2017网络控制与信息融合论坛

2017 Workshop for Network Control and Information Fusion

程 序 册

大连理工大学 电信学部

2017年12月25日

2017 网络控制与信息融合论坛

时间：2017 年 12 月 25-27 日

地点：大连理工大学电信学部创新园大厦 B201

12 月 26 日（星期二）上午 主持人：王伟教授		
时　间	报告人	报告题目
08:30-10:00	Changyun Wen	**Non-recursive Controller Design Approach for Nonlinear Systems**
10:00-10:20		茶歇
10:20-11:20	刘集	**Analysis and Control of Epidemic Spreading on Networks**
12 月 26 日（星期二）下午 主持人：孙希明教授		
14:00-15:30	Minyue Fu	**Distributed Approaches to Estimation, Control and Localization**
15:30-15:45		茶歇
15:45-16:45	柳振鑫	**Stochastic Stability of Dynamical Systems**
12 月 27 日（星期三）上午 主持人：赵珺教授		
时　间	报告人	报告题目
08:30-10:00	Henry Leung	**An Integrated Decision Support System Based on the Human OODA Loop**
10:00-10:20		茶歇
10:20-11:20	孟子阳	智能集群系统的理论与应用

Non-recursive Controller Design Approach for Nonlinear Systems
Changyun Wen

Nanyang Technological University, Singapore

报告时间：**2017 年 12 月 26 日(周二)** 上午 **8:30-10:00**

报告地点：大连理工大学电信学部创新园大厦 B201

About the Speaker

Changyun Wen received B.Eng. degree from Xi'an Jiaotong University, China in 1983 and Ph.D. degree from the University of Newcastle, Australia in 1990. From August 1989 to August 1991, he was a Postdoctoral Fellow at University of Adelaide. Since August 1991, he has been with School of EEE, Nanyang Technological University, where he is currently a Full Professor. His main research activities are in the areas of control systems and applications, intelligent power management system, intelligent mobile robots, cyber-physical systems.

He is an Associate Editor of a number of journals including Automatica, IEEE Transactions on Industrial Electronics and IEEE Control Systems Magazine. He is the Executive Editor-in-Chief, Journal of Control and Decision. He served the IEEE Transactions on Automatic Control as an Associate Editor from January 2000 to December 2002. He has been actively involved in organizing international conferences playing the roles of General Chair, General Co-Chair, Technical Program Committee Chair, Program Committee Member, General Advisor, Publicity Chair and so on. He received the IES Prestigious Engineering Achievement Award 2005 from the Institution of Engineers, Singapore (IES) in 2005. He received the Best Paper Award of IEEE Transactions on Industrial Electronics in 2017.

He is a Fellow of IEEE, a member of IEEE Fellow Committee from January 2011 to December 2013 and a Distinguished Lecturer of IEEE Control Systems Society from February 2010 to February 2013.

Abstract

Control design for nonlinear systems has been extensively studied in recent years. Two of the main approaches are using backstepping technique and the adding a power integrator design based on homogeneous system theory. However, the recursive design complexity and pre-required restrictive conditions are well acknowledged in control theory community. This results in limited practical implementations of the designed smooth/nonsmooth controllers, compared to the blossom of theoretical results. This talk will first give a brief introduction of a novel non-recursive synthesis approach. Then by considering a less ambitious but more practical semi-global control objective, less complicated controller can be designed even without some of the existing restrictive conditions.

Analysis and Control of Epidemic Spreading on Networks
刘集
Stony Brook University, USA
报告时间：**2017 年 12 月 26 日(周二) 上午 10:20-11:20**
报告地点：大连理工大学电信学部创新园大厦 B201

About the Speaker

Ji Liu received the B.S. degree in information engineering from Shanghai Jiao Tong University, Shanghai, China, in 2006, and the Ph.D. degree in electrical engineering from Yale University, New Haven, CT, USA, in 2013. He is currently an Assistant Professor in the Department of Electrical and Computer Engineering at Stony Brook University, Stony Brook, NY, USA. Prior to joining Stony Brook University, he was a Postdoctoral Research Associate at the Coordinated Science Laboratory, University of Illinois at Urbana-Champaign, Urbana, IL, USA, and the School of Electrical, Computer and Energy Engineering at Arizona State University, Tempe, AZ, USA. His current research interests include distributed control and computation, multi-agent systems, social networks, epidemic networks, and power networks.

Abstract

The talk will address a distributed continuous-time bi-virus model for a system of groups of individuals. An in-depth stability analysis will be performed on a more generic model than has been explored in previous work, for both the disease free equilibrium and non-disease free equilibria. In addition, we will investigate sensitivity properties of nontrivial equilibria, and show an impossibility result for a distributed feedback control.

Distributed Approaches to Estimation, Control and Localization

Minyue Fu

University of Newcastle, Australia

报告时间：**2017** 年 **12** 月 **26** 日(周二) 下午 **14:00-15:30**

报告地点：大连理工大学电信学部创新园大厦 B201

About the Speaker

Minyue Fu received the B.Sc. degree in electrical engineering from the University of Science and Technology of China, Hefei, China, in 1982, and the M.S. and Ph.D. degrees in electrical engineering from the University of Wisconsin-Madison, Madison, WI, USA. in 1983 and 1987, respectively. From 1987 to 1989, he was an Assistant Professor in the Department of Electrical and Computer Engineering, Wayne State University, USA. He joined the Department of Electrical and Computer Engineering at the University of Newcastle, Australia, in 1989, where he is a Chair Professor of Electrical Engineering. He has been Visiting Professors at the University of Iowa, USA, Nanyang Technological University, Singapore and Tokyo University, Tokyo, Japan. He has held ChangJiang Visiting Professorship at Shandong University, Jinan, China, Qian-ren Professorship at Zhejiang University, China, and Qian-ren Professorship at Guangdong University of Technology, China. He has been an Associate Editor for the IEEE Transactions on Automatic Control, Automatica, IEEE Transactions on Signal Processing, and the Journal of Optimization and Engineering. His main research interests include control systems, signal processing, and communications. His current research projects include networked control systems, distributed control, smart electricity networks, and super-precision positioning control systems. He is a Fellow of IEEE.

Abstract

In many applications, a network of autonomous agents holds eminent promises to achieve a desired level of performance, capability, robustness, and efficiency beyond what a single agent can achieve. However, to be advantageous, multiple agents have to work in an coordinated and synchronized manner. This talk considers a network of agents (or sub-systems) and seeks a distributed algorithm to steer the agents so that a global objective is achieved. Three distributed optimization problems will be discussed, namely, distributed estimation, distributed control and distributed localization. Firstly, we will study the weighted least squares (WLS) estimation problem for a networked system and offer a fully distributed algorithm for optimal WLS estimation. This algorithm is then extended to distributed average consensus and distributed Kalman filtering for networked systems. Secondly, we will investigate the formation control for a networked multi-agent systems. We will present a new approach for 2-dimensional and higher dimensional formation. A necessary and sufficient condition will be given in terms of a new type of graph connectedness, called rooted connectivity. A linear distributed control law will be provided using relative position measurements on the local frames attached to the agents. Finally, we will study distributed localization problems for a network of sensors where relative measurements and information exchange between neighbouring sensors are used to determine the physical locations of individual sensors. Several distributed solutions will be discussed.

Stochastic Stability of Dynamical Systems
柳振鑫
大连理工大学
报告时间：**2017 年 12 月 26 日(周二) 下午 15:45-16:45**
报告地点：大连理工大学电信学部创新园大厦 B201

About the Speaker

柳振鑫，大连理工大学数学科学学院教授、博士生导师，优秀青年科学基金获得者。主要从事随机动力系统的研究；在随机 Conley 指标理论、随机动力系统中的回复运动等方面做出系统深入的研究工作。在《Annals of Probability》、《Journal of Functional Analysis》、《Journal of Differential Equations》、《Physica D》、《SIAM Journal on Applied Dynamical Systems》、《Nonlinearity》等高水平杂志发表学术论文 30 篇。曾获得全国百篇优秀博士学位论文提名奖。

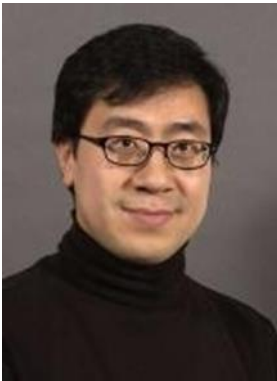## An Integrated Decision Support System Based on the Human OODA Loop

Henry Leung

University of Calgary, Canada

报告时间：**2017 年 12 月 27 日(周三) 上午 8:30-10:00**

报告地点：大连理工大学电信学部创新园大厦 B201

About the Speaker

Henry Leung is a professor of the Department of Electrical and Computer Engineering of the University of Calgary. Before joining U of C, he was with the Department of National Defence (DND) of Canada as a defence scientist. His main duty there was to conduct research and development of automated surveillance systems, which can perform detection, tracking, identification and data fusion automatically as a decision aid for military operators. His current research interests include big data analytic, chaos and nonlinear dynamics, information fusion, machine learning, signal and image processing, robotics and internet of things. He has published extensively in the open literature on these topics. He has over 200 journal papers and 200 refereed conference papers. Dr. Leung has been the associate editor of various journals such as the IEEE Circuits and Systems Magazine, International Journal on Information Fusion, IEEE Signal Processing Letters, IEEE Trans. Circuits and Systems. He has also served as guest editors for the special issue "Intelligent Transportation Systems" for the International Journal on Information Fusion and "Cognitive Sensor Networks" for the IEEE Sensor Journal. He is the topic editor on "Robotic Sensors" of the International Journal of Advanced Robotic Systems. He is the editor of the Springer book series on "Information Fusion and Data Science". He is a Fellow of the IEEE and SPIE.

Abstract

In this talk we present our works on decision support systems. The proposed decision support process follows the human decision making processing, namely, the observe-orient-decide-action (OODA) loop structure. The observe component consists of the sensing functions including object detection, target tracking, object recognition, and sensor fusion. The second part of the proposed decision support system is the orient function which carries out operations such as situation assessment, treat evaluation. Based on the assessment, the system will try to decide. If the uncertainty is high, actions including resource allocation, planning will be performed so that the system can try to make a better decision. A goal-driven net-enabled distributed sensing for large area surveillance will be used for illustration. Multiple platforms including mobile such as maritime patrol aircraft, helicopters, unmanned aerial vehicles, and ships and fixed surveillance assets such as land radar are deployed to identify, assess and track moving, stopped or drifting objects in a large geographic area. A simultaneous registration, association and fusion method is proposed for lower level information fusion, and machine intelligence is applied for situation assessment and path planning. We will also demonstrate the application of the proposed OODA loop decision support system to robotics.

智能集群系统的理论与应用
孟子阳
清华大学
报告时间：**2017** 年 **12** 月 **27** 日(周三) 上午 **10:20-11:20**
报告地点：大连理工大学电信学部创新园大厦 B201

About the Speaker

<u>孟子阳</u>，清华大学副教授，博士生导师，国家千人计划（青年人才项目）入选者，洪堡学者基金获得者。2006 年和 2010 年分别获得华中科技大学学士学位和清华大学博士学位。2008 年到 2009 年在美国犹他州立大学交流访问。2010 年至 2015 年先后在中国上海交通大学，瑞典皇家理工学院，德国慕尼黑工业大学从事博士后研究工作。2015 年进入清华大学精密仪器系工作，主要从事群体智能控制与优化，智能物联系统及微纳航天器的研究工作。在国际重要刊物和学术会议上发表 SCI/EI 检索论文 70 余篇，其中 SIAM 汇刊，IEEE 汇刊，IFAC 汇刊论文近 30 篇。论文累计被引用 1800 余次，5 篇论文入选 ESI 高被引用论文.作为项目负责人或骨干成员主持或参与国家自然科学基金，装备预研教育部联合基金，总装预研基金，博士后科学基金，国家重点研发计划，国家 863 项目，专项预研等项目 10 余项。

Abstract

报告首先对智能集群系统及我们的相关研究成果进行简单的介绍，主要包括群体系统的关联模型与行为分析，复杂环境下的集群控制方法，智能物联系统，以及微纳卫星系统。接下来，具体汇报近期的三个理论研究结果，包括极端工况下的系统状态同步，存在相对状态测量误差的编队控制行为，以及多自主体的集合聚集。最后，简要介绍清华大学研制的 NS-2，ZJ1/2 卫星编队。