类脑智能与智能控制论坛

第一期

程序册
Final Program

主办单位：华中科技大学人工智能与自动化学院

华中科技大学人工智能研究院

协办单位：图像信息处理与智能控制教育部重点实验室

会议日程：

2022 年 4 月 9 日

报告人	单位	报告主题	时间	主持人
Qing-Long Han	澳大利亚斯威本科技大学	**Towards Resource-Efficient and Secure Automated Vehicle Platoons**	**15:00-15:45**	肖强
Peng Shi	澳大利亚阿德莱德大学	**Intelligent Control for Multi-agent Systems**	**15:45-16:30**	刘慧
Zidong Wang	英国布鲁内尔大学	**PID Control Meets Networked Systems: The State-Space Approach**	**16:30-17:15**	盛银
Wen-Hua Chen	英国拉夫堡大学	**Dual Control for Exploration and Exploitation (DCEE) in Autonomous Search**	**17:15-18:00**	来金钢

以上时间为北京时间

腾讯线上会议 (ID: 922-397-537)

会议主题：类脑智能与智能控制论坛
会议时间：2022/04/09 15:00-18:00 (GMT+08:00) 中国标准时间 - 北京

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https://meeting.tencent.com/dm/g0goYYToqxIx

#腾讯会议：922-397-537

报告 1

Towards Resource-Efficient and Secure Automated Vehicle Platoons

Qing-Long Han

School of Science, Computing and Engineering Technologies,
Swinburne University of Technology, Australia

Abstract: Vehicle platooning has been regarded as a promising intelligent transportation system technology for achieving cooperative automated driving systems and automated highway systems due to its promising benefits, including improved road safety, highway capacity and traffic congestion relief, and reduced fuel consumption. Two critical challenges of accomplishing automated vehicle platoons are: 1) to deal with the intermittent and sporadic vehicle-to-vehicle data transmissions caused by limited wireless communication resources; and 2) to tackle the malicious cyber-attacks on the vehicle-to-vehicle communication channels.

The essentials of evolutionary platooning control technologies are first introduced for connected automated vehicles. After a brief historical background of connected automated vehicles and vehicle platooning, several key issues in the design and implementation of an automated vehicle platooning control system are elaborated. An emphasis is then placed on two emerging platooning control techniques: resource-efficient vehicle platooning and secure vehicle platooning. Furthermore, simulation and validation results under these two control techniques are presented. Finally, some challenging issues and concluding remarks are drawn.

Biography

Professor Han is Pro Vice-Chancellor (Research Quality) and a Distinguished Professor at Swinburne University of Technology, Melbourne, Australia. He held various academic and management positions at Griffith University and Central Queensland University, Australia.

Professor Han was awarded The 2021 Norbert Wiener Award (the Highest Award in systems science and engineering, and cybernetics), The 2021 M. A. Sargent Medal (the Highest Award of the Electrical College Board of Engineers Australia), The 2021 IEEE/CAA Journal of Automatica Sinica Norbert Wiener Review Award, The 2020 IEEE Systems, Man, and Cybernetics (SMC) Society Andrew P. Sage Best Transactions Paper Award, The 2020 IEEE Transactions on Industrial Informatics Outstanding Paper Award, and The 2019 IEEE SMC Society Andrew P. Sage Best Transactions Paper Award.

Professor Han is a Member of the Academia Europaea (The Academy of Europe). He is a Fellow of The Institute of Electrical and Electronic Engineers (IEEE) and a Fellow of The Institution of

Engineers Australia. He is a Highly Cited Researcher. He has served as an AdCom Member of IEEE Industrial Electronics Society (IES), a Member of IEEE IES Fellows Committee, and Chair of IEEE IES Technical Committee on Network-based Control Systems. Currently, he is Co-Editor-in-Chief of IEEE Transactions on Industrial Informatics, Deputy Editor-in-Chief of IEEE/CAA Journal of Automatica Sinica, Co-Editor of Australian Journal of Electrical & Electronics Engineering. He has served as an Associate Editor for 12 international journals including IEEE Transactions on Cybernetics, IEEE Industrial Electronics Magazine, Control Engineering Practice， Information Sciences, and a Guest Editor for 14 Special Issues.

报告 2

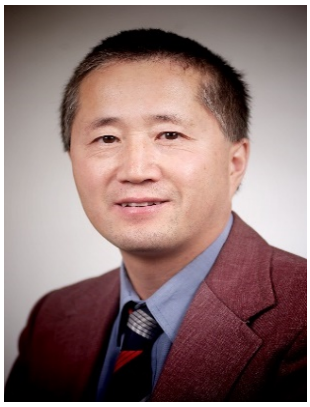
Intelligent Control for Multi-agent Systems

Peng Shi

School of Electrical and Electronic Engineering,
University of Adelaide, Australia

Abstract: A multi-agent system (MAS) is a group of entities, referred to as agents, working together for a common goal. As the agents often work under complex circumstances, unreliable networks due to potential cyberattacks, and incomplete local information, including system uncertainty, limitations of the hardware, and unknown environment, threaten the reliability and efficiency of their collaborations. In this talk, the design of intelligent control approaches, including neural networks, reinforcement learning, and resilient control, will be presented to support resilient interaction and optimal performance of consensus and dynamic formations for MASs. A robust and distributed framework will also be introduced for harmonious collaborations of heterogenous MASs consisting of different entities. Simulation and Lab experimental results will be given to demonstrate the effectiveness of the proposed design algorithms and schemes.

Biography



Peng Shi received the Doctor of Philosophy in Electrical Engineering from the University of Newcastle, Australia, and the Doctor of Philosophy degree in Mathematics from the University of South Australia. He was awarded two higher doctorates--Doctor of Science degree from the University of Glamorgan, UK in 2006, and the Doctor of Engineering degree from the University of Adelaide, Australia in 2015. He is now a Professor at the School of Electrical and Electronic Engineering, and the Director of Advanced Unmanned Systems Laboratory, at the University of Adelaide, Australia. His research interests include systems and control theory and applications to network systems, robotic and autonomous systems, cyber-physical systems, and intelligent systems. He has been continuously recognized as a Highly Cited Researcher in both fields of engineering and computer science by Clarivate Analytics/Thomson Reuters since 2014. He has also been acknowledged in the Lifetime Achiever Leader Board in engineering and information technology, and honored as the Field Leader by THE AUSTRALIAN Research Review from 2019 to 2021. He has served on the editorial board for many journals, including Automatica, and IEEE Transactions on (Automatic Control, Circuits and Systems, Fuzzy Systems), and IEEE Control Systems Letters. Now he serves as the Editor-in-Chief of IEEE Transactions on Cybernetics, Co-Editor of Australian Journal of Electrical and Electronic Engineering, and Senior Editor of IEEE Access. His professional services

also include as the President of the International Academy for Systems and Cybernetic Sciences, the Vice President of IEEE SMC Society, and IEEE Distinguished Lecturer. He is a Member of the Academy of Europe, a Fellow of IEEE, IET, IEAust and CAA.

报告 3

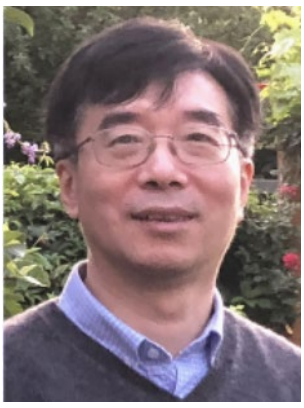
PID Control Meets Networked Systems: The State-Space Approach

Zidong Wang

Department of Computer Science,
Brunel University, United Kingdom

Abstract: In this presentation, we talk about the PID controller and PI observer design problems for networked stochastic systems. Some background knowledge is first introduced on traditional PID control from the perspectives of concepts, applications and challenges. Then, some detailed discussions are given on the state-space representation of the PID control problem for networked systems under network-induced phenomena, communication protocols or cyber-attacks. Both the stability and performance indices are justified in the framework of PID controller and PI observer design, and a few recent results are presented. Finally, we conclude our main contributions and some future directions.

Biography



王子栋，现任英国伦敦 Brunel University 讲席教授，欧洲科学院院士，欧洲科学与艺术院院士，IEEE Fellow，International Journal of Systems Science 主编，Neurocomputing 主编。多年来从事控制理论、机器学习、生物信息学等方面研究，在 SCI 刊物上发表国际论文六百余篇。现任或曾任十二种国际刊物的主编、副编辑或编委。曾任旅英华人自动化及计算机协会主席、东华大学长江学者讲座教授、清华大学国家级专家。

报告 4

Dual Control for Exploration and Exploitation (DCEE) in Autonomous Search

Wen-Hua Chen

Department of Aeronautical and Automotive Engineering,
Loughborough University, United Kingdom

Abstract: Autonomous search through airborne dispersion widely exists in the natural world from animals searching food with odour to insects seeking mating in frost. Using the same principle, a robot can be designed to autonomously search sources of chemical, biological and radiological hazardous substance, which can find a wide range of applications including environment protection, disaster management and anti-terrorism. This talk outlines the information theoretic approaches and control-oriented approaches for the autonomous search problem. A recently proposed Dual Control for Exploration and Exploitation (DCEE) is highlighted where the control action not only drives an agent moving towards a believed location of the source but also aims to reduce the uncertainty of the belief by actively exploring the unknown environment. The proposed algorithms have been implemented on ground robotics and drones using Bayesian estimation and particle filtering. Experiments show that DCEE outperforms the existing informative path planning and control-oriented search methods. It is argued that DCEE provides a promising alternative to reinforcement learning for many applications, particularly where the data set is small or expensive, or the environment are varying.

Biography

Wen-Hua Chen holds Professor in Autonomous Vehicles in the Department of Aeronautical and Automotive Engineering at Loughborough University, UK. Prof. Chen has a considerable experience in control, signal processing and artificial intelligence and their applications in aerospace, automotive and agriculture systems. In the last 15 years, he has been working on the development and application of unmanned aircraft system and intelligent vehicle technologies, spanning autopilots, situational awareness, decision making, verification, remote sensing for precision agriculture and environment monitoring. His unmanned vehicles related research is widely supported by the UK government and industry. He is a Chartered Engineer, and a Fellow of IEEE, the Institution of Mechanical Engineers and the Institution of Engineering and Technology, UK. Recently Prof Chen was awarded the EPSRC Established Career Fellowship in developing new control theory for robotics and autonomous systems.