2024 第七届 IEEE 国际无人系统大会
特邀专题简介表

特邀专题名称

基于模型的系统工程与应用

组织者

1. 杨成伟，特别研究员，北京理工大学

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个人简介

杨成伟，北京理工大学机电学院院长助理，特别研究员，博士生导师，中国科学院-加拿大麦吉尔大学联合培养博士，博士后。中国指挥与控制学会集群智能与协同控制专业委员会委员、青年工作委员会常务委员。长期从事装备论证和无人系统总体设计工作，推进“基于模型的系统工程”在高校的科研和教学工作，参与多个国家重大重点项目论证工作。主持国家自然科学基金、国家重大专项子课题、国家级预研和基金项目等科研项目 17 项，科研经费超 3900 万元，以第一完成人获省部级技术发明奖 1 项，获第十七届“中国兵工学会青年科技奖”，完成成果鉴定 3 项，出版学术专著 2 部。

陈建江，工学博士，研究员，在中国航天科工集团第三总体设计部工作，是数字化专业组、工业软件专家。曾获国防科学技术进步一、三等奖，第十七届国家级一等企业管理现代化创新成果一等奖；拥有国防专利 6 项，行业标准 4 项，国内外核心期刊上发表文章二十余篇；承担 10 项以上重大先进设计技术预研课题的研究。在基于模型的系统工程（MBSE）、复杂装备数字化建设、企业数字化转型、大型工业软件等方面积累了丰富的技术基础和实践经验。

特邀专题简介

随着复杂产品项目变得大型化和复杂化，其开发成本越来越高，风险也越来越大，因此需要借助先进的系统工程方法并结合完善的需求开发和管理流

程，来解决复杂产品开发过程中的资源、技术、软件、管理等一系列问题。面向未来数字智能时代，系统工程实践不仅需要系统理论、工程管理方法论的创新，也需要在设计方法、实验方法、构建方法、评估方法、运用模式等方面的创新，更需要紧密结合前沿数字化、智能化技术发展进行创新。基于模型的系统工程（Model-Based Systems Engineering，MBSE）是近年来针对解决复杂系统产品的研发问题逐渐发展起来的新兴技术，以模型为中心代替了以文本为中心，为系统工程提供了一种全新的实现途径，也为复杂产品研制提供了一整套解决方案，可保障复杂产品的高效、高质量、低风险研制，推动科研生产管理模式的变革。工程实践中，它包含完整的过程、方法、工具、支持环境的成套解决方案。基于模型的系统工程的研究对象、应用方法和功能作用在“数智时代”被广泛拓展，亟待建构新范式、发展新理论，来解决“数智”时代下复杂“信息-物理”系统、“人机混合”智能系统的需求、研制、试验和优化问题。

本特邀专题邀请以下与“基于模型的系统工程与应用”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。

- 基于模型的系统建模与仿真
- 基于模型的系统智能评估技术
- 基于模型的系统智能设计理论
- 基于模型的系统智能调控与优化
- 基于模型的系统需求工程
- 人工智能技术在基于模型的系统工程中的应用
- 大数据技术在基于模型的系统工程中的应用
- 知识图谱技术在基于模型的系统工程中的应用
- 基于模型的系统工程软件开发与应用

IEEE ICUS 2024
Invited Session Summary

Title of Session

Model-based System Engineering and Applications

Organizers

1. Prof. Chengwei Yang

Beijing Institute of Technology, China

2. Prof. Jianjiang Chen

Beijing Electromechanical Engineering Institute, China

Biosketches of Organizers

Chengwei Yang is the Assistant to the Dean of the School of Mechatronic Engineering of Beijing Institute of Technology, Professor and Doctoral Supervisor. He is the member of the Swarm Intelligence and Collaborative Control Professional Committee of the Chinese Command and Control Society, executive member of the Youth Work Committee. He has participated in the demonstration work of multiple major national key projects. He led multiple projects including the National Natural Science Foundation of China and major national key projects et al. His main research interests include system engineering and unmanned system. He won one Technology Invention Award as the first author. He has published more than 30 academic papers and published 2 academic monographs.

Jianjiang Chen is a research fellow working in the Beijing Electromechanical Engineering Institute of China Aerospace Science and Industry Corporation. He is a digital professional and industrial software expert. He has won the first and third prizes of National Defense Science and Technology Progress Award, and the first prize of the 17th National First Class Enterprise Management Modernization Innovation Achievement Award. He has 6 national defense patents and published over 20 articles in core domestic and foreign journals. He has accumulated rich technical foundations and practical experience in model-based systems engineering (MBSE), digital construction of complex equipment, digital transformation of enterprises, and large-scale industrial software.

Details of Session

As complex product projects become larger and more complex, their development costs are increasing and risks are also increasing. Therefore, it is necessary to use advanced system engineering methods and combine them with sound requirements development and management processes to solve a series of problems such as resources, technology, software, and management in the process of complex product development. Facing the future digital intelligence era, system engineering practice not only requires innovation in system theory and engineering management methodology, but also innovation in design methods, experimental methods, construction methods, evaluation methods, application modes, and other aspects. It is also necessary to closely combine cutting-edge digital and intelligent technology development for innovation. Model Based Systems Engineering (MBSE) is an emerging technology that has gradually developed in recent years to solve the research and development problems of complex system products. The model - centered approach has replaced the text-centered approach, providing a new implementation approach for system engineering and a complete set of solutions for complex product development, which can ensure the efficient, high-quality, and low-risk development of complex products, and promote the transformation of scientific research and production management models. In engineering practice, it includes a complete set of solutions for processes, methods, tools, and supporting environments. The research objects, application methods, and functional roles of model-based systems engineering have been widely expanded in the "digital intelligence era", and there is an urgent need to construct new paradigms and develop new theories to solve the demand, development, testing, and optimization problems of complex "information physics" systems and "human-machine hybrid" intelligent systems in the "digital intelligence" era.

This special session invites the following original papers related to the theme of "Model based System Engineering and Applications", including innovative ideas, concepts, new discoveries, improvements, and new applications.

- Modeling and simulation of model-based system
- Intelligent evaluation technology of model -based system
- Model based system intelligent design theory
- Intelligent regulation and optimization of model-based systems
- Requirements engineering of model-based system

- Application of artificial intelligence technology in model-based system engineering
- Application of big data technology in mode-based system engineering
- Application of knowledge graph technology in model-based system engineering
- Application of model-based system engineering software