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

智能海洋机器人技术

组织者

1.秦洪德，教授，哈尔滨工程大学

2.姜宇，副教授，吉林大学

3.薛祎凡，副教授，哈尔滨工程大学

4.余相，讲师，中国石油大学(华东)

个人简介

秦洪德：教授、博导，国家杰出青年科学基金获得者，国家重点研发计划首席科学家，哈尔滨工程大学水下智能机器人技术团队负责人,连续 3 年入选全球前 2%顶尖科学家。现担任十四五国家重点研发计划“智能机器人”重点专项专家委员会委员、中国计算机学会智能机器人专委会秘书长、国防科工局科技委船舶领域专家组成员、中国海洋学会深海技术分会理事、中国海洋学会海洋物理分会理事、中国光学工程学会海洋信息网络专委会海洋装备与工程组组长；IEEE Senior member，担任 JMSA 副主编、SIVP 副主编。主要从事水下自主航行器、水面无人艇技术研究，研发了“星海”系列海洋机器人。在海洋机器人总体设计、近底观测作业、自主导航与精细控制等方面取得突破，获得省部级奖励 8 项，发表 SCI 论文一百余篇，授权发明专利九十余项。

姜宇：吉林大学副教授、博士生导师。中国仿真学会机器人系统仿真专委会委员，中国指挥与控制学会高级会员。担任 CES 副主编，浙大学报（英文版）、Science Progress 等期刊客座编辑。长期围绕水下自主航行器智能感知技术从事人工智能、数据科学、智能控制、海洋工程等多学科领域的交叉融合研究。主持和参加国家、省部级项目 13 项，获得省部级奖励 2 项，发表 SCI 论文三

十余篇，授权发明专利三十余项。

薛祎凡：哈尔滨工程大学副教授，硕导。致力于无人帆船、水下机器人的研究。主要涉及系统辨识、模型预测控制和机器人设计等研究方向。承担国家自然科学基金青年基金、山东省自然科学基金青年基金、国家基础加强项目专题等纵向项目，作为骨干成员参加国家重点研发计划 3 项，承担多项无人船、水下航行器的横向委托项目。IEEE/CCF/机械工程学会会员，CCF 智能机器人专委委员；在船海、机器人控制领域权威期刊发表论文 SCI 论文二十余篇，参与编制机器人相关国家标准 2 项，多次在机器人、船舶与海洋工程相关国际会议进行口头报告并获得最佳论文，获得造船工程学会一等奖、发明学会二等奖。担任机械工程学报、Journal of Ocean University of China 青年编委。

余相：中国石油大学（华东）机电工程学院讲师。长期致力于海洋机器人单信标导航、水下组合导航、水下传感器网络定位以及最优状态估计等领域的研究。参与了多款海洋机器人的研发与应用。主持中国博士后科学基金面上资助项目，作为骨干成员参加国家自然科学基金、国家重点研发计划、工信部高技术船舶项目等科研项目 5 项。发表海洋机器人相关学术论文十余篇，授权/受理发明专利十余项。

特邀专题简介

近年来，随着人工智能、物联网与海洋机器人技术的深度融合，智能海洋机器人已成为海洋资源勘探、生态监测、深海科考、国防安全等领域的核心装备。其通过集成高精度感知、自主决策与智能控制能力，显著提升了复杂海洋环境下的作业效率与安全性，推动海洋开发从传统人力驱动向智能化、无人化方向跨越式发展。随着海洋开发向深远海、极地等复杂区域延伸，智能海洋机器人面临极端环境干扰、长续航受限、动态避障等挑战，亟需突破高效率驱动、跨域协同通信等关键技术，以实现从单体自主到群体协作、从近海作业到深远海探索的能力升级。

本特邀专题邀请以下与“智能海洋机器人技术”主题相关的包含新思想、新概念、新发现、改进以及新应用的原创论文。

- 智能海洋机器人设计与应用
- 智能海洋机器人环境感知
- 智能海洋机器人自主决策与智能控制算法
- 智能海洋机器人水下导航与定位
- 多海洋机器人协同作业

IEEE ICUS 2025
Invited Session Summary

Title of Session

Intelligent Marine Robots Technology

Organizers

1. Prof. Hongde Qin

Harbin Engineering University, China

2. Assoc. Prof. Yu Jiang

Jilin University, China

3. Assoc. Prof. Yifan Xue

Harbin Engineering University, China

4. Dr. Xiang Yu

China University of Petroleum (East China)

Biosketches of Organizers

Hongde Qin is a professor and doctoral supervisor, recipient of the National Distinguished Youth Science Foundation, and chief scientist of the National Key Research and Development Program. He leads the Underwater Intelligent Robotics Technology Team at Harbin Engineering University and he has been selected as the top 2% scientists in the world for three consecutive years. Currently, he serves as a member of the Expert Committee of the "Intelligent Robots" Key Special Project of the 14th Five-Year Plan, Secretary-General of the Intelligent Robotics Special Committee of the China Computer Society, member of the Ship Technology Expert Group of the Science and Technology Committee of the State Administration of Science, Technology and Industry for National Defense, director of the Deep Sea Technology Branch of the China Oceanographic Society, director of the Ocean Physics Branch of the China Oceanographic Society, and leader of the Ocean Equipment and Engineering Group of the Marine Information Network Special Committee of the Chinese Optical Engineering Society. He is an IEEE Senior member and serves as Associate Editor of JMSA and SIVP. His main research interests include autonomous underwater vehicles and unmanned surface vessels, and he has developed the "Xinghai" series of marine robots. He has made breakthroughs in overall design of marine robots,

near-bottom observation operations, autonomous navigation, and fine control, receiving eight provincial and ministerial awards, publishing over a hundred SCI papers, and holding more than ninety authorized patents.

Yu Jiang is an Associate Professor and doctoral supervisor at Jilin University. Currently, he serves as a member Robotics System Simulation Committee of China Simulation Society, and senior member of China Command and Control Society. He served as the Associate Editor of CES, guest editor of the Journal of Zhejiang University (English edition), Science Progress and other journals. His main research interests include the interdisciplinary integration research of artificial intelligence, data science, intelligent control, ocean engineering and other multidisciplinary fields around the intelligent sensing technology of underwater autonomous vehicles. He has presided over and participated in 13 national, provincial and ministerial projects, won 2 provincial and ministerial awards, published more than 30 SCI papers, and authorized more than 30 authorized patents.

Yifan Xue is an Associate Professor and Master's Supervisor at Harbin Engineering University. He is dedicated to research in the fields of unmanned sailboats and underwater vehicles. His research mainly involves system identification, model predictive control, and the design of marine robots. He has undertaken longitudinal projects such as the National Natural Science Foundation of China (NSFC) Youth Fund, the Shandong Provincial Natural Science Foundation Youth Fund, and specialized projects of basic strengthening projects. He has also been involved as a core member in three national key research and development programs and has undertaken multiple commissioned projects related to unmanned surface vessels and underwater vehicles. He is also the member of the IEEE/CCF/Mechanical Engineering Society, and member of the Intelligent Robotics Committee of the CCF. He has published more than 20 SCI papers in the fields of marine and robot control, participated in the compilation of 2 national standards related to robots, delivered oral reports in international conferences on robotics, ship and ocean engineering for many times and won the best papers. He has won the first prize of shipbuilding Engineering Society and the second prize of Invention Society. He serves as Journal of Mechanical Engineering and Journal of Ocean University of

China Youth Editorial Committee.

Xiang Yu is a lecturer at College of Mechanical and Electronic Engineering, China University of Petroleum (East China). He has been devoted to research in the fields of marine robotic single beacon navigation, underwater integrated navigation, underwater sensor network localization and optimal state estimation for a long time. He has been involved in the development and application of several marine robots. He has been awarded a fellowship from the China Postdoctoral Science Foundation. As a key member, he has participated in five projects such as the National Natural Science Foundation of China (NSFC), the National Key Research and Development Program of China, and the High-tech ship research project of Ministry of Industry and Information Technology. He has published over ten academic papers related to marine robotics, and has been authorized/accepted more than 10 invention patents.

Details of Session

In recent years, with the deep integration of artificial intelligence, Internet of Things and marine robotic technology, intelligent marine robots have become the core equipment in the fields of marine resources exploration, ecological monitoring, deep-sea scientific research, national defense and security. Through the integration of high-precision perception, autonomous decision-making and intelligent control capabilities, it significantly improves the operational efficiency and safety in complex marine environments, and promotes the development from the traditional manpower-driven to the direction of intelligent, unmanned leapfrog. With the extension of ocean development to complex areas such as deep and distant oceans and polar regions, intelligent marine robots are faced with challenges such as extreme environmental interference, limited long endurance and dynamic obstacle avoidance, and urgently need to break through key technologies such as high-efficiency drive and cross-domain collaborative communication, so as to realize the upgrade of capabilities from single-unit autonomy to group collaboration, and from near-sea operation to deep and distant ocean exploration.

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 “Intelligent Marine Robots Technology”.

- Design and applications of intelligent marine robots

- Environment sensing of intelligent marine robots
- Autonomous decision-making and intelligent control algorithms for marine robots
- Underwater navigation and positioning of intelligent marine robots
- Multi-robot collaborative operations in marine settings