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

人机混驾交通系统交互行为建模、优化与决策控制

组织者

1.殷国栋，教授，东南大学

2.梁晋豪，助理研究员，新加坡国立大学

3.方振伍，助理研究员，新加坡国立大学

4.武健，教授，聊城大学

5.王法安，助理教授，昆明理工大学

个人简介

殷国栋，国家杰出青年科学基金获得者，中国汽车工程学会会士，东南大学首席教授，东南大学教务处处长。兼任教育部高等学校工程训练教学指导委员会委员、中国汽车工程学会理事、中国自动化学会车辆控制与智能化专委会副主任委员等。主要从事车辆动力学与控制、电动汽车与智能网联汽车、车联网与车路协同等研究。主持国家自然基金重点项目、国家自然基金重大项目、国家重点研发计划项目等 30 项；排 1 获得教育部科技进步一等奖、江苏省科技进步一等奖、华为火花奖；担任《IEEE Transactions on Intelligent Vehicles》、《Journal of Intelligent and Connected Vehicles》、《Chinese Journal of Mechanical Engineering》、《机械工程学报》、《中国公路学报》等期刊副主编或编委。发表高水平论文近 150 篇，主编 3 部学术著作，授权 78 件发明专利。

梁晋豪目前是新加坡国立大学土木与环境工程系的助理研究员。他的研究兴趣主要集中在车辆动力学与控制、智能联网和自动驾驶车辆、电动车辆、车辆-道路协同控制等方面。在国际期刊和会议论文集上发表了 30 多篇论文，拥有 10 多项有关车辆系统动力学和控制的专利。他曾在第一届世界智能驾驶挑战赛上荣获自动紧急制动辅助系统（AEB）的领先奖。他还担任国际自动化与智能技术会议的国际程序委员会委员，并受邀担任 2023 年第六届国际机械工

程与应用复合材料会议的演讲嘉宾。

方振伍目前是新加坡国立大学土木与环境工程系的助理研究员。研究方向为车辆动力学与控制、线控转向控制、人机共享控制等。在国际学术期刊和论文集上发表论文 10 余篇。拥有 10 多项线控转向和 ADAS 专利。荣获 2023 年国际大学生创新创业大赛国家银奖。担任 IEEE Trans TE、IV、ITS 等期刊审稿人。负责厦门金龙联合汽车工业有限公司商用车电液耦合线控转向系统项目开发，中国商飞信息技术有限公司数字孪生自动驾驶 HIL 平台开发。

武健于 2015 年获得南京航空航天大学车辆工程博士学位，2016 年至 2018 年在清华大学开展了两年博士后研究，他目前是聊城大学的教授。在国际期刊和会议论文集上发表了 50 多篇论文，拥有 10 多项有关车辆系统动力学及控制的专利。他的研究兴趣包括人车系统动力学，人车自动化协作和共享控制。

王法安，昆明理工大学助理教授，现就职于昆明理工大学。研究方向为智能运输装备关键技术，包括智能环境感知、多传感器信息融合、激光与视觉 SLAM、自主决策与运动控制系统等。主要社会兼职有：中国农业工程学会会员、中国农业机械学会会员、中国汽车工程学会会员、农业机械化与电气化专业委员会委员、中国农业机械学会青年委员会委员、中国农业机械学会农机维修分会委员、云南省农业工程学会会员、云南省农业机械学会副秘书长。

特邀专题简介

随着智能交通和人工智能的发展，车辆自动化已成为改善交通安全和减轻驾驶员工作负担的有效方法。由于复杂的交通环境和法律问题，完全自动驾驶汽车在不久的将来很难实现。智能汽车的自动化水平在完全自动化之前仍处于人机共享阶段。人为因素问题是共享控制系统设计的关键，以确保车辆安全和驾驶员对辅助系统的接受度。此外，由于有人驾驶汽车（HDV）和自动驾驶汽车（AV）的共存，多车系统中的人机交互问题也是影响智能交通系统效率和安

全性的重要因素。由于人类代理的意图和行为的随机性和多变性，这些场景带来了严重的安全挑战，因此需要估计其先验未知的轨迹并将其集成到规划算法中。最近的一些研究已经意识到了这一点，并利用驾驶员-车辆动力学建模、车辆-行人博弈控制和风险评估技术开发了许多方法。尽管如此，驾驶员对交通流风险感知的特征仍需进一步探索，以增强机器对人类行为的准确理解。重型货车与自动驾驶汽车之间的博弈互动需要准确的风险感知预测。在人类社会行为的互动下，如何优化自动驾驶汽车的行为也是提高交通系统安全性和智能化水平的重要技术。我们希望以此次会议为基础，吸收和贡献智能交通领域的优秀见解，推动新时代智能交通的发展。

本特邀专题邀请以下与“人机混驾交通系统交互行为建模、优化与决策控制”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。

- 自动驾驶汽车的人为因素优化
- 智能汽车的人机动力学建模
- 交叉路口行人-车辆社会动力学建模
- 混合交通流中的风险感知预测
- 人类（驾驶员、行人）行为意图预测与风险评估
- 协作车辆
- 高级驾驶辅助系统
- 人工智能和机器学习在人车系统中的应用
- 多车系统中的人机博弈控制
- 安全可靠的自动驾驶算法

IEEE ICUS 2025
Invited Session Summary

Title of Session

Modeling, Optimization and Game Control of Human-Machine Interaction Behavior in Intelligent Transportation Systems

Organizers

1. Prof. Guodong Yin

Southeast University, China

2. Dr. Jinhao Liang

National University of Singapore, Singapore

3. Dr. Zhenwu Fang

National University of Singapore, Singapore

4. Prof. Jian Wu

Liaocheng University, China

5. Asst. Prof. Faan Wang

Kunming University of Science and Technology, China

Biosketches of Organizers

Prof. Guodong Yin is currently a Professor at Southeast University. He is the recipient of the National Science Fund for Distinguished Young Scholars, Fellow of China-SAE, Chief Professor at Southeast University, and Director of the Academic Affairs Office at Southeast University. He also serves as a member of the Engineering Training Teaching Advisory Committee of the Ministry of Education, a council member of the Society of Automotive Engineers of China, and Vice Chair of the Vehicle Control and Intelligence Subcommittee of the Chinese Association of Automation, among other roles. His primary research areas include vehicle dynamics and control, electric and intelligent connected vehicles, vehicle-to-everything (V2X) communication, and vehicle-road collaboration. He has led 30 major research projects, including Key Projects of the National Natural Science Foundation, Major Projects of the National Natural Science Foundation, and National Key R&D Program Projects. He has been awarded the First-Class Scientific and Technological Progress Award from the Ministry of Education, the First-Class Scientific and Technological Progress Award

from Jiangsu Province, and the Huawei Spark Award. He serves as an associate editor or editorial board member for several leading journals, including IEEE Transactions on Intelligent Vehicles, Journal of Intelligent and Connected Vehicles, Chinese Journal of Mechanical Engineering, Journal of Mechanical Engineering, and China Journal of Highway and Transport. He has published nearly 150 high-quality papers, edited three academic books, and holds 78 authorized invention patents.

Dr. Jinhao Liang is currently a Research Fellow with Department of Civil and Environmental Engineering, National University of Singapore, Singapore. His research interests have focused on the vehicle dynamics and control, connected and autonomous vehicles, electric vehicles, vehicle-road cooperative control, etc. Moreover, Dr. Jinhao liang has published more than 50 papers in Journals and proceedings of international conferences. 10+ patents on Vehicle System dynamics and control. He won the Leading Prize for Autonomous Emergency Braking (AEB) assistance system at the 1st World Intelligent Driving Challenge. He serves as a member of the international program committee for the 2024 International Conference on Automation and Intelligent Technology. Moreover, he is an invited speaker at the 2023 6th International Conference on Mechanical Engineering and Applied Composite Materials.

Dr. Zhenwu Fang is currently a Research Fellow with Department of Civil and Environmental Engineering, National University of Singapore, Singapore. His research interests have focused on the vehicle dynamics and control, steering-by-wire control, human-machine shared control, etc. Moreover, Zhenwu Fang has published more than 10 papers in Journals and proceedings of international conferences and 20+ patents on steering-by-wire control and ADAS. He won the National Silver Award in the International College Student Innovation and Entrepreneurship Competition (2023). He served as a reviewer for IEEE Trans TE, IV, ITS and other journals. Additionally, He was responsible for the development of the commercial vehicle electro-hydraulic coupling steering system project, funded by Xiamen Jinlong United Automotive Industry Co., Ltd. He developed the digital twin autonomous driving HIL platform for Shenzhen Research Institute and COMAC Information Technology Co., Ltd.

Jian Wu received the Ph.D. degree in Vehicle Engineering from Nanjing University of Aeronautics and Astronautics in 2015, and did two years research at Tsinghua University as a postdocor from 2016 to 2018. He is a Professor at Liaocheng University. Prof. Jian Wu has published more than 50 papers in Journals and proceedings of international conferences. 10+ patents on Vehicle System dynamics and control. His research interests include driver-vehicle system dynamics, driver-vehicle automation collaboration and shared control.

Faan Wang, Assistant Professor, Kunming University of Science and Technology. His research interests are key technologies of intelligent transport equipment, including intelligent environment perception, multi-sensor information fusion, laser and visual SLAM, autonomous decision making and motion control system. The main social part-time jobs are: Member of the Chinese Society of Agricultural Engineering, member of the Chinese Society of Agricultural Machinery, member of the Chinese Society of Automotive Engineering, member of the Professional Committee of Agricultural Mechanization and Electrification, member of the Youth Committee of the Chinese Society of Agricultural Machinery, member of the Agricultural Machinery Maintenance Branch of the Chinese Society of Agricultural Machinery, member of the Yunnan Society of Agricultural Engineering, Deputy Secretary-General of the Yunnan Society of Agricultural Machinery.

Details of Session

With the development of intelligent transportation and artificial intelligence, the vehicle automation has become an effective approach to improve traffic safety and reducing driver workload. Due to the complex traffic environment and legal issues, fully autonomous vehicles will be difficult to realize in the near future. The automation level of intelligent vehicles remains in the human-machine shared stage before full automation. Human factor issues are key to the design of shared control systems to ensure vehicle safety and driver acceptance of assistance systems. Furthermore, due to the coexistence of human-driven vehicles (HDVs) and autonomous vehicles (AVs), human-machine interaction issues in multi-vehicle systems are also important factors affecting the efficiency and safety of intelligent transportation systems. These scenarios pose serious security challenges due to the

randomness and variability of human agents' intentions and behaviors, thus requiring their a priori unknown trajectories to be estimated and integrated into planning algorithms. Some recent works have been aware of this and develop many methods with the driver-vehicle dynamics modeling, vehicle- pedestrian game control, and risk evaluation technique. Nevertheless, the characteristics of drivers' risk perception of traffic flow still need to be further explored to enhance the machine's accurate understanding of human behavior. The gaming interaction between HDVs and AVs requires accurate risk-aware prediction. Under the interaction of human social behavior, how to optimize the actions of autonomous vehicles is also an important technology to improve the safety and intelligence level of the transportation system. Based on this session, we want to absorb and contribute excellent insight in ITS, and promote the development of intelligent transportation in new era.

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 "Modeling, Optimization and Game Control of Human-Machine Interaction Behavior in Intelligent Transportation Systems".

- Human Factor Optimization for Autonomous Vehicles
- Human-machine Dynamics Modeling for Intelligent Vehicles
- Pedestrian-Vehicle Social Dynamics Modeling at Intersections
- Risk-Aware Prediction in a Mix Traffic Flow
- Human (Driver, Pedestrian) Behavioral Intention Prediction and Risk Assessment
- Cooperative Vehicles
- Advanced Driver Assistance Systems
- Application of AI and Machine Learning for Driver-Vehicle System
- Human-Machine Game Control in a Multi-Vehicle System
- Safe and Trustworthy Autonomous Driving Algorithm