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

具身智能海洋机器人

组织者

1. 向先波，教授，华中科技大学

2. 王卓，教授，哈尔滨工程大学

3. 左毅，教授，大连海事大学

个人简介

向先波，华中科技大学教授，船舶与海洋工程学院副院长。长期从事船海智能装备、海洋机器人领域的基础理论及工程应用研究，主持国家自然科学基金项目 4 项（含重点项目）、湖北省自然科学基金项目 2 项（含创新群体项目）以及国家重点研发计划国合重点专项、国家科技重大专项专题、重大装备研制项目等，发表论文 200 余篇，授权国内外发明专利 60 余项，主编/参编 4 部国家标准。2020 年起连续入选爱思唯尔中国高被引学者。第一完成人获 2025 中国造船工程学会科技进步特等奖、2023 日内瓦国际发明展特许金奖。

王卓，哈尔滨工程大学船舶工程学院教授，多年来从事水下机器人人工智能方向和多机器人协同方面的研究，具有较深厚的理论基础，也积累了丰富的工程经验。CCF 智能机器人专委会执行委员，系统仿真学会机器人系统仿真专委会委员，造船工程学会女科学家工作委员会会员。近几年发表 SCI/EI 源期刊学术论文 40 余篇，发明专利及软件著作权 20 余项，独立作者出版专著 1 部。JKW*73 首席科学家，主持了总装预先研究重点项目、科技委前沿创新、国家自然科学基金、核高基重大专项专项课题等研究。曾获得省部级科技进步二等奖 3 项，三等奖 1 项。

左毅，大连海事大学航海学院教授，辽宁省首批兴辽英才计划青年拔尖人才，大连市杰出青年科技人才，辽宁省高等学校协同创新中心学术带头人，海事大数据与航运通用人工智能协同创新中心主任。博士研究获名古屋大学杰出博士生研究奖，曾在关西大学、名古屋大学从事教学科研工作。长期从事人工智能、机器学习、数据科学研究，发表论文 100 余篇，其中包括 IEEE 汇刊，ADV ENG INFORM.，RELIAB ENG SYST SAFE.，TRANSPORT RES D-TR E.，ICDM 等机器学习和交通领域国际一流期刊和会议论文，主持并参加了多项国家级课题，包括日本学术振兴会青年基金 1 项和重点项目 1 项，国家自然科学基金重点项目 2 项、联合基金项目 1 项，获授权发明专利 26 项、软件著作权 12 项，以第一完成人获中国造船工程学会科技进步二等奖。

特邀专题简介

随着全球海洋发展战略深入推进，海洋资源开发、环境监测、应急响应等任务日益复杂化、常态化，传统海洋机器人在环境适应性、任务泛化能力、控制能力、人机协同效率等方面面临瓶颈。具身智能作为机器人与人工智能学交叉催生的新范式，为突破上述瓶颈提供了全新思路，通过赋予海洋机器人“动力学—感知—运动—作业-环境适应”闭环中的类生物智能，推动海洋机器人从“执行工具”向“自主协作者”演进。

本特邀专题邀请以下与“具身智能海洋机器人”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。

- 具身智能理论基础：先进运动控制、主动感知、环境建模与预测；
- 关键技术研究进展：柔性传感—驱动一体化、水下自适应运动控制、多模态感知融合；
- 系统集成与应用：多机器人协同探索、人机协作作业平台、水下作业机器人；
- 典型装备设计与研发：水面无人艇、深海探测机器人、仿生游动机器人、软体机器人等

IEEE ICUS 2026
Invited Session Summary

Title of Session

Embodied Intelligent Marine Robots

Organizers

1. Prof. Xianbo Xiang
Huazhong University of Science and Technology, China
2. Prof. Zhuo Wang
Harbin Engineering University, China
3. Prof. Yi Zuo
Dalian Maritime University, China

Biosketches of Organizers

Xianbo Xiang is a Professor and Vice Dean of the School of Ship and Ocean Engineering, Huazhong University of Science and Technology (HUST). His research focuses on fundamental theory and engineering applications in intelligent marine equipment and ocean robotics. He has led 4 National Natural Science Foundation of China projects (including a key project), 2 Hubei Natural Science Foundation projects (including an innovation group project), as well as key projects under the National Key Research and Development Program (International Cooperation Key Project), major national science and technology projects, and major equipment development projects. He has published over 200 papers and holds more than 60 domestic and international invention patents. He has also served as chief editor or contributor to 4 national standards. Since 2020, he has been consecutively listed as a Highly Cited Chinese Scholar by Elsevier. As the principal contributor, he received the 2025 China Shipbuilding Engineering Society Science and Technology Special Prize and the 2023 Geneva International Invention Grand Gold Award.

Zhuo Wang is a Professor at the College of Shipbuilding Engineering, Harbin Engineering University, she has long been engaged in research on artificial intelligence for underwater robots and multi-robot collaboration, with a solid theoretical foundation and extensive engineering experience. She serves as an Executive Committee Member of the CCF Technical Committee on Intelligent Robotics, a Committee Member of the Technical Committee on Robot System Simulation of the System Simulation Society of China, and a member of the Women Scientists Committee of the Chinese Society of Naval

Architecture and Marine Engineering. In recent years, she has published more than 40 academic papers in SCI/EI-indexed journals, been granted over 20 invention patents and software copyrights, and authored one monograph as the sole author. As Chief Scientist of JKW*73, She has led key research projects including key pre-research programs of the General Armament Department, frontier innovation projects of the Science and Technology Commission, projects of the National Natural Science Foundation of China, and key topics of the National Science and Technology Major Project for Core Electronics, High-end Chips and Basic Software. She has received three Second Prizes and one Third Prize of Provincial and Ministerial Science and Technology Progress Awards.

Yi Zuo is a Professor at the Navigation College of Dalian Maritime University. He is a recipient of the first Liaoning Xingliao Talents Program for Young Top Talent, the Dalian Outstanding Young Scientific and Technological Talent Award, and serves as Academic Leader of the Collaborative Innovation Center of Liaoning Higher Education Institutions and Director of the Collaborative Innovation Center for Maritime Big Data and General AI for Shipping. His doctoral research received the Outstanding Doctoral Research Award from Nagoya University. He previously held teaching and research positions at Kansai University and Nagoya University. His research interests include artificial intelligence, machine learning, and data science. He has published more than 100 papers in leading international journals and conferences, including IEEE Transactions, Advanced Engineering Informatics, Reliability Engineering & System Safety, Transportation Research Part D: Transport and Environment, and ICDM. He has led and participated in multiple national-level research projects, including one JSPS Young Scientists project, one JSPS major project, two key projects of the National Natural Science Foundation of China, and one joint fund project. He holds 26 authorized invention patents and 12 software copyrights, and received the Second Prize of Science and Technology Progress from the Chinese Society of Naval Architects and Marine Engineers as the first contributor.

Details of Session

With the deepening implementation of the global maritime strategy, marine resource exploitation, environmental monitoring, and emergency response tasks are increasingly complex and routine. Classic marine robots face bottlenecks in terms of environmental adaptability, task generalization capability, control performance, and human–machine collaboration efficiency.

As an emerging paradigm from the convergence of robotics and artificial

intelligence, embodied intelligence offers a novel approach to overcome these limitations. By endowing ocean robots with bio-inspired intelligence embedded within their physical form—linking dynamics, perception, motion, and environmental adaptation into a unified closed-loop framework—this paradigm propels marine robotics from passive "execution tools" toward proactive "autonomous collaborators."

This invited session welcomes original contributions related to the theme of Embodied Intelligent Ocean Robots, including novel ideas, concepts, discoveries, improvements, and applications.

- Theoretical Foundations of Embodied Intelligence: Advanced motion control, active perception, environmental modeling and prediction.
- Key Technological Advances: Integrated flexible sensing–actuation systems, underwater adaptive locomotion control, multimodal perception fusion.
- System Integration and Applications: Multi-robot collaborative exploration, human–machine collaborative operation platforms, underwater intervention robots.
- Typical Equipment Design and Development: Unmanned surface vessels, deep-sea exploration robots, bio-inspired swimming robots, soft robots, etc.