



IEEE 第 12 届自抗扰控制研讨会

----纪念韩京清先生逝世十周年

IEEE 12th Workshop on Active Disturbance Rejection Control
-- In Memory of Prof. Jingqing Han on the 10th Anniversary of His Passing

程序册初版

Initial Program

主办单位

中国科学院系统控制重点实验室
中国科学院国家数学与交叉科学中心
中国科学院数学与系统科学研究院

协办单位

IEEE 控制系统北京分会, 清华大学能源与动力工程系, 华北电力大学控制与计算机工程学院

Sponsoring Organizations

Key Lab of Systems and Control, Chinese Academy of Sciences
National Center for Mathematics and Interdisciplinary Sciences, Chinese Academy of Sciences
Academy of Mathematics and Systems Science, Chinese Academy of Sciences
IEEE Control Systems Society (CSS) Beijing Chapter
Department of Energy and Power Engineering, Tsinghua University
School of Control and Computer Engineering, North China Electric Power University

2018 年 7 月 19-21 日, 中国·北京
July 19-21, 2018, Beijing, China



程序委员会(Program Committee)

主席(Chair): 黄一 Academy of Mathematics and Systems Science, CAS

协主席(Co-Chair): 高志强 Cleveland State University, U.S.A.

苏剑波 Shanghai Jiao Tong University

组织委员会(Organizing Committee)

主席(Chair): 薛文超 Academy of Mathematics and Systems Science, CAS

协主席(Co-Chair): 李东海 Tsinghua University

黄从智 North China Electric Power University

会议联系人 (Contact Information)

薛文超: 15810081067

黄从智: 13717835522

本次研讨会不收注册费, 参会人员食宿自理。

Registration: Free

请有意向参会的人员填写回执单 (用于为参会人员提供挂牌等服务), 并将回执单于 5 月 20 日前通过电子邮件发送到 adrc2018@sohu.com

辽宁大厦, 北京市海淀区北四环西路甲二号(保福寺桥东南角)
Liaoning International Hotel, No.2 A, North 4th Ring Road West, Haidian District, Beijing

2018 年 7 月 19-21 日, 中国·北京
July 19-21, 2018, Beijing, China

目录

会议程序总览 (Program at a Glance)	1
会前专题讲座 (Pre-conference Tutorial).....	2
邀请报告-1 (Plenary Lecture 1)	3
邀请报告-2 (Plenary Lecture 2)	4
邀请报告-3 (Plenary Lecture 3)	5
邀请报告-4 (Plenary Lecture 4)	6
专题研讨会-1 (Panel Discussion 1)	7
专题研讨会-2 (Panel Discussion 2)	8
专题研讨会-3 (Panel Discussion 3)	9
专题研讨会-4 (Panel Discussion 4)	10
专题研讨会-5 (Panel Discussion 5)	11
专题研讨会-6 (Panel Discussion 6)	12
专题研讨会-7 (Panel Discussion 7)	13
专题研讨会-8 (Panel Discussion 8)	14
交通和会场位置 (Transportation and Venue Location).....	15

会议程序总览 (Program at a Glance)

会议地点: 辽宁大厦沈阳厅

Venue: Shenyang Meeting Room, Liaoning International Hotel

7月19日 08:30-12:00 July 19, 08:30-12:00	会前专题讲座(Pre-Conference Tutorial), 主席(Chair): Zhiqiang Gao Engineering Practice and Theoretical Foundation of ADRC
7月19日 14:00-15:00 July 19, 14:00-15:00	邀请报告(Plenary Lecture), 报告人(Lecturer): H. Sira-Ramírez Active Disturbance Rejection and Flat Filters in the Control of Nonlinear Systems
7月19日 15:00-16:00 July 19, 15:00-16:00	邀请报告(Plenary Lecture), 报告人(Lecturer): Wen-hua Chen Nonlinear Disturbance Observer Technique and Its application in Small Scale Unmanned Aerial Vehicles
茶歇 (Tea break)	
7月19日 16:20-17:20 July 19, 16:20-17:20	邀请报告(Plenary Lecture), 报告人(Lecturer): Zhiqiang Gao Engineering Cybernetics and Artificial Intelligence: a Shared Heritage and the Quest for Understanding
7月20日 08:30-10:00 July 20, 08:30-10:00	专题研讨会(Panel Discussion): 行业性问题与自抗扰控制: 电力系统 Industry Cluster Problems and ADRC: Power Systems 主席(Chair): 李东海(Donghai Li)
茶歇 (Tea break)	
7月20日 10:20-11:50 July 20, 10:20-11:50	专题研讨会(Panel Discussion): 行业性问题与自抗扰控制: 机器人 Industry Cluster Problems and ADRC: Robot Systems, 主席(Chair): 苏剑波(Jianbo Su)
7月20日 13:30-15:00 July 20, 13:30-15:00	专题研讨会(Panel Discussion): 行业性问题与自抗扰控制: 飞行控制系统 Industry Cluster Problems and ADRC: Flight control systems, 主席(Chair): 孙明玮(Mingwei Sun)
茶歇 (Tea break)	
7月20日 15:20-16:20 July 20, 15:20-16:20	邀请报告(Plenary Lecture), 报告人(Lecturer): Yangquan Chen Bode's ideals are fractional order – from Bode's ideal gain crossover (BIGC) behavior to Bode's ideal cut-off (BICO) behavior
7月20日 16:20-17:50 July 20, 15:20-16:20	专题研讨会 (Panel Discussion): 分数阶与自抗扰控制 Fractional Order and ADRC 主席(Chair): Yangquan Chen
7月21日 08:30-10:00 July 21, 08:30-10:00	专题研讨会(Panel Discussion): 汽车工程中的主动抗扰控制: 问题与对 Active Disturbance Rejection Control in Automotive: challenges and solutions 主席(Chair): 谢辉(Hui Xie)
茶歇 (Tea break)	
7月21日 10:20-11:50 July 21, 10:20-11:50	专题研讨会(Panel Discussion): 数据驱动和学习与自抗扰控 Data Driven, Learning and ADRC 主席(Chair): 侯忠生(Zhongsheng Hou)
7月21日 13:30-15:00 July 20, 13:30-15:00	专题研讨会(Panel Discussion): 行业性问题与自抗扰控制: 运动控制 Industry Cluster Problems and ADRC: Motion Control Systems 主席(Chair): 李世华(Shihua Li)
茶歇 (Tea break)	
7月21日 15:20-17:00 July 21, 15:20-17:00	专题研讨会(Panel Discussion): 抗扰控制思想、理论与方法的发展 Principles, Theory and Methodology of Disturbance Rejection Control 主席(Chair): 郭雷 (Lei Guo, Beihang Univeristy)
7月21日 17:00-18:00, July 21, 17:00-18:00 讨论 (Discussion)	

会前专题讲座 (Pre-conference Tutorial)

7月19日08:30-12:00
辽宁大厦沈阳厅

July 19, 08:30-12:00
Shenyang Meeting Room

Engineering Practice and Theoretical Foundation of ADRC

主席(Chair): Zhiqiang Gao (Cleveland State University, U.S.A.)

Time	Lecturer, Title and Abstract
8:30-9:20	<p>Lecturer, 黄一(Yi Huang), Academy of Mathematics and Systems Science, CAS</p> <p>Title: 学习自抗扰之路 (On the Road: Understanding ADRC)</p> <p>Abstract: The talk aims to share the understanding of the principles behind the success of ADRC with the audience and to address questions such as: What's unique about the concept of ADRC? What characterizes the ADRC as a viable technology? And what to expect in the future regarding the technological expansion and the continuous generation of ideas?</p>
9:20-10:10	<p>Lecturer: 薛文超(Wenchao Xue), Academy of Mathematics and Systems Science, CAS</p> <p>Title: Linear ADRC: Design Methods and Analysis</p> <p>Abstract: This talk will demonstrate the main design methods of linear ESO as well as ADRC, and provide the corresponding theoretical foundation. Also, the success as well as the limitations of linear ADRC will be discussed.</p>
茶歇(Tea Break)	
10:30-11:20	<p>Lecturer: 孙立(Li Sun), Southeast University</p> <p>Title: Process Control and ADRC</p> <p>Abstract: This talk is dedicated to the theory and practice of Active Disturbance Rejection Control (ADRC) in process control. Firstly, various design modifications are proposed in terms of time-delay, non-minimum phase and multivariable processes, respectively. Some tuning guideline are subsequently introduced. Finally, some experimental applications in power plant are demonstrated to show the effectiveness.</p>
11:20-12:00	<p>Lecturer: 赵志良(Zhiliang Zhao), Shaanxi Normal University</p> <p>Title: On nonlinear active disturbance rejection control</p> <p>Abstract: As an emerging and promising control technology, active disturbance rejection control (ADRC) has been successfully applied to many control practices. The key idea of ADRC is regarding the uncertainties and complicated time variables and nonlinearities as "total disturbance", and estimating and compensating it in the feedback control. It is widely realized that the nonlinear design can improve the control performance of ADRC. However, due to the complexities of the nonlinear design, and the uncertainties and nonlinearities of the control systems, the theoretical investigation of nonlinear ADRC lags behind it's application and linear investigation. In this talk I'll report some recent results on the nonlinear active disturbance rejection control, including the tracking differentiator (TD), extended state observer (ESO), and TD-ESO-based feedback control.</p>

邀请报告-1 (Plenary Lecture 1)

7月19日14:00-15:00
辽宁大厦沈阳厅

July 19, 14:00-15:00
Shenyang Meeting Room

H. Sira-Ramírez (CINVESTAV-IPN, Mexico)
Active Disturbance Rejection and Flat Filters
in the Control of Nonlinear Systems

主席(Chair): 黄一(Yi Huang)

中科院数学与系统科学研究院, Academy of Mathematics and Systems Science, CAS

Abstract: In this presentation we explore the equivalence between Active Disturbance Rejection Controllers (ADRC) and Flat Filters (FF) in the context of flat SISO systems. FF are classical compensators inspired by a robustness feature imposed on Generalized Proportional Integral (GPI) Controllers. Given an ADRC controller a unique equivalent FF can be immediately obtained. In general, the reverse implication does not always hold valid. The importance of this result, which gives it wide applicability, is due to a homotopy equivalence between input to flat output representations and unit gain perturbed pure integration systems induced by a state dependent (Lie-Backlund) time coordinate transformation in (locally) regular flat systems. The results are easily extended to MIMO flat systems. Several simulation and experimental examples will be presented.



H. Sira-Ramírez was born in San Cristóbal (Venezuela). He obtained the Electrical Engineer's degree from the Universidad de Los Andes in Mérida (Venezuela) in 1970. He later obtained the MSc in EE and the Electrical Engineer degree, in 1974, and the PhD degree, also in EE, in 1977, all from the Massachusetts Institute of Technology (Cambridge, USA). He has been a Visiting Professor at Universities in Argentina, Peru, Colombia, The United States of America, Spain, France, Germany, The United Kingdom, Hungary, Kuwait and the People's Republic of China.

Currently, he is a Titular Researcher in the Centro de Investigación y Estudios Avanzados del Instituto Politécnico Nacional (CINVESTAV-IPN) in México City (México). Dr. Sira-Ramírez received a Honoris Causa Doctor degree in Engineering from the Universidad de Los Andes (Venezuela) in 2015. He has published over 470 technical articles; 180 of them in credited journals and the rest, 290, in refereed international conferences. Dr. Sira-Ramírez has authored chapters in twenty nine contributed books and he is the author, or coauthor, of 8 books in Automatic Control.

Dr. Sira-Ramírez is interested in the theoretical and practical aspects of feedback regulation of nonlinear dynamic systems, with special emphasis in Algebraic methods, Active Disturbance Rejection and Variable Structure feedback control techniques and their applications in Power Electronics, Electro-mechanical systems, Robotics and Aerospace problems.

邀请报告-2 (Plenary Lecture 2)

7月19日15:00-16:00
辽宁大厦沈阳厅

July 19, 15:00-16:00
Shenyang Meeting Room

Wen-Hua Chen (Loughborough University, U.K.)

Nonlinear Disturbance Observer Technique and Its application in Small Scale Unmanned Aerial Vehicles

主席(Chair): 黄一(Yi Huang)

中科院数学与系统科学研究院, Academy of Mathematics and Systems Science, CAS

Abstract: Small scale unmanned aerial vehicles (UAVs) (e.g. mini or even smaller micro/nano UAVs) benefited from their small size and light weight are man-portable flying machines suitable for close-in support in contested, cluttered environment. They can find a wide range of applications in both military and civilian operations; such as urban overwatch or structure inspection. However, for the same reason, they are also vulnerable to various changes particularly gusts, payload and structure changes. Gusts and the local airflow due to buildings and other structures may cause serious problems on flight stability and performance. Gust tolerance and alleviation is important for the survivability and the safe operation of this kind of UAV. This presentation will first introduce the nonlinear disturbance observer based control technique, where a nonlinear disturbance observer is designed to estimate external disturbance and the influence of uncertainty and then a compensation mechanism is designed based on the feedforward strategy. This technique is applied to gust alleviation of small scale UAVs where a nonlinear disturbance observer is developed to estimate the forces or torque applied on the aircraft due to wind/gust and then integrated with a nominal nonlinear controller. Both helicopters and fixed wing aircraft will be considered in this presentation, with the support of video clips of indoor and outdoor flight tests.



Wen-Hua Chen holds Professor in Autonomous Vehicles in the Department of Aeronautical and Automotive Engineering at Loughborough University where he is leading the Autonomous Systems Laboratory. He is also the Head of Control and Reliability Research Group. Prof. Chen has a considerable experience in control and signal processing and their applications in aerospace systems. He has made a number of significant contributions in the development of disturbance observer based control and model predictive control for nonlinear systems. In the last ten years, he has been spending most of his effort in developing research in unmanned aircraft systems, covering most of the aspects from autopilots, situational awareness, decision making to verification. His unmanned vehicles related research is widely supported by the government and industry. Prof. Chen has published over 200 papers with 100 international journal papers. He is a Chartered Engineer, a Fellow of IEEE, the Institution of Mechanical Engineers and the Institution of Engineering and Technology, UK.

邀请报告-3 (Plenary Lecture 3)

7月19日16:20-17:20
辽宁大厦沈阳厅

July 19, 16:20-17:20
Shenyang Meeting Room

Zhiqiang Gao (Cleveland State University, U.S.A.)
Engineering Cybernetics and Artificial Intelligence:
a Shared Heritage and the Quest for Understanding

主席(Chair): 黄一(Yi Huang)

中科院数学与系统科学研究院, Academy of Mathematics and Systems Science, CAS

Abstract: 20 years after the birth of ADRC and 10 years after the passing of Prof. Jingqing Han, the full impact has just begun to show. ADRC is but a bridge that connects two eras in industrial control and in the science of engineering cybernetics (EC). A strong parallel exists between EC and AI, in their common roots and in our quest for understanding. Both fields have evolved beyond the recognition of their founders but the 400 year search of understanding in industrial control and EC sheds lights on our on-going effort to understand AI and to establish a scientific foundation, starting with pure concepts and founding principles.



高志强于1987年和1990年在美国圣母大学分别获得电机工程的硕士和博士学位，1990年起在美国俄亥俄州克利夫兰州立大学（CSU）任教，任CSU 先进控制技术中心主任。高志强经过二十多年的潜心研究，解决了工业控制中技术与理念陈旧等多个宏观及具体问题，获七项国际专利，并在国际刊物和会议上发表论文百余篇。特别是从1995年起与韩京清研究员及中科院系统所长期合作，全面开展自抗扰控制技术的研究，使其突破了参数

整定的瓶颈口，以高效、鲁棒、节能、简单易行的特点成为工程控制除PID外又一用途广泛的有力工具，并已被TI, Parker等多家公司采纳。自抗扰技术近年来在国内外学术界也受到了普遍的关注。2013年12月,《控制理论与应用》杂志出版了自抗扰控制专刊。美国的ISA Transactions 也在2014年出版了相应的专刊。2013美国控制会议和2014IFAC年会都设立了自抗扰控制专题讲习班。中国控制会议也多次举办自抗扰控制邀请组。2012拉美控制会议和2014中国控制会议还出现了自抗扰控制的大会报告。近年来,高志强多次从历史和人文的角度,以自抗扰控制为契机,开设讲座,和老师、同学们一起探索怎样跨越控制理念与工程实际的沟壑,成为一名既思维严谨又富于创造力的优秀控制工程师。他还先后为各个单位的研究生、工程技术人员开设相应的短期课程,举办者包括美国的国家航天总署,美国的Rockwell, Bendix, Energizer等公司,以及意大利都灵理工大学,中国科学院系统所,清华大学、北京航空航天大学,北京科技大学,天津大学,等等。最后,欢迎有兴趣的老师同学参加自抗扰控制QQ群:128464029 或者访问CSU 先进控制技术中心的网页: <http://cact.csuohio.edu>.

邀请报告-4 (Plenary Lecture 4)

7月20日15:20-16:20
辽宁大厦沈阳厅

July 20, 15:20-16:20
Shenyang Meeting Room

Yangquan Chen (University of California, Merced, U.S.A.)

Bode's Ideals Are Fractional Order – from Bode's Ideal Gain Crossover (BIGC) Behavior to Bode's Ideal Cut-off (BICO) Behavior

主席(Chair): 黄一(Yi Huang)

中科院数学与系统科学研究院, Academy of Mathematics and Systems Science, CAS

Abstract: The lecture goes back to H. W. Bode's 1945 classic book and focuses on two aspects: Bode's discussions on gain crossover (BIGC) behavior and cut-off (BICO) behavior. I will reveal the fact that, Bode's ideal loop transfer function as well as Bode's ideal cut-off are both fractional order (FO) irrational transfer functions. Impulse response invariant discretization method is introduced to make those FO transfer functions realized in IIR forms with illustrative examples. Applications of the BIGC and BICO are introduced and their potential application in ADRC is outlined.



Yangquan Chen earned his Ph.D. from Nanyang Technological University, Singapore, in 1998. He had been a faculty of Electrical Engineering at Utah State University from 2000-12. He joined the School of Engineering, University of California, Merced in summer 2012 teaching “Mechatronics”, “Engineering Service Learning” and “Unmanned Aerial Systems” for undergraduates; “Fractional Order Mechanics” and “Nonlinear Controls” for graduates. His research interests include mechatronics for sustainability, cognitive process control, small multi-UAV based cooperative multi-spectral “personal remote sensing”, applied fractional calculus in controls, modeling and complex signal processing; distributed measurement and control of distributed parameter systems with mobile actuator and sensor networks.

Dr. Chen serves as a Co-Chair for IEEE Robotics and Automation Society Technical Committee (TC) on Unmanned Aerial Vehicle and Aerial Robotics (12-18). He recently served the TC Chair for the ASME DED Mechatronics Embedded Systems Applications (2009-10); Associated Editor (AE) for IEEE Trans. on Control Systems Technology (00-16), ISA Trans. (12-17), IFAC Control Engineering Practice (12-17) and Journal of Dynamics Systems, Measurements and Control (09-15). He now serves as Topic Editor-in-Chief of International Journal of Advanced Robotic Systems (Field Robotics), Section AE (Remote Sensors) for Sensors, Senior Editor for International Journal of Intelligent Robotic Systems, Topical AE for Nonlinear Dynamics (18-) and AE for IFAC Mechatronics, Intelligent Service Robotics; IET Control Theory and Applications, and Fractional Calculus and Applied Analysis. He is a member of IEEE, ASME, AIAA, ASPRS, AUVSI and AMA.

Dr. Chen started some new investigations, published some papers and books, graduated some students, hosted some visiting scholars and also received some awards including the IFAC World Congress Best Journal Paper Award (Control Engineering Practice, 2011), First Place Awards for 2009 and 2011 AUVSI SUAS competitions, and most importantly, the “Relationship Counselor” award from IEEE Utah State University Student Branch for “explaining human relationship using control theory.”

专题研讨会-1 (Panel Discussion 1)

7月20日08:30-10:10

辽宁大厦沈阳厅

July 20, 08:30-10:00

Shenyang Meeting Room

Industry Cluster Problems and ADRC: Power Systems

行业性问题与自抗扰控制：电力系统

主席(Chair): 李东海(Donghai Li), 清华大学(Tsinghua University)

协主席(Co-Chair): 谭文(Wen Tan), 华北电力大学(North China Electric Power University)

协主席(Co-Chair): 孙立(Li Sun), 东南大学(Southeast University)

Panelists:

黄从智(Congzhi Huang), North China Electric Power University

黄焕袍(Huanpao Huang), Guodian Zhishen Control Technology Co. Ltd.

李东海(Donghai Li), Tsinghua University

牛海明(Haiming Niu), Guodian Zhishen Control Technology Co. Ltd.

潘凤萍(Fengping Pan), Guangdong Electric Power Research Institute of Energy Technology Co. Ltd.

孙立(Li Sun), Southeast University

孙立明(Liming Sun), Key Intelligence (Beijing) Technology Co., Ltd.

谭文(Wen Tan), North China Electric Power University

摘要: 讨论分析热力系统中 ADRC 的理论研究、仿真和试验应用。

Abstract: ADRC Symposium about its theoretical research, simulation and experimental application on thermal systems.



李东海：工学博士，清华大学能源与动力工程系副教授。

研究领域：能源动力系统控制。

简介：1994 年获清华大学控制理论专业博士学位。现任清华大学能源与动力工程系副教授，博士生导师。在国内外发表控制科学论文 110 篇。兼任 IFAC 动力系统控制委员会委员，ICCAS 程序委员会委员，中国仿真学会(CAS)理事。自 1998 年开始从事自抗扰控制研究，指导三十名博硕士生研究了高阶系统、非最小相位系统、非线性系统、复动力系统、分数阶系统、分布参数系统、多变量系统的自抗扰控制。近三年来与国电智深、广东电科院、山西电科院合作完成了自抗扰控制在大型火电机组的炉膛负压回路、磨煤机出口风温回路、加热器水位回路、二次风量回路、过热汽温回路和协调回路的应用，解决了自抗扰控制在工程应用中的无扰切换、抗积分饱和、参数整定等问题，试验效果达到国际领先水平。

专题研讨会-2 (Panel Discussion 2)

7月20日10:20-11:50

辽宁大厦沈阳厅

July 20, 10:20-11:50

Shenyang Meeting Room

Industry Cluster Problems and ADRC: Robot Systems

行业性问题与自抗扰控制：机器人

主席(Chair): 苏剑波(Jianbo Su), 上海交通大学(Shanghai Jiao Tong University)

协主席(Co-Chair): 雷旭升(Xusheng Lei), 北京航空航天大学(Beihang University)

协主席(Co-Chair): 邢登鹏(Dengpeng Xing), 中科院自动化所(Institute of Automation, CAS)

Panelists:

Xusheng Lei(雷旭升), Beijing University of Aeronautics and Astronautics

Jianbo Su(苏剑波), Shanghai Jiao Tong University

Dan Wu(吴丹), Tsinghua University

Guofei Xiang(向国菲), Shanghai Jiao Tong University

Dengpeng Xing(邢登鹏), Institute of Automation, Chinese Academy of Sciences

摘要: 机器人控制需要处理非线性、多自由度、外界干扰等问题，而 ADRC 可以把所有不确定因素归结为未知干扰并对其进行估计和补偿，将 ADRC 应用到机器人领域具有广泛的应用前景。本专题旨在总结已有的 ADRC+机器人的成果，并展开讨论如何将 ADRC 更好地应用与机器人行业。

Abstract: Robot control needs to deal with the problems of non-linearity, multiple DOFS, external disturbances, etc. ADRC deems all uncertainties as unknown disturbances, and estimates and compensates for them. Combining ADRC and robotics has widely prospect in application. This panel aims at concluding existing results of applying ADRC to robotics and discusses how to further extend this combination.



苏剑波，男，1969 年 11 月生，博士，教授。1989 年上海交通大学自动控制系获得学士学位；1995 年东南大学博士学位，2000 年起被聘为上海交通大学教授。目前担任上海交通大学智能机器人系统与技术研究中心主任。

主要研究智能机器人非结构环境下的机器学习与人机交互控制理论与技术，在上述领域已发表论文 260 余篇，出版专著 3 部，获得发明专利 22 项。主持研制了多个大型软件平台和软件包，广泛应用于家居服务机器人和消毒机器人等平台，取得了良好的社会和经济效益。累计获得中国国际工业博览会一等奖、

国家级教学成果二等奖，教育部自然科学二等奖、上海市科技进步三等奖，指导学生获得第 13 届“挑战杯”全国大学生课外科技竞赛特等奖。

应邀兼任中国自动化学会理事、中国自动化学会智能自动化专业委员会副主任委员；IEEE 网络机器人技术委员会委员、IEEE 人机交互技术委员会委员；IEEE Transactions on Cybernetics 等四部国际主流学术刊物编委。2014 年获得 IEEE 最佳编委奖。

专题研讨会-3 (Panel Discussion 3)

7月20日13:30-15:00

辽宁大厦沈阳厅

July 20, 13:30-15:00

Shenyang Meeting Room

Industry Cluster Problems and ADRC: Flight control systems

行业性问题与自抗扰控制：飞行控制系统

主席(Chair): 孙明玮(Mingwei Sun), 南开大学(Nankai University)

协主席(Co-Chair): 魏先利(Wei Xianli), 北京机电工程研究所(Beijing Institute of Mechanical and Electrical Engineering)

Panelists:

侯砚泽(Yanze Hou), China Institution of Manned Spacecraft System Engineering

季登高(Denggao Ji), Beijing Institute of Nearspace Vehicle's Systems Engineering

李高风(Gaofeng Li), Beijing Institute of Mechanical and Electrical Engineering

孟斌(Bin Meng), Beijing Institute of Control Engineering

张奇(Zhang Qi), Beijing Institute of Mechanical and Electrical Engineering

孙明玮(Mingwei Sun), Nankai University

魏先利(Xianli Wei), Beijing Institute of Mechanical and Electrical Engineering

摘要: 本分组邀请一些航天航空院所的工程技术人员, 介绍目前 ADRC 在飞行器多种控制问题上的应用, 包括取得的成效和遇到的问题。

Abstract: Several practitioners are invited to introduce the applications of ADRC on flight vehicles, including achievements and problems.



1972 年生, 北京市人。1995 年本科毕业于北方交通大学通信与控制工程系交通信号与控制专业, 1995--2000 年硕博连读于南开大学控制理论与控制工程专业, 获得工学博士学位。

2000--2008 年在航天三院三部从事制导、导航与飞行控制研究与工程实践工作, 高工, 主任研究员。2009 年转入南开大学从事教学科研工作, 教授, 博导。主要研究兴趣为预测控制、自抗扰控制、飞行器制导与控制和非线性优化等。

专题研讨会-4 (Panel Discussion 4)

7月21日16:20-17:50
辽宁大厦沈阳厅

July 21, 16:20-17:50
Shenyang Meeting Room

Fractional Order and ADRC

分数阶与自抗扰控制

主席(Chair): Yangquan Chen (University of California, Merced, U.S.A.)

Panelists:

Yangquan Chen, University of California, Merced, U.S.A.

李明大(Mingda Li), Beijing Information Science & Technology University

罗映(Ying Luo), Huazhong University of Science and Technology

王春阳(Chunyang Wang), Changchun University of Science and Technology

王孝洪(Xiaohong Wang), South China University of Technology

Abstract: If the world, as the dynamics of change, is to be described with the language of fractional order calculus, our understanding of active disturbance rejection control could take a drastic turn. The questions could be posed as follows: 1) What is gained and sacrificed by using the integer ADRC to deal with fractional order dynamics? 2) How can Prof. Han's Nonlinear ADRC be better understood using the vast literature on Fractional Order Calculus. This panel discussion bring together scholars whose research overlaps both areas, to pose research questions and to give an outlook for the interplay between the two fields in the near future.



Yangquan Chen earned his Ph.D. from Nanyang Technological University, Singapore, in 1998. He had been a faculty of Electrical Engineering at Utah State University from 2000-12. He joined the School of Engineering, University of California, Merced in summer 2012 teaching “Mechatronics”, “Engineering Service Learning” and “Unmanned Aerial Systems” for undergraduates; “Fractional Order Mechanics” and “Nonlinear Controls” for graduates. His research interests include mechatronics for sustainability, cognitive process control, small multi-UAV based cooperative multi-spectral “personal remote sensing”, applied fractional calculus in controls, modeling and complex signal processing; distributed measurement and control of distributed parameter systems with mobile actuator and sensor networks.

Dr. Chen serves as a Co-Chair for IEEE Robotics and Automation Society Technical Committee (TC) on Unmanned Aerial Vehicle and Aerial Robotics (12-18). He recently served the TC Chair for the ASME DED Mechatronics Embedded Systems Applications (2009-10); Associated Editor (AE) for IEEE Trans. on Control Systems Technology (00-16), ISA Trans. (12-17), IFAC Control Engineering Practice (12-17) and Journal of Dynamics Systems, Measurements and Control (09-15). He now serves as Topic Editor-in-Chief of International Journal of Advanced Robotic Systems (Field Robotics), Section AE (Remote Sensors) for Sensors, Senior Editor for International Journal of Intelligent Robotic Systems, Topical AE for Nonlinear Dynamics (18-) and AE for IFAC Mechatronics, Intelligent Service Robotics; IET Control Theory and Applications, and Fractional Calculus and Applied Analysis. He is a member of IEEE, ASME, AIAA, ASPRS, AUVSI and AMA.

Dr. Chen started some new investigations, published some papers and books, graduated some students, hosted some visiting scholars and also received some awards including the IFAC World Congress Best Journal Paper Award (Control Engineering Practice, 2011), First Place Awards for 2009 and 2011 AUVSI SUAS competitions, and most importantly, the “Relationship Counselor” award from IEEE Utah State University Student Branch for “explaining human relationship using control theory.”

专题研讨会-5 (Panel Discussion 5)

7月21日08:30-10:00
辽宁大厦沈阳厅

July 21, 08:30-10:00
Shenyang Meeting Room

Active Disturbance Rejection Control in Automotive: challenges and solutions

汽车工程中的主动抗扰控制：问题与对策

主席(Chair): 谢辉(Hui Xie), 天津大学(Tianjin University)

协主席(Co-Chair): 陈虹(Hong Chen), 吉林大学(Jilin University)

Panelists:

陈虹(Hong Chen), Jilin University

耿聪(Cong Geng), Beijing Jiaotong University

李乐(Le Li), United Automotive Electronic Systems Co., Ltd.

雷正玲(Zhengling Lei), Shanghai Ocean University

宋康(Kang Song), Michigan State University, U.S.A.

佟强(Qiang Tong), Tianjin University

谢辉(Hui Xie), Tianjin University

邹栋(Dong Zou), Tianjin University

摘要: 汽车内燃机是典型的多变量、强耦合、非线性和时变的系统，具有大量的不确定性。本讨论组将首先介绍汽车内燃机中的典型控制问题和挑战，并从学术界和工业界的视角，针对汽车内燃机领域的自抗扰控制展开深入讨论。

Abstract: The automotive engine is a typical multi-variable, cross-coupled nonlinear time-variant system with uncertainties. In this panel, an overview about the control challenges in engines will be presented. Then control solutions for engines and vehicles, based on the philosophy of active disturbance rejection control, will be discussed, from both academical and industrial perspectives.



Hui Xie, male, born in August 1970, professor. Prof. Hui Xie received his PhD in propulsion machine and engineering at Tianjin University in 1998. And now he holds a position as professor and vice director in State Key Laboratory of Engines at Tianjin University, also as director in Tianjin University – Infineon Automotive Electronics Joint Lab.

His research topics are control technology for combustion process on ICE, theories and methods for control of gasoline HCCI/CAI engines, software and hardware for electronic control of engine and vehicle, calibration method and technology for electronic control system, and control of electrical vehicles and hybrid electrical vehicles.

In the past five years, Prof. Xie was and is charge of about 50 R&D projects from government and industry on control of engine and vehicle. He published about 100 scientific publications within engine and vehicle field, and obtained over twenty patents within engine and vehicle fields.

Prof. Xie has got the second award of National Technology Invention Award from the State Council and the second award of Scientific Development Award from China Ministry of Education in 2010; got grand award of China machinery industry science and Technology Award from China Machinery Industry Federation in 2011 and the third Science and Technology Development Award of Tianjin in 2012.

专题研讨会-6 (Panel Discussion 6)

7月21日10:20-11:50

辽宁大厦沈阳厅

July 21, 10:20-11:50

Shenyang Meeting Room

Data Driven, Learning and ADRC

数据驱动和学习与自抗扰控制

主席(Chair): 侯忠生(Zhongsheng Hou), 北京交通大学(Beijing Jiaotong University)

协主席(Co-Chair): Zhiqiang Gao, Cleveland State University, U.S.A.

Panelists:

袁薇(Wei Ai), South China University of Technology

陈增强(Zengqiang Chen), Nankai University

侯忠生(Zhongsheng Hou), Beijing Jiaotong University

Zhiqiang Gao, Cleveland State University, U.S.A.

李大宇(Dazi Li), Beijing University of Chemical Technology

李向阳(Xiangyang Li), South China University of Technology

Abstract: It is from the same question both research fields of Data Driven Control and ADRC arose. That question is: Must control design begin with an accurate mathematical model? Now, after twenty plus years of separate development, it's time the two fields come together and compare notes: Did we address the problem successfully? What are the commonalities and differences in our solutions? What are the remaining tasks to be tackled in research? How do we take the research outcome of our fields in the past two decades and address the challenges of today?



侯忠生 北京交通大学自动控制系主任、卓越百人计划“领军人才”入选者。IEEE Senior Member、IFAC Technical Committee "Adaptive and Learning Systems" 委员、IFAC Technical Committee "Transportation Systems" 委员。中国自动化学会“数据驱动控制、学习与优化”专业委员会创始主任。“自动化学报”、“控制理论与应用”、“控制与决策”、“系统科学与数学”编委；曾是 IEEE Transactions on Neural Networks and Learning Systems 专刊 "Data-Based Control, Modeling, and Optimization" 客座编委，以及 IEEE Transactions on Industrial Electronics 专刊 "Data Driven Control and Learning Systems" 责任客座编委。

代表性科研项目：主持国家自然科学基金重点项目 2 项，国家自然科学基金重大国际合作项目 1 项。

主要学术成果如下：在控制理论研究领域提出了“无模型自适应控制”、“数据驱动控制”、“动态线性化技术”、“伪偏导数”、“伪梯度”、“伪 Jacobian 矩阵”，等新概念，并被广泛认可。

具体工作如下：

- 1、建立并完善了“无模型自适应控制 (MFAC) 理论”。无模型自适应控制是一套新体制的控制理论与方法。出版专著 3 部，包括 CRC Press 出版社出版的专著《Model Free Adaptive Control: Theory and Applications》。该内容已经被 7 部专著作为整章和部分章节引用；已经在 150 余个不同实际系统中得到应用。
- 2、提出了系列的交通系统（包括道路和高铁）数据驱动学习预报与控制方法，代表性结果发表在如 IEEE 会刊、交通研究，等刊物上。
- 3、是迭代学习控制理论研究领域具有国际影响的活跃学者。代表性结果发表在，如 IEEE 会刊、Automatica、和国际过程控制，等刊物上。
- 4、是数据驱动控制理论研究具有国际影响的活跃学者。代表性论文发表在如 IEEE 会刊、Infor Sci、Systems & Control Letter，等刊物上。

专题研讨会-7 (Panel Discussion 7)

7月20日13:00-15:00

辽宁大厦沈阳厅

July 20, 13:00-15:00

Shenyang Meeting Room

Industry Cluster Problems and ADRC: Motion Control Systems

行业性问题与自抗扰控制：运动控制

主席(Chair): 李世华(Shihua Li), 东南大学(Southeast University)

协主席(Co-Chair): 闫鹏(Peng Yan), 北京航空航天大学(Beihang University)

协主席(Co-Chair): 左志强(Zhiqiang Zuo), 天津大学(Tianjin University)

Panelists:

李生权(Shengquan Li), Yangzhou University

李世华(Shihua Li), Southeast University

谭徽(Hui Tan), Texas Instruments Company

魏伟(Wei Wei), Beijing Industry and Commerce University

闫鹏(Peng Yan), Beihang University

杨志军(Zhijun Yang), Guangdong University of Technology

左志强(Zhiqiang Zuo), Tianjin University

摘要: 精度、灵活性、鲁棒性、效率和智能等已经成为现代运动控制系统的设计指标。本次小组讨论主要围绕如何基于建模、分析、基于干扰估计的控制来提升运动控制系统的上述指标。本主题的一些最新的 ADRC 研究进展也将得到介绍。

Abstract: Precision, agility, robustness, efficiency and intelligence are now becoming the design indexes for modern motion control systems. In this panel discussion, we will discuss how to improve these performances on the basis of modeling, analysis and disturbance estimation based control for motion control systems. Some new research developments and results related to ADRC on this topic will be introduced.



Shihua Li was born in Pingxiang, Jiangxi Province, China in 1975. He received his bachelor, master, Ph.D. degrees all in Automatic Control from Southeast University, Nanjing, China in 1995, 1998 and 2001, respectively. Since 2001, he has been with School of Automation, Southeast University, where he is currently a professor. His main research interests include modeling and nonlinear control theory (nonsmooth control, disturbance rejection control, adaptive control, etc) with applications to mechatronic systems, including motion control, power electronics, manipulator, robot, flight control systems and others.

He serves as Editors of International Journal of Robust and Nonlinear Control, International Journal of Electronics, International Journal of Control, Automation, and Systems and Guest Editors of International Journal of Robust and Nonlinear Control, IEEE Transactions on

Industrial Electronics, IET Control Theory & Applications, and SCIENCE CHINA Information Sciences.

He is a Senior Member of IEEE CSS, IES and PELS, the vice chairman of IEEE CSS Nanjing Chapter, a member of Technical Committee on Nonlinear Systems and Control, Technical Committee on System Identification and Adaptive Control, Technical Committee on Variable Structure Systems and Sliding Mode Control of the IEEE CSS and a member of Electrical Machines Technical Committee, Motion Control Technical Committee of the IEEE IES. He is a member of the Technical Committee on Control Theory of Chinese Association of Automation. He visited UC Berkeley from 2006.9-2007.9, RMIT University 2011.3-2011.6, University of Minnesota at Twin Cities 2012.4-2012.10, University of Hong Kong 2014.6-2014.8 and University of Western Sydney 2017.7-2017.8.

He has published over 200 research papers, among them over 100 international journal papers. He is one of Clarivate Analytics Highly Cited Researchers (Engineering) all over the world in 2017, one of the Most Cited Chinese Researchers from Elsevier (Control and system engineering), 2015, 2016 and 2017. He is a winner of best paper in the IET Control Theory & Applications 2017 and a winner of annual ICI prize for best paper in the Transactions of the Institute of Measurement 2016.

专题研讨会-8 (Panel Discussion 8)

7月21日15:20-17:00

辽宁大厦沈阳厅

July 20, 15:20-17:00

Shenyang Meeting Room

Principles, Theory and Methodology of Disturbance Rejection Control

抗扰控制思想、理论与方法的发展

主席(Chair): 郭雷(Lei Guo), 北京航空航天大学(Beihang University)

Panelists:

Wen-Hua Chen, Loughborough University, U.K.

陈增强(Zengqiang Chen), Nankai University

ZhengTao Ding, The University of Manchester, U.K.

Zhiqiang Gao, Cleveland State Univeristy, U.S.A.

郭雷(Lei Guo), Beihang University

H. Sira-Ramírez, CINVESTAV-IPN, Mexico

夏元清(Yuanqing Xia), Beijing Institute of Technology

摘要: 抗扰控制领域已经有近半个世纪的发展, 并已经成为了非常活跃的研究领域。本专题研讨会邀请了多位在抗扰领域有创新思维和杰出贡献的学者, 他们将与大家分享和总结研究成果, 并展望抗扰领域未来发展。

Abstract: The field of disturbance rejection has been around for about half century and it has become very active in recent years. In this panel discussion, we bring together scholars of unique understanding and contributions to the field to share our collective outcome in our investigation and to look forward to the next 50 years of development.



郭雷, 北京航空航天大学自动化科学与电气工程学院教授, 博士生导师, “飞行器一体化控制技术”国家级重点实验室副主任, 北京市智能感知与控制国际合作基地主任。1997 年获得东南大学自动控制理论及应用专业博士。1997-1999 年任东南大学无线电系博士后、副教授。1999-2006 年曾先后获得法国 Pays de la Loire 基金、英国皇家学会基金和日本学术振兴会 JSPS 基金, 分别在法国国家科学研究中心(IRCCyN)、英国拉夫堡大学和曼彻斯特理工学院(UMIST)合作研究, 曾任英国曼彻斯特大学和日本冈山县立大学访问教授。

长期从事控制理论与控制工程、导航制导与控制、人工智能等方面的教学和科学研究工作。研究方向为不确定与随机系统控制理论、导航制导与控制系统技术。近年主持国家自然科学基金重大/重点、国家/国防 863 重大项目课题、国家/国防 973 项目课题等项目 30 余项。于 2009 年获国家杰出青年基金, 2011 年获批教育部长江学者特聘教授, 2015 年入选国家百千万人才工程、当选国家有突出贡献中青年专家, 2017 年入选中组部万人计划。所带领的研究团队分别于 2012、2015 年获批“飞行器抗干扰控制理论与应用”教育部长江学者创新团队和科技部“飞行器先进导航和控制系统技术”重点领域创新团队。迄今发表论文 200 余篇, 授权发明专利 60 余项。2014 年至 2017 年连续入选爱思唯尔中国高被引学者榜单。获得 2013 年国家自然科学二等奖、2007 年教育部自然科学一等奖(均排名第一)。

交通和会场位置 (Transportation and Venue Location)

会场位置：辽宁大厦（北京市海淀区北四环西路甲二号，保福寺桥东南角）

1. 从北京首都国际机场到北京辽宁大厦

路线 1：地铁

路线：乘坐机场线地铁至三元桥站，在三元桥站换乘地铁 10 号线至知春路站下车。步行 2 公里到辽宁大厦

费用：约 30 元

步行路线（以下乘坐地铁方法步行路线如下图所示）



路线 2：公交

路线：乘坐机场大巴中关村线至保福寺桥北站下车，步行 530 米到辽宁大厦
费用：约 30 元

步行路线（以下乘坐公交方法步行路线均如图所示）



线路 3: 出租车

线路: 全程约 33 公里

费用: 约 106 元

2. 从北京南站到北京辽宁大厦

线路 1: 地铁

线路: 乘坐地铁 4 号线大兴线至西直门站, 在西直门站换乘地铁 13 号线至知春路站下车, 步行 2 公里到辽宁大厦

费用: 约 5 元

线路 2: 公交

线路: 乘坐地铁 4 号线大兴线至中关村站, 换乘公交 466 路至保福寺桥北站下车, 步行 550 米到辽宁大厦

费用: 约 7 元

路线 3: 出租车

路线: 全程约 23.7 公里

费用: 约 71 元

3. 从北京站到北京辽宁大厦

线路 1: 地铁

路线: 乘坐地铁 2 号线至西直门站, 在西直门站换乘地铁 13 号线至知春路站下车, 步行 2 公里到辽宁大厦

费用: 约 5 元

线路 2: 公交

线路: 乘坐地铁 2 号线至宣武门站, 在宣武门站换乘地铁 4 号线大兴线到中关村站下地铁换乘公交 466 路至保福寺桥北站下车, 步行 550 米到辽宁大厦。

费用: 约 7 元

4. 从北京西站到北京辽宁大厦

线路 1: 地铁

线路: 乘坐地铁 9 号线至国家图书馆站, 在国家图书馆站换乘地铁 4 号线大兴线至西直门站, 在西直门站换乘地铁 13 号线至知春路站下地铁, 步行 2 公里到辽宁大厦

费用: 约 5 元

线路 2: 公交

线路: 乘坐特 19 路公交车至保福寺桥北站下车, 步行 540 米到辽宁大厦

费用: 约 3 元

线路 3: 出租车

路线: 全程约 18.9 公里

费用: 约 55 元