2025 第八届 IEEE 国际无人系统大会
特邀专题简介表
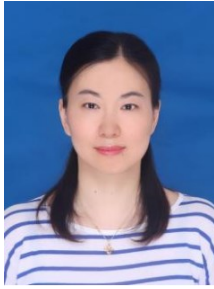
特邀专题名称
无人集群系统智能决策与弹性重构

组织者

1. 张婷婷，教授，陆军工程大学

2. 孙有朝，教授，南京航天航空大学

3. 丁飞，教授，南京邮电大学

4. 刘云平，教授，南京信息工程大学

个人简介

张婷婷，陆军工程大学教授、东南大学博士后，首届江苏青年女科学家、江苏省"333 高层次人才培养工程"中青年科学技术带头人。研究领域无人系统智能指挥控制。主持国家自然科学基金、科技委基础加强计划基金等科研项目十余项。获中国指挥与控制学会科技进步一等奖 1 项、江西省科技进步一等奖 1 项、吴文俊人工智能科技进步二等奖 1 项、军队科技进步二等奖 1 项。发表中科院一区、CCF A 类期刊第一作者/通讯作者论文 20 余篇、出版专著《网络信息体系能力演化分析方法》。已授权国家/国防发明专利 14 项。长期担任 ICUS、ICGNC 等国际会议委员,并担任 IEEE Transactions on Aerospace and Electronic Systems、AAAI 等电子信息领域多种国际期刊和会议审稿人。

孙有朝，南京航空航天大学教授、博士生导师，可靠性与适航技术研究中心主任、国防科工委"适航技术与管理"国防紧缺学科负责人，工信部"航空适航技术"国防特色学科负责人、中国民航局"民航飞机机载系统适航工程技术中心"主任。中国航空学会运行支持分会委员，全国航空器标准化技术委员会 SAC/TC435/SC4 委员，中国人类工效学学会理事、生物力学专委会委员，中国电子学会智能人机交互专家委员会委员。

丁飞，南京邮电大学教授，现任现代邮政学院副院长、智慧物联网应用技术研究院副院长，并担任江苏省宽带无线通信和物联网重点实验室副主任等职。他是江苏省"333高层次人才培养工程"和"六大人才高峰"的入选者，曾作为访问学者在伦敦大学学院深造。丁教授专注于群智感知、智能计算及模型预测控制等领域的研究，主持或参与了包括国家新一代宽带无线移动通信网重大专项、国家自然科学基金在内的16项科技项目，以及30多项创新项目。他已发表80余篇学术论文，拥有50多项授权发明专利，并荣获江苏省科学技术奖、中国通信学会科学技术奖等8项省部级及以上科技奖励。

刘云平，教授/博导，入选江北新区高层次人才、烟台市双百计划人才团队，中国人工智能学会教育工作委员会委员/中国自动化学会混合智能专业委员会委员。主要研究方向为智能无人系统，承担国家重点研发计划、国家自然科学基金、装备部预研项目等省部级以上课题20余项，发表学术论文50余篇，授权专利50余项。

特邀专题简介

　　随着无人技术的不断发展和普及，无人集群系统作为一种新型协同工作体系得到了广泛应用。在实际场景中，无人集群系统可以被用于进行搜索救援、环境监测、安全巡逻等任务，其能够利用多个节点之间的协同作用来增强系统性能、提高效率。作为军事技术手段，无人集群具有低成本、高灵活的部署方式可以通过遥控或自主行动进行协同作战，因此可以降低战场上士兵伤亡的风险。然而，由于无人集群系统需要通过通信链接进行协同作战，一旦通信链路被干扰、中断或遭到攻击，就会导致系统失去关键信息和命令，进而较难实现预定目标。另一方面，在集群系统中，每个节点的失效都可能对整个系统产生不同程度的影响。例如，设备故障、装备毁伤等问题可能会导致节点失效，进而影响整个体系的稳定运行。为了降低这些因素对无人集群系统的干扰，需要采取相应的措施和技术来提升无人体系的可靠性和抗干扰能力。针对上述问题，本专题以无人集群系统智能决策与弹性重构为研究对象，重点聚焦通过自主控制和自我适应机制，使得无人集群体系能够具有更强的灵活性、韧性和鲁

棒性，以推动无人集群技术的全面发展和应用。

    本特邀专题邀请以下与"无人集群系统智能决策与弹性重构"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。

- 无人机集群组网技术
- 面向集群系统的任务规划方法
- 无人作战体系弹性重构方法
- 无人机任务与航迹智能规划方法仿生学习与控制
- 智能任务规划模型和算法
- 面向韧性提升的无人化指控体系架构设计

IEEE ICUS 2025
Invited Session Summary

Title of Session
Intelligent Decision-making and Resilient Reconfiguration of Unmanned Swarm Systems

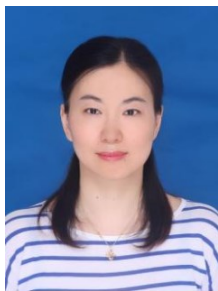| **Organizers** |
|---|
| **1. Prof. Tingting Zhang** |
| Army Engineering University of PLA, China |
| **2. Prof. Youchao Sun** |
| Nanjing University of Aeronautics and Astronautics, China |
| **3. Prof. Fei Ding** |
| Nanjing University of Posts and Telecommunications, China |
| **4. Prof. Yunping Liu** |
| Nanjing University of Information Science and Technology, China |

Biosketches of Organizers

Tingting Zhang is a professor at the Army Engineering University and a postdoctoral fellow at Southeast University. She is recognized as the inaugural Jiangsu Young Female Scientist and a mid-to-young-aged science and technology leader under Jiangsu Province's "333 High-Level Talent Cultivation Project". Her research focuses on intelligent command and control of unmanned systems. She has led more than ten scientific research projects, including those funded by the National Natural Science Foundation of China and the Basic Strengthening Plan Fund of the Science and Technology Commission. Her accolades include the First Prize of Science and Technology Progress from the Chinese Institute of Command and Control, the First Prize of Science and Technology Progress from Jiangxi Province, the Second Prize of Wu Wenjun Artificial Intelligence Science and Technology Progress, and the Second Prize of Military Science and Technology Progress. She has published over 20 first-author/corresponding-author papers in CAS Zone 1 and CCF A-category journals and authored the monograph "Analytical Methods for the Evolution of Network Information System Capabilities". She holds 14 authorized national/defense invention patents. She has long served as a committee member for international conferences such as ICUS and ICGNC and as a reviewer

for various international journals and conferences in the field of electronic information, including IEEE Transactions on Aerospace and Electronic Systems and AAAI.

Youchao Sun is a professor and doctoral supervisor at Nanjing University of Aeronautics and Astronautics. He serves as the Director of the Reliability and Airworthiness Technology Research Center, the head of the "Airworthiness Technology and Management" defense-critical discipline under the Commission of Science, Technology, and Industry for National Defense, and the head of the "Aeronautical Airworthiness Technology" defense-specific discipline under the Ministry of Industry and Information Technology. Additionally, he is the Director of the "Civil Aircraft Airborne Systems Airworthiness Engineering Technology Center" under the Civil Aviation Administration of China. He is a member of the Operational Support Branch of the Chinese Society of Aeronautics and Astronautics, a member of the SAC/TC435/SC4 committee of the National Aircraft Standardization Technical Committee, a council member of the Chinese Ergonomics Society and a member of its Biomechanics Committee, and a member of the Intelligent Human-Computer Interaction Expert Committee of the Chinese Institute of Electronics.

Fei Ding is a professor at Nanjing University of Posts and Telecommunications, currently serving as the Deputy Dean of the School of Modern Posts and the Deputy Director of the Smart Internet of Things Application Technology Research Institute. He also holds the position of Deputy Director at the Jiangsu Provincial Key Laboratory of Broadband Wireless Communication and Internet of Things, among other roles. He is a selected candidate for Jiangsu Province's "333 High-Level Talent Cultivation Project" and the "Six Talent Peaks" initiative, and has previously been a visiting scholar at University College London. Professor Ding specializes in research areas such as swarm intelligence sensing, intelligent computing, and model predictive control. He has led or participated in 16 scientific and technological projects, including the National Major Special Project on New Generation Broadband Wireless Mobile Communication Networks and the National Natural Science Foundation of China, as well as over 30 innovation projects. He has published more than 80 academic papers, holds over 50 authorized

invention patents, and has been awarded 8 provincial and ministerial-level scientific and technological accolades, including the Jiangsu Provincial Science and Technology Award and the China Institute of Communications Science and Technology Award.

Yunping Liu, professor and doctoral supervisor, is listed in the high-level talents of Jiangbei New Area and Yantai Double Hundred Plan Talent Team. He is also a member of the Education Working Committee of the Chinese Association of Artificial Intelligence and the Hybrid Intelligence Professional Committee of the Chinese Association of Automation. His main research direction is intelligent unmanned systems. He has undertaken more than 20 provincial and ministerial-level projects such as the National Key Research and Development Program, the National Natural Science Foundation, and the Equipment Department's pre-research projects. He has published more than 50 academic papers and been granted more than 50 patents.

Details of Session

With the continuous development and popularization of unmanned technology, unmanned swarm systems have been widely applied as a new type of collaborative working system. In practical scenarios, unmanned swarm systems can be used for tasks such as search and rescue, environmental monitoring, security patrols, etc. By utilizing the collaborative effects between multiple nodes, they can enhance system performance and improve efficiency. As a military technology, unmanned swarm has the advantages of low cost and flexible deployment. It can conduct collaborative combat operations through remote control or autonomous action, thereby reducing the risk of soldiers casualties on the battlefield. Unmanned swarm systems require communication links to accomplish collaborative operations. However, once the communication link is interfered with, interrupted, or attacked, it will cause the system to lose critical information and commands, which in turn hinders the achievement of the intended objectives. On the other hand, within the swarm system, the failure of each node may have varying degrees of impact on the entire system. For example, equipment failures and damage may cause node failure, which further affects the stability of the entire system's operations. In order to reduce the interference of these factors on unmanned swarm systems, corresponding measures and technologies need to be taken to improve the reliability and anti-interference

capabilities of unmanned systems. To address the above problems, this topic takes intelligent decision-making and elastic reconfiguration of unmanned swarm systems as the research objects, focusing on enabling unmanned swarm systems to have greater flexibility, robustness, and resilience through autonomous control and self-adaptive mechanisms. This will promote the comprehensive development and application of unmanned swarm technology.

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 Decision-making and Resilient Reconfiguration of Unmanned Swarm Systems".

- UAV swarm networking technology
- Task planning methods for swarm systems
- Resilient methods for restructuring unmanned combat system of systems
- Biomimetic learning and control for intelligent planning of UAV missions and trajectories
- Intelligent task planning model and algorithm
- Design of a system of systems architecture for enhancing resilience in unmanned systems.