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

面向复杂场景应用的具身智能系统与技术

组织者

1. 刘华平，教授，清华大学

2. 李志伟，副教授，北京化工大学

3. 孟骞，副教授，东南大学

个人简介

刘华平，清华大学计算机系教授，IEEE Fellow，于 2004 年获得清华大学计算机系博士学位。主要研究方向为智能机器人的感知、学习与控制。担任中国自动化学会“智能自动化专业委员会”主任，中国指挥与控制学会具身智能专委会主任委员。出版英文专著两部、中文教材一部，发表学术论文 100 余篇。担任 International Journal of Robotics Research 的 Senior Editor。曾获日内瓦国际发明展特别嘉许金奖、IEEE Andy Chi 最佳论文奖、IEEE IROS 最佳认知机器人论文奖。

李志伟，北京化工大学副教授，硕士生导师。2020 年 6 月于清华大学车辆与运载学院进行博士后工作，从事自动驾驶车辆、飞行汽车等智能无人移动平台的研发。2022 年 7 月入职北京化工大学信息科学与技术学院，主要聚焦自动驾驶融合感知及车路云协同、具身智能机器人、视觉语言大模型等研究。在 IEEE Transactions on Neural Networks and Learning Systems、IEEE Transactions on Intelligent Vehicles、IEEE Transactions on Vehicular Technology、IEEE Transactions on Computational Social Systems、Pattern Recognition 等国际期刊上发表多篇论文；授权国家发明专利 20 余项，授权美国发明专利 7 项。北京化工大学氦客自动驾驶车队负责人，中国自动化学会智能自动化专业委员会委员。

孟骞，东南大学仪器科学与工程学院副教授，博士生导师，东南大学“至善青年学者”，“小米青年学者”。现任 SCI 期刊 Satellite Navigation、Springer Nature 期刊 Urban Lifeline 和卓越期刊《测绘学报》、《导航定位与授时》、《导航与控制》以及《遥测遥控》等专业期刊青年编委。当前研究工作集中于智能导航与可信定位技术，包括自主导航完好性监测，弹性 PNT 终端技术，复杂场景环境感知与智能融合，故障检测与隔离，北斗/GNSS 接收机基带信号处理等。主持国家自然基金、GF 创新特区项目、江苏省自然基金面上项目、航空科学基金等。

特邀专题简介

随着人工智能与机器人技术的深度融合，智能系统正从抽象的计算模型迈向与物理世界紧密耦合的新范式。具身智能强调智能体通过与其所处环境进行实时物理交互来获取感知、学习与决策的能力，其核心在于“身体”与“环境”对于智能塑造的根本性作用。当前，具身智能研究致力于构建能够理解物理规则、适应复杂场景、并与人类自然协作的智能系统。这需要突破传统隔离的感知、认知与控制框架，实现感知-决策-行动闭环在物理世界中的高效统一与涌现。系统级的集成与优化，成为实现其真正自主性与适应性的关键。

本专题旨在探讨具身智能从基础理论到系统集成与应用的前沿进展及其在复杂场景应用中需要解决的关键问题与技术。我们关注如何通过算法、硬件与架构的协同创新，实现智能体在物理交互中的鲁棒性、高效性与智能性，并推动其在智能制造、居家服务、医疗康复、太空探索等领域的广泛应用。

本专题征集包括但不限于以下方向的原创研究：

- 具身感知与场景理解
- 具身学习与决策
- 物理交互与操作
- 具身导航与移动
- 人机协作与共融
- 具身智能系统架构与集成
- 仿真到真实的迁移与训练

- 具身智能在机器人、自动驾驶、虚拟智能体等领域的创新应用。

IEEE ICUS 2026
Invited Session Summary

Title of Session

Embodied Intelligence Systems and Technologies for Challenging Scenarios

Organizers

1. Prof. Huaping Liu
Tsinghua University, China
2. Assoc. Prof. Zhiwei Li
Beijing University of Chemical Technology, China
3. Assoc. Prof. Qian Meng
Southeast University, China

Biosketches of Organizers

Huaping Liu, Professor in the Department of Computer Science and Technology at Tsinghua University and IEEE Fellow, received his Ph.D. from the same department in 2004. His primary research focuses on perception, learning, and control for intelligent robots. He serves as the Chair of the "Intelligent Automation Professional Committee" of the Chinese Association of Automation and as the Chair of the Embodied Intelligence Committee of the Chinese Institute of Command and Control. He has authored two English monographs and one Chinese textbook, and has published over 100 academic papers. He is a Senior Editor for the International Journal of Robotics Research. His awards include the Gold Medal with Special Congratulations at the International Exhibition of Inventions Geneva, the IEEE Andy Chi Best Paper Award, and the IEEE IROS Best Paper Award on Cognitive Robotics.

Zhiwei Li, Associate Professor and Master's Supervisor at Beijing University of Chemical Technology. He conducted postdoctoral research at the School of Vehicle and Mobility, Tsinghua University from June 2020, focusing on the development of intelligent unmanned mobile platforms such as autonomous vehicles and flying cars. In July 2022, he joined the College of Information Science and Technology at Beijing University of Chemical Technology, where his research primarily centers on autonomous driving fusion perception, vehicle-road-cloud collaboration, embodied intelligent robotics, and vision-language large models. He has published multiple papers in international journals including IEEE Transactions on Neural Networks and Learning Systems, IEEE Transactions on

Intelligent Vehicles, IEEE Transactions on Vehicular Technology, IEEE Transactions on Computational Social Systems, and Pattern Recognition. He holds over 20 authorized Chinese invention patents and 7 authorized U.S. invention patents. He serves as the Head of the Heike Autonomous Driving Team at Beijing University of Chemical Technology and is a member of the Intelligent Automation Professional Committee of the Chinese Association of Automation.

Qian Meng, Associate Professor and Ph.D. Supervisor at the School of Instrument Science and Engineering, Southeast University. He is recognized as a "Zhishan Young Scholar" of Southeast University and a "Xiaomi Young Scholar." He currently serves as a Youth Editorial Board Member for several professional journals, including the SCI-indexed Satellite Navigation, the Springer Nature journal Urban Lifeline, as well as the distinguished Chinese journals Acta Geodaetica et Cartographica Sinica, Navigation Positioning and Timing, Navigation and Control, and Telemetry, Tracking, and Command. His current research focuses on intelligent navigation and trustworthy positioning technologies, including autonomous navigation integrity monitoring, resilient PNT terminal technology, environmental perception and intelligent fusion in complex scenarios, fault detection and isolation, and Beidou/GNSS receiver baseband signal processing. He has presided over multiple research projects, including those funded by the National Natural Science Foundation of China, the Defense Innovation Special Zone Program, the General Program of Jiangsu Provincial Natural Science Foundation, and the Aviation Science Foundation.

Details of Session

With the deep integration of artificial intelligence and robotics technologies, intelligent systems are transitioning from abstract computational models toward a new paradigm closely coupled with the physical world. Embodied intelligence emphasizes the ability of agents to acquire perception, learning, and decision-making capabilities through real-time physical interactions with their environments. Its core lies in the fundamental role of "embodiment" and the "environment" in shaping intelligence. Current research in embodied intelligence is dedicated to building intelligent systems that can understand physical rules, adapt to complex scenarios, and collaborate naturally with humans. This requires breaking through the traditional isolated frameworks of perception, cognition, and control to achieve the efficient integration and emergence of the perception-decision-action loop in the physical world. System-level integration and optimization are key to realizing true autonomy and adaptability.

This special issue aims to explore the cutting-edge progress of embodied intelligence, from fundamental theories to system integration and applications, as well as the key challenges and technologies that need to be addressed in complex scenario applications. We focus on how to achieve robustness, efficiency, and intelligence in agents during physical interactions through the synergistic innovation of algorithms, hardware, and architectures. Furthermore, we seek to promote the widespread application of embodied intelligence in fields such as smart manufacturing, home services, medical rehabilitation, and space exploration.

This special issue invites original research including but not limited to the following areas:

- Embodied Perception and Scene Understanding
- Embodied Learning and Decision-Making
- Physical Interaction and Manipulation
- Embodied Navigation and Mobility
- Human-Robot Collaboration and Integration
- Architecture and Integration of Embodied Intelligence Systems
- Simulation-to-Reality Transfer and Training
- Innovative Applications of Embodied Intelligence in Robotics, Autonomous Driving, Virtual Agents, and Related Fields