最佳论文奖，谷歌学术引用超过 3900 次。担任 2 个期刊副编辑、3 个期刊编委会成员。指导学生在国内外高校担任副教授、牛津大学博士后等。

刘陆，男，江苏大学，副教授，硕士生导师，江苏省科技副总。2015 年 6 月于江苏大学自动化专业获学士学位，2020 年 12 月江苏大学控制科学与工程专业获博士学位，2018 年 9 月至 2019 年 9 月于澳大利亚西悉尼大学联合培养。在 IEEE 汇刊等刊物发表学术论文 10 余篇；授权国家发明专利 19 件；参编专著 1 部。主持国家自然科学基金项目 1 项、江苏省自然科学基金 1 项；获中国自动化学会自然科学二等奖 1 项，江苏省科学技术三等奖 1 项；指导硕士生获国家奖学金、中日韩创新工程设计竞赛金奖。研究方向为高阶滑模控制理论及应用、农业机械导航与控制、电动汽车主动安全控制等。

都海波，男，国家级青年人才，合肥工业大学，教授，博士生导师。2012 年在中国南京东南大学获得自动控制专业博士学位。现任合肥工业大学电气与自动化工程学院教授。曾在美国、澳大利亚和中国香港地区多个科研机构担任访问职位。其研究方向主要为非线性控制理论及其在多智能体系统、航天器与电力电子领域的应用。都海波教授曾获 2023 年中国教育部自然科学一等奖，2014 年度中国教育部自然科学二等奖、2020 年度安徽省自然科学二等奖，并于 2020-2024 年入选爱思唯尔 Scopus 全球"控制与系统工程领域中国高被引学者"。现任《Asian Journal of Control》和《International Journal of Advanced Robotic Systems》等期刊的客座编辑，并担任多个学术期刊编委职务。

特邀专题简介

人工智能驱动的无人机系统在智能感知、规划与控制方面的进展，使得无人机的自主能力和智能化水平大幅提升。通过结合深度学习、计算机视觉、传感器融合等先进 AI 技术，无人机能够高效地感知周围环境，实时处理来自摄像头、激光雷达、IMU 等多种传感器的数据，精确识别并跟踪目标、避开障碍物、进行路径重规划等任务。这些感知能力使得无人机可以在动态、复杂的环境中自主飞行，同时应对各种突发情况。在规划方面，AI 算法能够基于任务目标、环境信息和飞行约束，生成最优或近似最优的飞行路径，确保无人机在执行任务时的高效性与安全性。此外，基于强化学习和其他自适

应控制算法，无人机在控制方面能够进行实时调节，逐步优化飞行控制策略，提升飞行的平稳性、精准度与安全性。人工智能赋能的无人机系统不仅极大拓展了其应用范围，如精准物流、环境监测、工业巡检、农业巡查等领域，也使得无人机在执行复杂任务时更加自主、高效和可靠。

本特邀专题旨在邀请围绕“人工智能驱动的无人机系统感知、规划与控制”主题的原创研究论文，特别关注创新思想、控制算法、理论分析以及应用实例等方面的研究进展。

- “机理+数据”的无人机系统建模
- 无人机高精度位姿估计
- 无人机抗干扰智能控制
- 无人机智能决策、规划与避障
- 无人机协同与分布式优化
- 无人机安全与防护机制
- 人工智能算法及其在无人机系统应用
- 无人机系统应用研究

IEEE ICUS 2025
Invited Session Summary

Title of Session

Perception, Planning and Control of UAV Systems Driven by AI

Organizers

1. Dr. Wenwu Zhu

Hefei University of Technology, China

2. Prof. Jinya Su

Southeast University, China

3. Assoc. Prof. Lu Liu

Jiangsu University, China

4. Prof. Haibo Du

Hefei University of Technology, China

Biosketches of Organizers

Wenwu Zhu, male, Lecturer and Master's supervisor at Hefei University of Technology. He received his Bachelor's degree in Automation in June 2015 and Master's degree in Control Engineering in June 2018 from Hefei University of Technology. He obtained his Ph.D. in Control Science and Engineering from Southeast University in June 2022. He joined the School of Electrical and Automation Engineering at Hefei University of Technology as a Lecturer in July 2022. He has published over 10 academic papers in journals such as IEEE Transactions and SIAM Journal on Control and Optimization, and holds over 10 national invention patents. He is the principal investigator for one National Natural Science Foundation project and one Anhui Provincial Natural Science Foundation project. His research focuses on non-smooth disturbance rejection control theory and applications, as well as intelligence control of UAV.

Jinya Su received his Bachelor and Ph.D. degrees in Shandong University (Weihai), China and Loughborough University, U.K. in 2011 and 2016, respectively. He then held various positions including Post-doctor, Lecturer, Senior Lecturer in the U.K. He is currently a Professor at Southeast University, China, and an

Honorary Senior Lecturer at University of Essex, U.K. He was also among the World's Top 2% Scientists 2023 by Stanford University. His research interests mainly include AI empowered autonomous systems: perception and control under uncertainties.

Lu Liu is an associate professor and master's supervisor at Jiangsu University, and a vice president of science and technology in Jiangsu Province. He received his bachelor's degree in Automation from Jiangsu University in June 2015 and his Ph.D. in Control Science and Engineering from Jiangsu University in December 2020. From September 2018 to September 2019, he was a visiting scholar at the University of Western Sydney in Australia. He has published over ten academic papers in IEEE Transactions and the International Journal of Robust and Nonlinear Control, among others. He has been granted 19 invention patents of China and co-authored one monograph. He has led one project funded by the National Natural Science Foundation of China and one by the Natural Science Foundation of Jiangsu Province. He has won the Second Prize in Natural Science from the Chinese Association of Automation and the Third Prize in Science and Technology from Jiangsu Province. His master's students have won the National Scholarship and the China-Japan-Korea Innovation Engineering Design Competition Gold Award under his guidance. His research interests include high-order sliding mode control theory and its applications, navigation and control of agricultural machinery, and active safety control of electric vehicles.

Haibo Du, male, Professor and Ph.D. supervisor at Hefei University of Technology. Haibo Du received the Ph.D. degree in automatic control from Southeast University, Nanjing, China, in 2012. He is currently a Professor with the School of Electrical Engineering and Automation, Hefei University of Technology, Hefei, China. He held several visiting positions in USA, Australia, and Hong Kong. His research interests include nonlinear control theory with applications to multiagent systems, spacecraft, and power electronics. Prof. Du was a recipient of the Natural Science Award (First Class) of the Ministry of Education of China in 2023, the Natural Science Award (Second Class) of the Ministry of Education of China in 2014 and the Natural Science Award (Second Class) of Anhui Province in 2020. He is one of the Elsevier Scopus Most Cited Chinese Researchers (Control and Systems Engineering) all over the

world in 2020. He currently serves as a Guest Editor for the Asian Journal of Control and International Journal of Advanced Robotic Systems and other editorial board member.

Details of Session

The progress of AI-driven UAV systems in intelligent perception, planning, and control has significantly enhanced the autonomy and intelligence level of UAVs. By integrating advanced AI technologies such as deep learning, computer vision, and sensor fusion, UAVs can efficiently perceive their surroundings, process data from various sensors like cameras, LiDAR, and IMUs in real-time, and perform tasks such as target recognition, tracking, obstacle avoidance, and path replanning. These perception capabilities enable UAVs to autonomously fly in dynamic and complex environments, while also handling various unforeseen situations. In terms of planning, AI algorithms can generate optimal or near-optimal flight paths based on mission objectives, environmental information, and flight constraints, ensuring the efficiency and safety of UAVs during mission execution. Moreover, through reinforcement learning and other adaptive control algorithms, UAVs can make real-time adjustments in control, progressively optimizing their flight control strategies to improve stability, precision, and safety. AI-powered UAV systems have not only greatly expanded their application range in areas such as precision logistics, environmental monitoring, industrial inspections, and agricultural surveys, but also enhanced their autonomy, efficiency, and reliability when executing complex tasks.

This special issue aims to invite original research papers focusing on the theme of "Perception, Planning and Control of UAV Systems Driven by AI" with a particular emphasis on innovative ideas, control algorithms, theoretical analysis, and application case studies.

- "Model + Data" UAV System Modeling
- High-precision UAV pose estimation
- Disturbance rejection intelligent control of UAV
- UAV intelligent decision-making, planning, and obstacle avoidance
- UAV cooperation and distributed optimization
- UAV safety and protection mechanisms
- Artificial intelligence algorithms and their application in UAV systems
- UAV system application research