

2025 第八届 IEEE 国际无人系统大会 特邀专题简介表

<p>特邀专题名称</p> <p>无人集群高可靠协调规划与控制</p>
<p>组织者</p> <ol style="list-style-type: none">1.许涛，助理研究员，北京理工大学2.伊泉剑，研究员，北京理工大学3.温广辉，教授，东南大学4.柯津，助理研究员，上海交通大学5.李颖，助理研究员，上海交通大学
<p>个人简介</p> <div data-bbox="252 904 504 1236"></div> <p>许涛，北京理工大学助理研究员，南洋理工大学博士后。2022 年获北京大学力学系统与控制专业博士学位，研究方向包括智能无人集群、事件触发控制、数据驱动控制。近年来，在 <i>Automatica</i>、<i>IEEE TAC</i> 等专业权威期刊上发表 SCI 论文 20 余篇；授权国家专利 4 项；主持国家自然科学基金项目 1 项、中国博士后科学基金项目 2 项；入选中国指挥与控制学会博士学位论文激励计划；现任中国指挥与控制学会青年工作委员会委员，担任 ICUS (2024)、CCSICC (2023)、SRSE (2022) 等多个国际会议的邀请组主席以及多个国际期刊的审稿人。</p> <div data-bbox="252 1487 520 1818"></div> <p>伊泉剑，北京理工大学研究员，系统可靠性研究中心常务副主任，长期从事系统可靠性与装备运维决策技术的研究与工程应用。以第一作者或通讯作者身份发表 SCI 论文 40 余篇，授权国家发明专利 36 项，主持国家级科研项目 9 项。获军队科技进步二等奖 1 项，国防科技进步三等奖 1 项，兵器工业集团科技进步二等奖 2 项、三等奖 1 项，中国石油和化工自动化应用协会技术发明一等奖 1 项，日内瓦国际发明展金奖 1 项。担任《<i>International Journal of Structural Integrity</i>》和《<i>Neurocomputing</i>》副主编，中国现场统计研究会智能运维分会副理事长兼秘</p>

书长，中国技术市场协会工程故障预测与健康管理工作专业委员会理事，中国现场统计研究会可靠性工程分会理事，PHM 领域三大国际会议程序委员会主席。



温广辉，东南大学首席教授，博士生导师，IET Fellow。2012 年获北京大学力学系统与控制专业博士学位，长期从事网络群体智能理论与技术、分布式控制与优化、弹性协同控制和分布式强化学习等领域的研究工作。在 *Nature Reviews Electrical Engineering*、*Research*、*The Innovation* 和 *IEEE* 汇刊发表学术论文 200 余篇，出版学术专著 4 部，获国际学术期刊最佳论文奖 1 次、国内外学术会议最佳论文奖 4 次。任中国指挥与控制学会副秘书长、中国指挥与控制学会青年工作委员会副主任；主持国家杰青项目（2023）、优青项目（2017），国家自然科学基金联合重点项目、科技部重点研发计划项目课题等 30 余项科研项目。获中国青年科技奖，ARC Decra Fellow、中国指挥与控制学会青年科学家奖等荣誉称号。



柯津，博士，上海交通大学博士后、助理研究员，于 2017 年毕业于福州大学自动化专业，获工学学士学位，2022 年毕业于厦门大学控制科学与工程专业，获工学博士学位。主要研究方向包括分布式控制、安全控制等。在控制领域知名期刊 *International Journal of Robust and Nonlinear Control* 和国际顶级会议 *America Control Conference* 发表论文 10 余篇，主持第 74 批中国博士后科学基金面上项目。



李颖，上海交通大学博士后、助理研究员。2022 年获厦门大学控制理论与控制工程专业博士学位，主要从事网络控制系统、安全控制等领域的研究工作，在控制领域知名期刊和会议上发表学术论文 10 余篇，主持上海市自然科学基金面上项目，担任 *IEEE TCYB*、*IEEE TCNS* 等国际期刊和会议的审稿人。

特邀专题简介

近年来，无人集群系统在智能交通、环境监测、灾害救援和军事侦察等领域展现出广阔的应用前景。相比单一无人系统，集群系统凭借分布式感知、协同决策和自主执行能力，在动态环境和大规模任务分配中表现出显著优势。然而，在实际应用中，集群系统仍面临通信受限、个体故障、环境不确定性及网络攻击等挑战，严重影响系统的可靠性和任务执行效果。例如，通信受限导致信息交换不稳定，个体故障削弱集群的整体性能，环境不确定性增加任务执行的复杂度，而网络攻击则可能威胁系统安全，影响任务的成功率。因此，构建安全可靠的分布式控制框架，并提升集群系统的鲁棒性和自适应能力，已成为该领域的核心研究方向。在此背景下，探索无人集群的高可靠协调规划与控制，不仅具有重要的科学价值，也对提升无人系统的自主性和智能化水平具有深远的现实意义。本特邀专题欢迎但不限于以下主题的研究和应用成果：

- 可靠性建模与分析
- 故障预测与健康管理
- 故障诊断与容错控制
- 无人集群安全协同控制
- 无人集群任务规划与优化
- 不确定环境下的智能决策

IEEE ICUS 2025
Invited Session Summary

Title of Session

High-Reliability Cooperative Planning and Control for Unmanned Swarms

Organizers

1. Dr. Tao Xu

Beijing Institute of Technology, China

2. Prof. Xiaojian Yi

Beijing Institute of Technology, China

3. Prof. Guanghui Wen

Southeast University, China

4. Dr. Jin Ke

Shanghai Jiao Tong University, China

5. Dr. Ying Li

Shanghai Jiao Tong University, China

Biosketches of Organizers



Tao Xu is an Assistant Researcher at Beijing Institute of Technology and a Postdoctoral Fellow at Nanyang Technological University. He received the Ph.D. degree in dynamical systems and control from Peking University, Beijing, China, in 2022. His research interests include intelligent unmanned swarms, event-triggered control, and data-driven control. He has published over 20 SCI papers in leading journals such as *Automatica* and *IEEE TAC*. He holds four granted national patents and has led one project funded by the National Natural Science Foundation of China and two projects supported by the China Postdoctoral Science Foundation. He received the Excellent Doctoral Dissertation Award from the Chinese Institute of Command and Control. He has served as Special Session Chair for ICUS (2024), CCSICC (2023), and SRSE (2022).



Xiaojian Yi is a Researcher at Beijing Institute of Technology and executive deputy director of the System Reliability Research Center. He has published more than 40 SCI papers as the first author or corresponding author, and holds 36 authorized national invention patents. He has led 9 national-level scientific research projects. He has received the second prize of military scientific and technological progress, the third prize of national defense scientific and technological progress, two second prizes and one third prize of technological progress from the China Ordnance Industry Group, the first prize of technological invention from the China Petroleum and Chemical Automation Application Association, and a gold medal at the Geneva International Exhibition of Inventions. He serves as the associate editor of International Journal of Structural Integrity and Neurocomputing, vice president and secretary-general of the Intelligent Operations and Maintenance Division of the China Field Statistics Society, director of the Engineering Fault Prediction and Health Management Technology Professional Committee of the China Technology Market Association, and board member of the Reliability Engineering Division of the China Field Statistics Society. He is also the program committee chair for the three major international conferences in the PHM field.



Guanghui Wen is an Endowed Chair Professor at Southeast University, an IET Fellow. He received the Ph.D. degree in mechanical systems and control from Peking University, Beijing, China, in 2012. He has been engaged in long-term research in the fields of analysis and synthesis of complex networks, distributed control and optimization, resilient control, and distributed reinforcement learning. He has published over 200 academic papers in prestigious journals, including Nature Reviews Electrical Engineering, Research, The Innovation, and various IEEE Transactions. He has authored four academic monographs and received one Best Paper Award from an international academic journal and four Best Paper Awards from domestic and international conferences. Prof. Wen currently serves as the Deputy Secretary-General of the Chinese Institute of Command and Control and the Deputy Director of its Youth Working Committee. He has led over 30 major research projects, including projects funded by the National

Science Fund for Distinguished Young Scholars of China (2023), the National Science Fund for Excellent Young Scholars of China (2017), the Key Joint Funds of the National Natural Science Foundation of China, and key projects of the Ministry of Science and Technology, China. His honors include the China Youth Science and Technology Award, ARC Decra Fellow, and the Young Scientist Award from the Chinese Institute of Command and Control.



Jin Ke received the B.E. degree in Automation from Fuzhou University, Fuzhou, China, in 2017, and the Ph.D. degree in Control Science and Engineering from Xiamen University, Xiamen, China, in 2022. She is currently a postdoctoral researcher and an assistant researcher in the Department of Automation at Shanghai Jiao Tong University, Shanghai, China. Her research interests include distributed control and safety control. She has published over 10 papers in international journals and conferences. She has also led a project of China Postdoctoral Science Foundation.



Ying Li received the Ph.D. degree in control theory and control engineering from Xiamen University, Xiamen, China, in 2022. She is currently a postdoctoral researcher and an assistant researcher in the Department of Automation at Shanghai Jiao Tong University, Shanghai, China. Her research interests include networked control systems, security and safety control. She has published over 10 papers in international journals and conferences. She has led a project of Natural Science Foundation of Shanghai. She has also served as a reviewer for international journals and conferences such as IEEE TCYB and IEEE TCNS.

Details of Session

In recent years, unmanned swarm systems have shown immense potential in applications such as intelligent transportation, environmental monitoring, disaster response, and military reconnaissance. Compared to single unmanned systems, swarm systems offer significant advantages in dynamic environments and large-scale task allocation due to their distributed sensing, cooperative decision-making, and autonomous execution capabilities. However, in practical applications, swarm systems still face challenges such as communication constraints, individual failures, environmental uncertainties, and network attacks, which significantly impact system

reliability and task performance. For example, communication constraints may result in unstable information exchange, individual failures can degrade overall swarm performance, environmental uncertainties increase task complexity, and network attacks may damage system security, reducing mission success rates. As a result, developing a secure and reliable distributed control framework that enhances the robustness and adaptability of swarm systems has become a central research focus in this field. In this context, exploring high-reliability cooperative planning and control for unmanned swarms is not only scientifically valuable but also of significant practical importance for improving the autonomy and intelligence of unmanned systems. This invited session welcomes, but is not limited to, research and application results on the following topics:

- Reliability modeling and analysis
- Fault prediction and health management
- Fault diagnosis and fault-tolerant control
- Secure cooperative control of unmanned swarms
- Task planning and optimization for unmanned swarms
- Intelligent decision-making under uncertain environments