The 2016 12th World Congress on Intelligent Control and Automation (WCICA 2016)

FINAL PROGRAM

June 12 – 15, 2016, Guilin, China

WCICA 2016 Program at a Glance (June 12 - 15, 2016)

Sunday, June 12, 2016

09:00 - 12:00	Registration 08:00 - 20:00	Workshop 1 - 姜钟平: Nonlinear Control of Dynamic Networks: The Small-Gain Approach (Pearl Hall, 明珠厅)	Workshop 2 - 郭雷（北航）: Anti-Disturbance Control: Theory and Applications (Jade Hall, 翡翠厅)
12:00 - 13:30		Lunch break	
13:30 - 16:30		Workshop 3 - 侯忠生: Model Free Adaptive Control (MFAC): Progress and Applications (Pearl Hall, 明珠厅)	Workshop 4 - 乔红: Brain-Like Intelligent Robots-Cognition, Planning and Motion (Jade Hall, 翡翠厅)
18:00 - 19:30		Welcome reception	

Monday, June 13, 2016

09:00 - 09:30	Opening ceremony (Grand Ballroom, 延惠厅)										
09:30 - 10:30	Plenary 1: Smart Optimization Control System for Energy-Intensive Equipments by Tianyou Chai (Chair: Derong Liu)										
10:30 - 11:00	Coffee break										
11:00 - 12:00	Plenary 2: Cooperative Control for Multi-Agent Systems in Microgrid Distributed Generation by Frank Lewis (Chair: Don Wunsch)										
12:00 - 13:30	Lunch break										
Room	Li River Hall 漓江厅	Seven Stars Hall 七星厅	Elephant Trunk Hill Hall 象山厅	Fold Brocade Hall 叠彩厅	Yangshuo Hall 阳朔厅	Lingui Hall 临桂厅	Pearl Hall 明珠厅	Jade Hall 翡翠厅	Amber Hall 琥珀厅	VIP Room VIP室	Poster area 海报粘贴区
13:30 - 15:30	MonN1-1: Modeling, Control and Optimization in Air Transportation System	MonN1-2: Control and Filtering for Distributed Networked Systems	MonN1-3: New Development on Fuzzy Systems and Fuzzy Control	MonN1-4: Nonlinear Systems and Control	MonN1-5: Constrained Control	MonN1-6: Adaptive Control and Learning Control	MonN1-7: Guidance and Navigation	MonN1-8: System Modeling and Identification	MonN1-9: Multi-Agent Systems and Distributed Control	MonN1-10: Data-based Modeling and Control	P1: Poster Session 1
15:30 - 15:50	Coffee break										
15:50 - 17:50	MonN2-1: Advanced Intelligent Control of Autonomous Systems	MonN2-2: New Development on Fuzzy Systems and Fuzzy Control	MonN2-3: Computational Intelligence Based Data-driven Modeling, Optimization and Control	MonN2-4: Pattern Recognition, Image Processing, Machine Learning	MonN2-5: Neural Networks and Control	MonN2-6: Smart Grids	MonN2-7: Biomedical Systems and Biosystems Automation	MonN2-8: Intelligent Transportation Systems	MonN2-9: Big Data Analysis, Compressed Sampling and Visualization	MonN2-10: Intelligent Optimization and Applications	
18:00 - 19:30	Dinner										

Tuesday, June 14, 2016

Room	Pearl + Jade Hall（明珠+翡翠厅）					Yangshuo + Lingui Hall（阳朔+临桂厅）					
08:30 - 09:30	Semi-plenary 1: Distributed Fault Detection and Isolation for Multi-Agent Systems Using Relative Information by Jie Chen (BIT) (Chair: Derong Liu)					Semi-plenary 2: Intelligence in the Cyber-Physical Revolution by Cesare Alippi (Chair: Xinpin Guan)					
09:30 - 10:00	Coffee break										
10:00 - 11:00	Semi-plenary 3: Optimal Control Using Adaptive Dynamic Programming: Fundamental Theory and New Development by Huaguang Zhang (Chair: Yaochu Jin)					Semi-plenary 4: Data Analytics Challenges in Biomedical Engineering by Don Wunsch (Chair: Zhong-Ping Jiang)					
11:00 - 12:00	Semi-plenary 5: Quasi-linear Systems with Spacecraft Control Applications by Guangren Duan (Chair: Yangmin Li)					Semi-plenary 6: Controlling Physical Human-Robot Interaction by Milos Zefran (Chair: Dongbin Zhao)					
12:00 - 13:30	Lunch break										
13:30 - 15:30	TueN1-1: Modeling, Identification and Control of Distributed Parameter Systems (DPS)	TueN1-2: Quantum Control and Quantum Cybernetics	TueN1-3: Application Oriented Image Analysis in Robot Vision and Machine Vision	TueN1-4: TJ Tarn Best Theoretical Paper Award	TueN1-5: TJ Tarn Best Application Paper Award	TueN1-6: TJ Tarn Best Student Paper Award	TueN1-7: Steve and Rosalind Hsia Best Biomedical Paper Award	TueN1-8: SUPCON Best Paper Award on Industrial Automation	TueN1-9: Mobile Robots	TueN1-10: Service Robots and Intelligent Society	P2: Poster Session 2
15:30 - 15:50	Coffee break										
15:50 - 17:50	TueN2-1: Modeling, Control and Optimization of Electrical Traction System in High-speed	TueN2-2: Application Oriented Image Analysis in Robot Vision and Machine Vision	TueN2-3: Control and Filtering for Distributed Networked Systems	TueN2-4: Control Systems	TueN2-5: System Modeling and Networked Control Systems	TueN2-6: Computational Intelligence and Applications	TueN2-7: Pattern Recognition, Image Processing, Machine Learning	TueN2-8: Fuzzy Systems and Neural Networks	TueN2-9: Intelligent Automation Systems	TueN2-10: Intelligent Robots and Brain-like Intelligence	
18:00 - 19:30	Dinner										
Room	Pearl Hall（明珠厅）					Yangshuo Hall（阳朔厅）					
19:30 - 21:30	论坛1：如何做好科研？（主持人：乔红） 关新平、郭雷（北航）、姜钟平、阳春华					论坛2：基金委、国际杂志、国际学术组织（主持人：刘德荣） 柴天佑、陈俊龙、金耀初					

Wednesday, June 15, 2016

08:30 - 09:30	Plenary 3: Compressive Feedback Control: Theory and Applications by Ning Xi (Chair: Hong Qiao)										
09:30 - 10:00	Coffee break										
10:00 - 12:00	"Research Trend of Control and Automation" plenary panel with panelists: Ji-feng Zhang, Ning Xi, Gary Feng, Tong Zhou, and Tielong Shen (Chairs: Jie Huang, Zhongsheng Hou, and Xinping Guan)										
12:00 - 13:30	Lunch break										
13:30 - 15:30	WedN1-1: Autonomous Control of Unmanned Aircraft Systems	WedN1-2: Computational Intelligence Based Data-driven Modeling, Optimization and Control	WedN1-3: Modeling, Control and Optimization in Air Transportation system	WedN1-4: Linear Systems and Control	WedN1-5: Computational Intelligence and Applications	WedN1-6: Optimization for Decision Making Systems	WedN1-7: Control Theory	WedN1-8: Intelligent Robots and Brain-like Intelligence	WedN1-9: Data-based System Performance Analysis	WedN1-10: Complex Networks	P3: Poster Session 3
15:30 - 15:50	Coffee break										
15:50 - 17:50	WedN2-1: Operator Based Robust Nonlinear Control and Its Application	WedN2-2: Real-time Computing, Perception, Decision, and Interaction for Autonomous Robots and Robot Operating System	WedN2-3: Quantum Control and Quantum Cybernetics	WedN2-4: Application Oriented Image Analysis in Robot Vision and Machine Vision	WedN2-5: Computational Intelligence and Applications	WedN2-6: Pattern Recognition, Image Processing, Machine Learning	WedN2-7: Sensors, Sensor Networks, Sensing and Signal Processing	WedN2-8: Industrial Robots and Intelligent Manufacturing	WedN2-9: Unmanned Aerial Vehicles and Autonomous Systems	WedN2-10: Optimal Control	
18:00 - 20:00	Award banquet and WCICA 2018 TJ Tarn Best Theoretical Paper Award, TJ Tarn Best Application Paper Award, TJ Tarn Best Student Paper Award Best Poster Paper Award, Steve and Rosalind Hsia Best Biomedical Paper Award SUPCON Best Paper Award on Industrial Automation, He-Pan-Qing-Yi Best Paper Award Invitation from WCICA 2018 (Yunhui Liu)										

Welcome Message from the General Chair

It is our great honor to welcome you to the 2016 12th World Congress on Intelligent Control and Automation (WCICA 2016), to be held in Guilin, China, June 12–15, 2016. Guilin is a city in the northeast of Guangxi Zhuang Autonomous Region of southern China, sitting on the west bank of Lijiang River. Guilin is China's shining pearl, with verdant mountains, elegant waters, magnificent crags, and fantastic caverns. All the participants of WCICA 2016 will have a technically rewarding experience as well as memorable experiences in this great city.

WCICA 2016, as a sequel of WCICA 2014 (Shenyang, China), aims to provide a forum for scholars all over the world to present their achievements in the fields of intelligent control and automation. In addition to the contributed papers, several distinguished scholars (Professor Tianyou Chai, Professor Frank L. Lewis, Professor Ning Xi, Professor Jie Chen, Professor Cesare Alippi, Professor Huaguang Zhang, Professor Donald Wunsch, Professor Guangren Duan and Professor Milos Zefran) were invited to give plenary or semi-plenary lectures, providing us with recent hot topics, latest developments and novel applications.

WCICA 2016 is sponsored by Chinese Academy of Sciences, University of Science and Technology Beijing, IEEE Control Systems Society, IEEE Robotics and Automation Society, Chinese Association of Automation, and IEEE/CAA Journal of Automatica Sinica. We wish to express our appreciation to all the individuals who have contributed to WCICA 2016 in a variety of ways. Special thanks are extended to our colleagues for their thorough review of all submissions, which is vital to the success of this conference, and also to the members of the organizing committee and our volunteer students who have dedicated their time and efforts to planning, promoting, organizing and helping with the conference. Our special thanks go to distinguished plenary lecturers, as well as all the authors for contributing their latest research work to the conference, and to all the participants in making WCICA 2016 a memorable event.

Enjoy the congress and enjoy your stay in Guilin!

Derong Liu
WCICA 2016 General Chair

Welcome Message from the Program Chair

Welcome to WCICA 2016! The 12th World Congress on Intelligent Control and Automation is being held from June 12 to 15 in Guilin, China. The international conference has a long tradition of focusing on both the theory and the applications of control and automation. This year is no exception. The scope of this year's conference includes control theory and systems, intelligent automation systems, big data automation, engineering optimization, sensing, modeling and analysis, and intelligent robots and brain-like intelligence.

WCICA 2016 received 759 submissions from 17 countries and regions. Each submitted paper was carefully reviewed by at least three expert reviewers. Based on the rigorous peer-review process and hard work of the corresponding program committee members and reviewers, 610 papers have been accepted for either oral or poster presentation at the conference. Papers presented at the conference cover a broad spectrum of fields, ranging from control and systems theory, intelligent automation systems, big data automation, engineering optimization, sensing, modeling and analysis, intelligent robots and brain-like intelligence, to high performance computing. The program booklet provides materials about the location of the session rooms, maps of the congress venue as well as the day-by-day program and abstracts of the plenary and invited lectures.

We would like to express our sincere appreciation and thanks to the technical program committee members and the reviewers for their great efforts in the paper review process, and also to the members of the organizing committee and the volunteers who have dedicated a lot of time and efforts to promoting the conference. We would like to thank all the invited panelists and speakers, as well as all the authors for sharing their ideas, insights and latest research results with the WCICA community. We would also like to thank all the participants and sponsors for their great contributions and strong supports to WCICA 2016.

On behalf of the Program Committee, we thank you for attending WCICA 2016 and hope that you enjoy the conference. Finally, if your travel plans permit, we would hope you to stay beyond the conference to enjoy visiting Guilin and the rest of China. We wish you a great conference and enjoyable visits in Guilin, China.

Welcome to Guilin!

Hong Qiao
WCICA 2016 Program Chair

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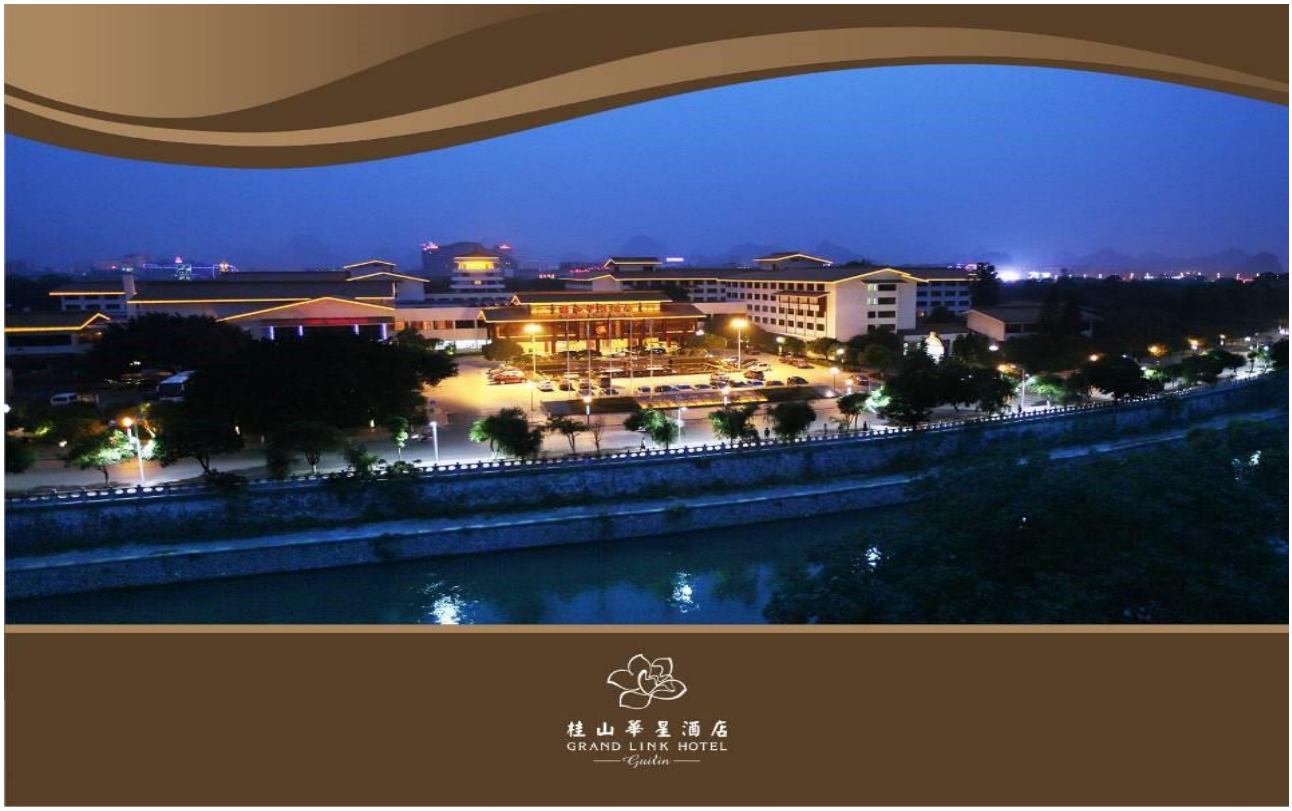
Conference Venue

WCICA 2016 will be held at the Grand Link Hotel Guilin. The Grand Link Hotel Guilin is located on the bank of Lijiang River in the beautiful city of Guilin which enjoys the fame as “having the best scenery in China”. Facing the city badge, the Elephant Trunk Hill crosses the river and is adjacent to the Seven Star Park and Zizhou Island Park. It is only 10 minutes’ ride to the downtown, the railway station, the Hi-tech Industrial Zone and International Exhibition & Conference Center, and 45 minutes’ to Guilin Liangjiang International Airport. It is the only luxury garden resort hotel on the Lijiang River bank and near the gardens.



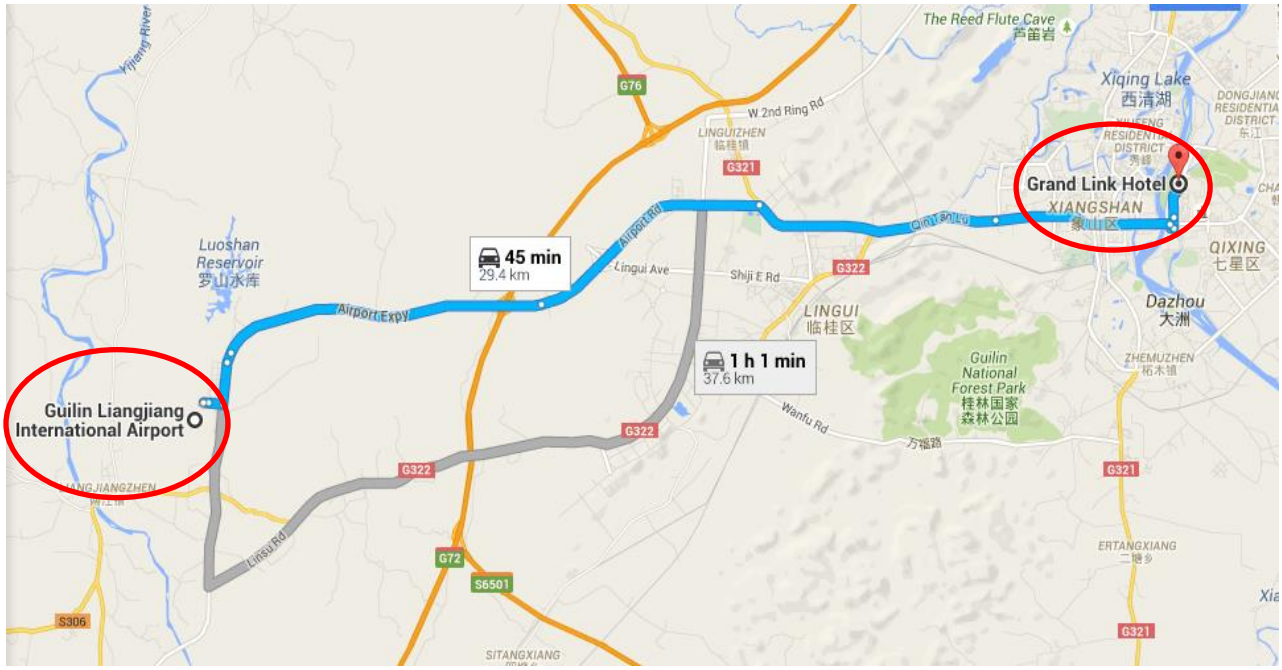
Hotel Address:
Grand Link Hotel Guilin
42 Chuanshan Road, Guilin, China
Tel: +86 773 3199999

酒店地址：
中国广西壮族自治区桂林市穿山路 42 号
桂山华星酒店
电话：(0773) 3199999

Location of the Grand Link Hotel Guilin

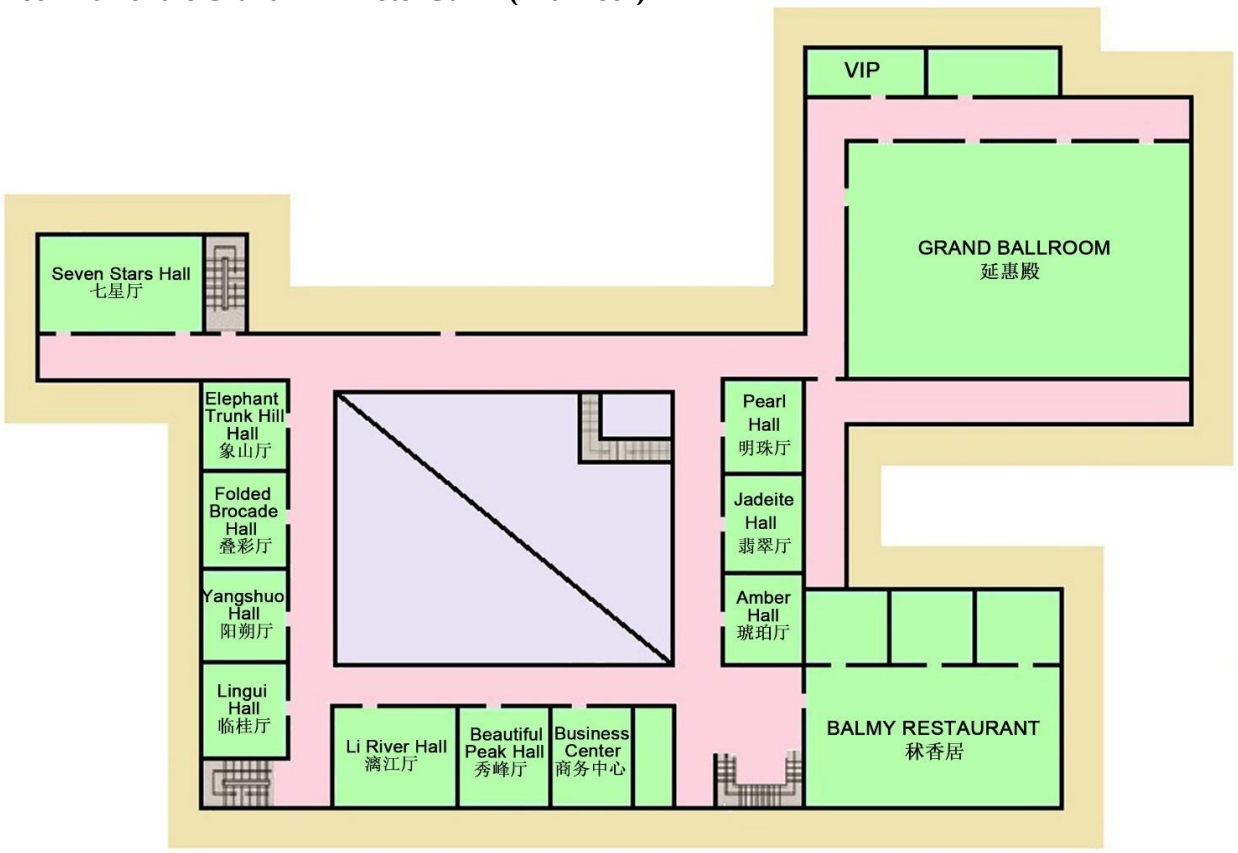
It is only 10 minutes' ride to the downtown and the railway station, and 45 minutes' to Guilin Liangjiang International Airport.

	酒店 From	距离 Distance (km)	时间 Time (mins)	方式 By
机场	**Airport**	31	45	乘车 By Car
火车站	**Railway Station**	5	10	乘车 By Car
阳朔	**Yangshuo**	55	70	乘车 By Car
高新产业园	**Hi-Tech Park**	5	10	乘车 By Car
七星公园	**Seven Star Park**	1	10	步行 On Foot
訾洲公园	**Zizhou Island Park**	0.5	5	步行 On Foot
漓江	**Lijiang River**	5	10	步行 On Foot
象山公园	**Elephant Trunk Hill Park**	5	10	乘车 By Car



There are 11 meeting rooms with a total area of 1,400 square meters, which can accommodate 100–800 people. It is the ideal place for holding a big conference like WCICA. The floor plan of the Grand Link Hotel Guilin is shown as follows.

Floor Plan of the Grand Link Hotel Guilin (2nd Floor)



Registration Information

The WCICA 2016 registration desk, located in the Lobby of Grand Link Hotel Guilin, will be open during:

- June 12, 2016 (Sunday) 08:00–20:00
- June 13, 2016 (Monday) 08:00–17:00
- June 14, 2016 (Tuesday) 08:00–17:00
- June 15, 2016 (Wednesday) 08:00–12:00

Each full registration includes a welcome reception ticket, conference attendance, a banquet ticket, and the conference CD-ROM proceedings.

Additional sets of CD-ROM proceedings and hardcopy proceedings may be purchased at the registration desk (50USD/330RMB for CD-ROM proceedings and 100USD/650RMB for one volume of hardcopy proceedings). In addition, each additional banquet ticket costs 80USD/500RMB.

Exhibition Information

The exhibition will be held from June 13, 2016 (Monday) to June 15, 2016 (Wednesday) with the following schedule:

- June 12, 2016 (Sunday) 14:00–17:00 Exhibit booth setup
- June 13, 2016 (Monday) 08:00–17:00
- June 14, 2016 (Tuesday) 08:00–17:00
- June 15, 2016 (Wednesday) 08:00–15:00
- Exhibition Area: 2nd floor by meeting rooms

Instructions for Oral and Poster Presentations

Oral Presentation:

- Oral Presentation Time: 15 minutes (including discussion).
- Each speaker is required to meet his/her session Chair in the corresponding session room 10 minutes before the session starts and copy the slide file (PPT or PDF) to the computer.
- Please note that each session room will be equipped with an LCD projector, a screen, a pointer device, and a laptop or desktop computer with general presentation software such as Microsoft PowerPoint and Adobe Reader preinstalled. Please make sure that your files are compatible and readable with our operation system by using commonly used fonts and symbols. If you plan to use your own computer, please try the connection and make sure it works before your presentation. Make sure to bring your special connectors.

Poster Presentation:

- The author should print the poster slide file by yourself in advance and take it with you to the conference site.
- The conference will provide a poster board (0.9m in width, 1.5m in height) for each poster paper. The boards will be arranged in the order of papers in the final program. Tape and other materials will be provided on site, and volunteer-assistants will give necessary help. Posters are required to be condensed and attractive. The characters should be large enough so that they are visible from one meter away.
- Please note that during your poster session, the author should stay by your poster paper to explain and discuss your paper with visiting delegates. The members of the Evaluation Committee of WCICA 2016 Best Poster Award will also be there to inspect poster papers.

History of WCICA

Congress	Date and Venue	Organizer
12th WCICA	Guilin, China June 12–15, 2016	Chinese Academy of Sciences
11th WCICA	Shenyang, China June 29–July 4, 2014	Northeastern University
10th WCICA	Beijing, China July 6–8, 2012	Academy of Mathematics and Systems Science
9th WCICA	Taipei, China June 21–25, 2011	National Taiwan University
8th WCICA	Jinan, China July 6–9, 2010	Shandong University
7th WCICA	Chongqing, China June 25–27, 2008	Chongqing University
6th WCICA	Dalian, China June 21–23, 2006	Dalian University of Technology and Northeastern University
5th WCICA	Hangzhou, China June 14–18, 2004	Zhejiang University
4th WCICA	Shanghai, China July 10–14, 2002	Shanghai Jiao Tong University
3rd WCICA	Hefei, China June 29–July 2, 2000	University of Science and Technology of China
2nd WCICA	Xi’an, China June 23–27, 1997	Xi’an Jiaotong University
1st WCICA	Beijing, China August 26–30, 1993	Tsinghua University

Plenary Lectures

Plenary Lecture I

Smart Optimization Control System for Energy-Intensive Equipments

Tianyou Chai
Northeastern University, China

Abstract – China has abundance of mineral resources such as magnesite, hematite and bauxite, which constitute a key component of its economy. The relatively low grades, and widely varying and complex compositions of raw extracts, however, pose difficult processing challenges including specialized equipment with excessive energy demands. The energy intensive furnaces together with widely uncertain features of the extracts form hybrid complexities of the system, where the existing modeling, optimization and control methods have met only limited success. Currently, the mineral processing plants generally employ manual control and are known to impose greater demands on energy, while yielding unreasonable waste and poor operational efficiency. The key solution to solve these problems is to make the control systems of energy intensive equipment become CPS. CPS for energy intensive equipment is a smart optimal control system.

This talk presents syntheses and implementations of a smart optimal control system for the energy intensive processing equipment. The talk will focus on three main functions of the proposed smart optimal control system: (i) process control; (ii) operational optimization control; and (ii) operational conditions diagnostics and self-healing control. The design of a novel data-driven dual closed-loop intelligent optimal operational control will be described for realizing these primary functions.

The data-driven dual closed-loop control employs a two-layer structure: (i) an intelligent optimal control layer for identification of optimal set points of control loops which takes functions of target indices associated with energy saving, product yield, product quality and efficiency as the optimization index, and the set points as the decision variables; and (ii) a set point tracking intelligent control layer focusing on a virtual unmodeled dynamics compensation based controller.

This talk introduces a hybrid simulation system for operational optimization and control of complex industrial processes developed by our team. Simulations to electric magnesium melting furnace for magnesia production industry are used to demonstrate the effectiveness of the proposed method.

This talk also introduces the smart embedding control system of electric magnesium melting furnace developed by our team adopting the novel data-driven dual closed-loop intelligent optimal operational control algorithm proposed. It has been successfully applied to the largest magnesia production enterprise in China, resulting in great returns. Issues for future research on the smart optimization control system are outlined in the final section.

Tianyou Chai was born in Lanzhou, China. He received the B.A. degree in automation from Northeastern University of Electric Power, Jilin, China in 1980, the M.S. and Ph.D. degrees in control theory and engineering in 1983 and 1985, respectively, from Northeastern University, Shenyang, China.

Since 1985, he has been with the Center of Automation at Northeastern University, where he became a Professor in 1988. He serves as a director of the National Engineering and Technology Research Center of Metallurgical Automation since 1997; director of Key Laboratory of Integrated Automation of Process Industry, Ministry of Education since 2003; director of Department of Information and Science of National Natural Science Foundation of China since 2010; director of the State Key Laboratory of Synthetical Automation for Process Industries since 2011; and Chair of Academic Committee of Northeastern University since 2011. In 2003, he was elected as a member of Chinese Academy

of Engineering.

He is a Fellow of IFAC and IEEE. He has served as Member of Technical Board of IFAC and Chairman of Coordinating Committee on Manufacturing and Instrumentation of IFAC from 1996 to 1999, a member of Chinese National Disciplinary Appraisal Group since 1992, and Vice-Director of Committee of Experts of Advanced Manufacturing and Automation in National 863 High-Tech Program from 2001-2006.

His main research interests are in modeling, control, optimization and integrated automation of complex industrial processes. He has served extensively as a consultant to industry and government. He has authored or coauthored 3 books, more than 450 technical articles including 176 international journal papers and 280 international conference papers, and holds 14 patents. He has been invited to deliver 41 plenary speeches on international conferences including 21 in IFAC and IEEE hosted conferences.

For his contributions, he has won 4 prestigious awards of National Science and Technology Progress and National Technological Innovation from China, the 2002 Technological Science Progress Award from Ho Leung Ho Lee Foundation, the 2007 Industry Award for Excellence in Transitional Control Research from IEEE Multiple-conference on Systems and Control and the 2010 Yang Jia-Chi Science and Technology Award from Chinese Association of Automation. He received several best paper awards, including Best Paper Award for 2011-2013 from Control Engineering Practice in 2014.

Plenary Lecture II

Cooperative Control for Multi-Agent Systems in Microgrid Distributed Generation

Frank L. Lewis
University of Texas at Arlington, USA

Abstract – With aging power distribution systems and new opportunities for renewable energy generation, the smart grid and microgrid are becoming increasingly important. Microgrid allows the addition of local loads and local distributed generation (DG) including wind power, solar, hydroelectric, fuel cells, and micro-turbines. Microgrid holds out the hope of scalable growth in power distribution systems by distributed coordination of local loads and local DG so as not to overload existing power grid generation and transmission capabilities. Sample microgrids are smart buildings, isolated rural systems, and offshore drilling systems. Microgrid takes power from the main power grid when needed, and is able to provide power back to the main power system when there is local generation excess.

When connected to the main distribution grid, microgrid receives a frequency reference from grid synchronous generators. Standard operating procedures call for disconnecting microgrid from the main power grid when disturbances occur. On disconnection, or in islanded mode, the absence of rotating synchronous generation leads to a loss of frequency references. After islanding, it is necessary to return microgrid DG frequencies to synchronization, provide voltage support, and ensure power quality.

In this talk we develop a new method of synchronization for cooperative systems linked by a communication graph topology that is based on a novel distributed feedback linearization technique. This cooperative feedback linearization approach allows for different dynamics of agents such as occur in the DGs of a microgrid. It is shown the new cooperative protocol design method allows for frequency synchronization, voltage synchronization, and distributed power balancing in a microgrid after a grid disconnection islanding event. The distributed nature of the cooperative feedback linearization method is shown to lead to sparse communication topologies that are more suited to microgrid control, more reliable, and more economical than standard centralized secondary power control methods.

Frank L. Lewis is a Member of National Academy of Inventors. Fellow IEEE, Fellow IFAC, Fellow U.K. Institute of Measurement & Control, PE Texas, U.K. Chartered Engineer. UTA Distinguished Scholar Professor, UTA Distinguished Teaching Professor, and Moncrief-O'Donnell Chair at the University of Texas at Arlington Research Institute. Qian Ren Thousand Talents Consulting Professor, Northeastern University, Shenyang, China. IEEE Control Systems Society Distinguished Lecturer. Bachelor's Degree in Physics/EE and MSEE at Rice University, MS in Aeronautical Engineering at Univ. W. Florida, Ph.D. at Ga. Tech. He works in feedback control, reinforcement learning, intelligent systems, and distributed control systems. He is author of 6 U.S. patents, 316 journal papers, 406 conference papers, 20 books and 12 journal special issues. He received the Fulbright Research Award, NSF Research Initiation Grant, ASEE Terman Award, Int. Neural Network Soc. Gabor Award 2009, U.K. Inst. Measurement & Control Honeywell Field Engineering Medal 2009. Received IEEE Computational Intelligence Society Neural Networks Pioneer Award 2012. Distinguished Foreign Scholar at Nanjing Univ. Science & Technology. Project 111 Professor at Northeastern University, China. Distinguished Foreign Scholar at Chongqing Univ. China. Received Outstanding Service Award from Dallas IEEE Section, selected as Engineer of the Year by Ft. Worth IEEE Section. Listed in Ft. Worth Business Press Top 200 Leaders in Manufacturing. Received the 2010 IEEE Region 5 Outstanding Engineering Educator Award and the 2010 UTA Graduate Dean's Excellence in Doctoral Mentoring Award. Elected to UTA Academy of Distinguished Teachers 2012. Texas Regents Outstanding Teaching Award 2013. He served on the NAE Committee on Space Station in 1995.

Plenary Lecture III

Compressive Feedback Control: Theory and Applications

Ning Xi
The University of Hong Kong, China

Abstract – The compressive feedback means the sensory information in the feedback of a control system is compressed or obtained from compressive sensing. Compressive sensing is a newly developed sensing method in which the key information can be obtained based on limited sampling. The compressive feedback method can significantly reduce sensing time. Therefore, high performance real time control can be achieved even for the systems with slow sensory feedbacks. The key question is how to use such compressive information to control a real-time system. In this talk, following a brief introduction of compressive sensing, the theoretical foundation as well as implementation methods for modeling, analysis and design of compressive feedback control systems will be presented. Applications, including robot control and high precision nano motion control, will be discussed. The experimental testing results will also be presented.

Ning Xi received his D.Sc. degree in Systems Science and Mathematics from Washington University in St. Louis, Missouri, USA in December 1993. He is the Chair Professor of Robotics and Automation in the Faculty of Engineering and the Director of the Emerging Technologies Institute at the University of Hong Kong. Before he joined the University of Hong Kong in 2016, he was a University Distinguished Professor, the John D. Ryder Professor of Electrical and Computer Engineering and the Director of Robotics and Automation Laboratory at Michigan State University. Dr. Xi received the Best Paper Award in IEEE/RSJ International Conference on Intelligent Robots and Systems (IROS) in August, 1995, and the Best Paper Award in the 1998 Japan-USA Symposium on Flexible Automation. Dr. Xi was awarded the first Early Academic Career Award by the IEEE Robotics and Automation Society in May, 1999. He also received the Best Paper Award of IEEE Transactions on Automation Science and Engineering in 2007. Dr. Xi was awarded SPIE Nano Engineering Award in 2007. In addition, he is a recipient of US National Science Foundation CAREER Award. Dr. Xi is a fellow of IEEE.

Semi-Plenary Lecture I

Distributed Fault Detection and Isolation for Multi-Agent Systems Using Relative Information

Jie Chen
Beijing Institute of Technology, China

Abstract – Automatic fault detection and isolation for multi-agent systems is of growing importance with the growth of systems' complexity and intelligence. But their inherent decentralized structure makes it more challenging for the lack of a central node monitoring the whole system's activities. In this talk, we will discuss the distributed fault detection and isolation strategy for a class of linear multi-agent systems using only relative information. First, by applying a series of model transformations, a new fault detection model which can estimate the neighbors' nominal outputs by solving linear system equations is created. The distributed FDI strategy based on the proposed model is then designed. After that, a novel event-triggered communication framework is proposed to improve the reliability of the fault detection result.

Jie Chen is currently the Vice President of Beijing Institute of Technology, the head of the State Key Laboratory of Intelligent Control and Decision of Complex Systems, and the leader of an innovative research group of the Natural Science Foundation of China (NSFC). He also serves as the Vice President of the Chinese Association of Automation (2013-present), the Managing Editor for the Journal of Systems Science and Complexity (2014-present), and Editorial Board Member and Associate Editor for many international journals. His main research interests include multi-objective optimization and decision-making of complex system, intelligent control, constrained nonlinear control, and optimization methods. He has authored/ co-authored 3 monographs and more than 100 research papers. He also holds 56 patents of invention. He is a Distinguished Young Scholar honored by NSFC and a ChangJiang Scholar Distinguished Professor Awarded by the Ministry of Education China. He is also a senior member of IEEE. He received the National Natural Science Award of China (2nd Grade) in 2014, and the National Science and Technology Progress Award of China (2nd Grade) twice in 2009 and 2011, respectively.

Semi-Plenary Lecture II

Intelligence in the Cyber-Physical Revolution

Cesare Alippi
Politecnico di Milano, Italy and Universitàdella Svizzera Italiana, Switzerland

Abstract – The emergence of non-trivial embedded sensor units and cyber-physical systems has made possible the design and implementation of sophisticated applications where large amounts of real-time data are collected, possibly to constitute a big data picture as time passes. Within this framework, intelligence mechanisms play a key role to provide systems with advanced functionalities. Intelligent mechanisms are needed to guarantee appropriate performances within an evolving, time-invariant environment, optimally harvest and manage the residual energy, identify faults within a model-free framework, solve the compromise between output accuracy and computational complexity.

The talk will show how the above aspects of intelligence are needed to boost the next generation of cyber-physical-based and Internet of Things applications, generation whose footprint is already around us.

Cesare Alippi received the degree in electronic engineering cum laude in 1990 and the Ph.D. in 1995 from Politecnico di Milano, Italy. Currently, he is a Full Professor of information processing systems with the Politecnico di Milano. He has been a visiting researcher at UCL (UK), MIT (USA), ESPCI (F), CASIA (CN), USI (CH), A*STAR (SIN).

Alippi is an IEEE Fellow, Vice-President Education of the IEEE Computational Intelligence Society, member of the Board of Governors of the International Neural Networks Society, Associate editor (AE) of the IEEE Computational Intelligence Magazine, past AE of the IEEE-Trans Instrumentation and Measurements, IEEE-Trans. Neural Networks, and member and Chair of other IEEE committees.

In 2016, he received the INNS Gabor Award and the IEEE Transactions on Neural Networks and Learning Systems outstanding paper award; in 2004 the IEEE Instrumentation and Measurement Society Young Engineer Award; in 2011 has been awarded Knight of the Order of Merit of the Italian Republic; in 2013 he received the IBM Faculty Award.

Among the others, Alippi was General Chair of the International Joint Conference on Neural Networks (IJCNN) in 2012, Program Chair in 2014, Co-Chair in 2011 and General Chair of the IEEE Symposium Series on Computational Intelligence 2014. Current research activity addresses adaptation and learning in non-stationary environments and intelligent embedded systems. Alippi holds 5 patents, has published in 2014 a monograph with Springer on “Intelligence for embedded systems” and (co-)authored about 200 papers in international journals and conference proceedings.

Semi-Plenary Lecture III

Optimal Control Using Adaptive Dynamic Programming: Fundamental Theory and New Development

Huaguang Zhang
Northeastern University, China

Abstract – It is known that dynamic programming is a powerful tool in solving the optimal control problems based on the principle of optimality. However, it is often computationally untenable to run true dynamic programming due to the backward numerical process required for its solutions, i.e., the well-known "curse of dimensionality". In order to overcome this difficulty, adaptive dynamic programming (ADP) is proposed as a promising method, the idea of which is to approximate the optimal solutions successively via iterative algorithms implemented by the neural networks. In this report, we will present some fundamental optimal control theory and recent development of ADP algorithms, which includes as follows: 1) A novel method named off-policy is proposed to solve the model-free problems, which only requires system data with different control inputs rather than the accurate system mathematical models. 2) Given an initial cost function which is not necessarily optimal, the sequences of cost function and control policy are updated through the neural networks based on HJB equation. 3) The iterative sequences of cost function and control policy are rigorously proved to converge to the optimal ones. 4) Considering the unavoidability of time delays, we further study the infinite-horizon and finite-horizon optimal control problem for the nonlinear systems with time delays. Some numerical simulation examples are provided to demonstrate the feasibility and effectiveness of these theories and designs.

Huaguang Zhang received the Ph.D. degree from Southeast University, Nanjing, China, in 1991. From 1992 to 1994, he did his postdoctoral research at Northeastern University, Shenyang, China. He has been with Northeastern University since 1991, and is currently as a Full Professor and Ph.D. advisor. He has authored and coauthored over 300 journal and conference papers, four monographs and co-invented more than 50 patents. He has been severing as an Associate Editor of Automatica since 2008, an Associate Editor of IEEE Transactions on Neural Networks since 2010, an Associate Editor of IEEE Transactions on Cybernetics since 2007, an Associate Editor of Neurocomputing since 2007. In addition, he is a fellow of IEEE, the E-letter Chair of IEEE CIS Society, the former Chair of the Adaptive Dynamic Programming & Reinforcement Learning Technical Committee on IEEE Computational Intelligence Society. Besides those he has been a member of the Neural Systems and Applications (NSA) Committee of IEEE Circuits and Systems Society, a member of the Blind Signal Processing (BSP) Committee of IEEE Circuits and Systems Society, a member of the Technical Committee on Computational Intelligence of the Systems, Man, and Cybernetics Society since 2007. He was awarded the Outstanding Youth Science Foundation Award from the National Natural Science Foundation Committee of China in 2003. He was named the Cheung Kong Scholar by the Education Ministry of China in 2005. He is a recipient of the IEEE Transactions on Neural Networks Outstanding Paper Award (2012). His current research interests include adaptive dynamic programming, fuzzy system theory, fuzzy control, neural network-based control, adaptive control, chaotic control, complex industry process automation, electric power system automation, motor driving system automation.

Semi-Plenary Lecture IV

Data Analytics Challenges in Biomedical Engineering

Donald Wunsch
Missouri University of Science & Technology, USA

Abstract – Biomedical engineering applications are now generating data at a rate that is increasing even faster than Moore's Law, just as that Law has come to an end. Thus it is incumbent on those who design intelligent computing techniques to compensate for the bottleneck results. This provides amazing challenges and opportunities for researchers in this fast-growing field.

Donald Wunsch is the Mary K. Finley Missouri Professor of Computer Engineering at Missouri University of Science and Technology. His expertise and training is in neural networks and other areas of computational intelligence, coupled with experience working with biological collaborators on large-scale genomics and biomedical engineering projects. This experience includes applications such as cancer diagnostics and prognostics, microarray data analysis, cell signaling and genetic regulatory networks, epilepsy onset prediction, neural spike sorting, multidisciplinary bioinformatics research, image analysis, automated depression and other mental health assessment, autism research, interpersonal relations assessment, automated ethics analysis, medical literature analysis, risk assessment, human-machine interfaces, explanation capabilities of automated reasoning systems, biomedical instrumentation, theories of learning, theories of motivation and addiction, neural network modeling and more. He has produced 18 Ph.D. recipients in Computer Engineering, Electrical Engineering and Computer Science, and is supervising eight additional Ph.D. Candidates in these fields as well as Systems Engineering. He is also supervising a Fulbright Fellow and two sabbatical faculty visitors. He is an IEEE Fellow, International Neural Networks Society (INNS) Fellow, former INNS President and Senior Fellow, and recipient of an NSF CAREER Award, the Halliburton Award for Excellence in Teaching and Research, the 2015 INNS Gabor Award and the 2016 Missouri University of Science and Technology Faculty External Recognition Award.

Semi-Plenary Lecture V

Quasi-Linear Systems with Spacecraft Control Applications

Guangren Duan
Harbin Institute of Technology, Harbin, China

Abstract – This world really behaves in a nonlinear fashion. Nonlinear systems really govern the dynamical behaviors of most of the practical systems in the world.

Whenever possible, nonlinear system technique is preferred to realize control of a nonlinear system, since it usually guarantees the global stability of the closed-loop system, and hence allows the system to be operated within a wide working range. However, existing nonlinear control approaches are limited and each one is only applicable to a special type of nonlinear systems.

An alternative way in tackling control of nonlinear systems is through linearization. Linear system techniques are popular and have wide applications in various fields, because linear systems theories and techniques are relatively mature, simple and universal. Yet they only guarantee local stability, and are only applicable to those systems which have narrow operating ranges.

Is there an approach which combines the advantages of both the linear and nonlinear approaches? The answer is positive.

Quasi-linear systems are linear in form, but nonlinear in nature. Many nonlinear systems can be represented in quasi-linear forms. Quasi-linear system techniques can often give results which are superior to those given by both pure nonlinear system techniques and linear system techniques.

In this talk, a brief introduction to the direct parametric design approaches for quasi-linear systems is given. It is shown with several types of quasi-linear systems that the approaches have the following advantages:

- result in constant linear closed-loop systems with desired eigenstructure although the open-loop systems are highly nonlinear;
- provide complete degrees of freedom which can be further utilized to achieve additional system properties.

These advantages are demonstrated with certain spacecraft control applications, including space rendezvous control and spacecraft attitude control.

Guangren Duan received his B.S. degree in Applied Mathematics, and both his M.S. and Ph.D. degrees in Control Systems Theory. From 1989 to 1991, he was a post-doctoral researcher at Harbin Institute of Technology, where he became a full professor of control systems theory in 1991. He visited the University of Hull, the University of Sheffield, and also the Queen's University of Belfast, UK, from December 1996 to October 2002. He was selected by the Cheung Kong Scholars Program of the Chinese government in August 2000, elected in 2005 leader of a Cheung Kong Scholar Innovative Team sponsored by the Chinese Ministry of Education, and elected in 2009 leader of an Innovative Research Group sponsored by NSFC. He is the founder and currently the Director of the Center for Control Theory and Guidance Technology at Harbin Institute of Technology, and also Member of the Science and Technology committee of the Chinese Ministry of Education, Vice President of the Control Theory and Applications Committee, Chinese Association of Automation, and Associate Editors of a few international journals.

Prof. Duan is the winner of the 4th Chinese National Youth Award of Science and Technology, the winner of two Chinese National Awards of Natural Sciences, and also winner of the Over-century Talents Program of the Chinese Ministry of Education, and that of the Distinguished Young Scholars Program of NSFC (Natural Science Foundation of China). His main research interests include parametric robust control systems design, LMI-based control systems, descriptor systems, spacecraft control and magnetic bearing systems. He is the author and co-author of 5 books and over 270 SCI indexed publications, with more than 50 appeared in IEEE Transactions.

Semi-Plenary Lecture VI

Controlling Physical Human-Robot Interaction

Milos Zefran
University of Illinois at Chicago, USA

Abstract – Rapid advances in social robotics, humanoids, autonomy and deep learning over the past decade suggest that robot assistants are within reach. However, robots are still unable to effectively collaborate with humans in everyday physical tasks. In this talk, I will describe our research on how to allow robots to physically interact with humans. An application that motivates this work is robot assistants for the elderly, where the robot needs to actively involve the human in Activities of Daily Living (ADLs). I will discuss challenges in obtaining measurements of physical interaction and introduce the ELDERLY-AT-HOME corpus of annotated human-human collaborative multimodal interactions; the corpus is instrumental for understanding how humans perform collaborative tasks and can be used for learning by demonstration. I will then highlight our results on human-robot collaborative manipulation and on robot-human handover, two tasks that frequently occur in ADLs. In both cases, the focus will be on how to control the robot to replicate and possibly improve on how a human helper acts during physical interaction. For collaborative manipulation, I will discuss how to compute the interaction force-thought to be responsible for coordination-and how this force can be used to quantify and in turn control the cooperation. For robot-human handover, I will introduce a novel model that explicitly includes a slipping mode; in turn, the model is used to design a robust controller that makes the handover smooth, yet safe.

Miloš Žefran completed his undergraduate studies in Electrical Engineering and Mathematics at the University of Ljubljana, Slovenia, where he also received a M.S. degree in Electrical Engineering. He received a M.S. degree in Mechanical Engineering and a Ph.D. degree in Computer and Information Science in 1995 and 1996, respectively, from the University of Pennsylvania. From 1997 to 1999, he was a NSF Postdoctoral Scholar at the California Institute of Technology. He then joined Rensselaer Polytechnic Institute. Since 1999, he has been with the Department of Electrical and Computer Engineering at the University of Illinois at Chicago where he is a Professor and the Director of Graduate Studies. In 2008, he was a visiting researcher at the University of Pisa. His research interests are in robotics and control with applications to human-robot interaction, cyber-physical systems, and robot networks. Dr. Žefran's research has been supported by a National Science Foundation (NSF) Career Award (2000) and a number of subsequent NSF awards. He has published over 100 journal and conference papers, and is the Associate Editor for the IEEE Transactions on Control Systems Technology.

Plenary Panel: Research Trends of Control and Automation

Organizers:

- Jie Huang, Professor, Chinese University of Hong Kong
- Choh-Ming Li, Professor, Chinese University of Hong Kong
- Zhongsheng Hou, Professor, Beijing Jiaotong University
- Xinping Guan, Professor, Shanghai Jiao Tong University

Abstract:

In this plenary panel session, we invite five prominent scholars including Gang Feng, Tielong Shen, Ning Xi, Ji-Feng Zhang, and Tong Zhou to present their viewpoints on research trends of control and automation, and to share their visions of the evolution and development of the control theory and applications. Their presentations will be followed by interactive discussions between the five scholars and the audience of WCICA 2016.

Pre-Conference Workshops

Workshop I

Nonlinear Control of Dynamic Networks: The Small-Gain Approach

Organizer: **Zhong-Ping Jiang**, New York University, USA

Abstract

Physical systems are inherently nonlinear and interconnected in nature. Significant progress has been made on nonlinear control systems in the past three decades. However, new system analysis and design tools that are capable of addressing more communication and networking issues are still highly desired to handle the emerging theoretical challenges underlying the new engineering problems. As an example, small quantization errors may cause the performance of a "well-designed" nonlinear control system to deteriorate.

The purpose of this half-day pre-conference workshop is to introduce a set of novel analysis and design tools to address the newly arising theoretical problems from the viewpoint of dynamic networks. The results are intended to help solve real-world nonlinear control problems, including quantized control, event-based control and distributed control aspects.

This tutorial is based on the authors' recent research results on nonlinear control of dynamic networks. In particular, it introduces refined nonlinear small-gain results for dynamic networks and their applications in solving the control problems of nonlinear uncertain systems subject to disturbance, quantization error, and other information exchange constraints.

Description of Workshop

Speakers:

- Tengfei Liu, Northeastern University, China
- Zhong-Ping Jiang, New York University, USA

Outline:

- Stability and Stabilization Problems of Dynamic Networks
- Input-to-State Stability
- The Nonlinear Small-Gain Theorem
- Small-Gain Designs
  - Quantized Nonlinear Control
  - Event–Based Control
  - Distributed Nonlinear Control

Workshop II

Brain-Like Intelligent Robots – Cognition, Planning and Motion

Organizer: **Hong Qiao,** Chinese Academy of Sciences, China

Abstract

Robotics has been a research hotspot for next generation of technology revolution. Although great developments have been made in recent years, robotics still has many technical bottlenecks. At present, it becomes a main concern for the governments, academia and industry on how to make a significant leap of research and develop key technologies for next generation robots.

As a promising direction of next generation robotics, brain-like intelligent robotics is an interdisciplinary research area integrating various research fields such as robotics, neuroscience, informatics, mechatronics, and etc. By mimicking the structure, mechanisms and underlying principles of biological systems, especially the perception, cognition, reasoning, planning, motor control and emotion modules, we could build more flexible, harmonious and personalized next generation robots and expand the market of intelligent robots. Furthermore, the related researches could also help humans understand the essence of biological systems and provide computational platforms for neural experiments.

Description of Workshop

Speakers:

- Wei Wu, Chinese Academy of Sciences, China
- Peijie Yin, Chinese Academy of Sciences, China
- Yinlin Li, Chinese Academy of Sciences, China
- Yongbo Song, Chinese Academy of Sciences, China

Outline:

- Motor Control Model Mimicking the Central Nervous System and the Peripheral Nervous System
- Visual Perception Model Mimicking the Primate Visual Cortex
- Coordinating the Visual Perception and Motor Control for Robot Manipulation
- Introduction of the Relevant Robot Platforms Integrating Bio-Inspired Algorithms

Workshop III

Model Free Adaptive Control (MFAC): Progress and Applications

Organizer: **Zhongsheng Hou**, Beijing Jiaotong University, China

Abstract

With the development of information sciences and technologies, practical processes, such as chemical industry, metallurgy, machinery, electronics, transportation, and logistics, pose enormous research and technical challenges for control engineering and management due to their size, distributed and multi-domain nature, safety and quality requirements, complex dynamics and performance evaluation, maintenance and diagnosis. Modeling these processes accurately using first principles or identification is almost impossible although these plants produce and store huge amount of impersonal valuable data on the plant and equipment operations in every moment during production. This challenges the existing control theory and technology, and meanwhile urgently pushes scientists and engineers to develop new data driven control and methodology to solve control and optimization issues for these complex practical plants. The high-tech hard/software and the cloud computing enable us to have ability to perform a complex computation real time, which makes the implementation of data driven control and methodology in practice possible. Thus, it would be very significant if we can learn the systems' behaviors and discover the correlation relationship of system variables by making full use of those on-line and off-line process data, and then design a controller directly, predict system states, perform real-time optimization, and realize system control. For this reason, the establishment and development of data-driven control theory and methodology are urgent in both the theory and applications.

Description of Workshop

Speakers:

- Zhongsheng Hou, Beijing Jiaotong University, China
- Ronghu Chi, Qingdao University of Science and Technology, China
- Yuanming Zhu, East China University of Science and Technology, China

Outline:

- The Dynamic Linearization Technique (DLT) and MFAC for Discrete-Time Nonlinear Systems
- Controller Dynamic Linearization Based MFAC
- Dynamic Linearization Based MFAC for Repetitive Systems
- MFAC for Complex Connected Systems, Modulized Designing with the Model Based Control Methods, and Further Research Topics

Workshop IV

Anti-Disturbance Control: Theory and Applications

Organizer: **Lei Guo**, Beihang University, China

Abstract

Existence of multiple types of disturbances influences the performance of control systems largely in various practical fields. A good amount of applications has shown the potentials of anti-disturbance control methods, especially by using of the disturbance rejection or compensation methods. Among them, the approaches of ADRC, DOBC and CHADC which have been hot research directions recently, since surely they can supply better performance in precision and reliability for many different practical plants. And we are happy that some mentioned approaches were established and developed by Chinese scientists.

However, there are still a lot of confusion and misunderstanding, more research is required to understand the true benefits and shortcomings (or limitations) of these methods. There is still a significant room to improve the design and analysis of these methods. Theoretical research is still well behind the applications in this area. What is the limit of this approach or what kind of uncertainty could not be dealt with by this approach? How to analyze the robust stability and performance for a designed DOBC strategy? Another related question is, for a described level of uncertainty, how to develop a strategy that requires a minimum level of feedback or control bandwidth? Also, there is still lack of software packages for supporting analysis and design process. More software and hardware tools shall be developed to facilitate design and real implementation of these methods. It is expected that more and more applications will be found due to the wide existence of disturbance and uncertainty, for which CHADC may be a desired choice. Furthermore, DOB techniques provide an alternative approach by considering faults as unknown inputs and estimating the size of faults directly.

Description of Workshop

Speakers:

- Lei Guo, Beihang University, China
- Yuanqing Xia, Beijing Institute of Technology, China
- Shihua Li, Southeast University, China
- Wenchao Xue, Chinese Academy of Sciences, China

Outline:

- New Design Methods for Complex Systems with Disturbances and Uncertainties
- Theoretic Research for Some Anti-Disturbance Control Approaches for Complex Systems Including Stability, Robustness and Optimality
- Comparisons And Unifications for Various Anti-Disturbance Control Methods
- Applications of Anti-Disturbance Control for Practical Engineering
- Control for Whole Loop Systems with Multiple Disturbances

Best Paper Award Finalists

1. TJ Tarn Best Theoretical Paper Award

(1) Boundary Analysis in Block Schemes for Control of Some Multi-Level Quantum Systems
by Yang Ling, Dewen Cao, Yaoxiong Wang, Feng Shuang and Fang Gao
(2) Modeling and Vibration Control of Flexible Wings with Output Constraint
by Wei He, Tong Lv, Yunan Chen, Xiuyu He and Changyin Sun
(3) Integrated Translational and Rotational Control for Rendezvous and Docking on Ellipse Orbits
by Han Yan, Shuping Tan and Yongchun Xie
(4) Minimum Entropy Tracking Control for Non-gaussian Systems Using Proportional-Integral Strategy
by Bo Tian, Yan Wang and Lei Guo
(5) Time-Varying Group Formation Control for Multi-Agent Systems with Second-Order Dynamics and Directed Topologies
by Xiwang Dong, Qingdong Li, Qilun Zhao and Zhang Ren
(6) Exponential Stability of Impulsive Differential Systems with Variable Delays
by Huamin Wang, Shukai Duan, Tingwen Huang and Lidan Wang

2. TJ Tarn Best Application Paper Award

(1) Dynamics Analysis of an Offshore Ship-Mounted Crane Subject to Sea Wave Disturbances
by Yuzhe Qian and Yongchun Fang
(2) Nonlinear Model Predictive Controller Design for Air System Control of a Gasoline Engine
by You Li, Yunfeng Hu, Shuwen Wang and Hong Chen
(3) A Diagnosis Scheme for Intermittent Faults in Active Suspension Systems of High Speed Trains
by Rongyi Yan, Xiao He and Donghua Zhou
(4) Fault Detection Filter and Controller Design for Unmanned Surface Vehicles
by Yulong Wang, Qinglong Han, Tianbao Wang and Chen Peng
(5) Introducing Projective Transformations into Lunar Image Correspondence for Positioning Large Distance Rover
by Chuankai Liu, Baofeng Wang, Xu Yang and Geshi Tang
(6) Teleoperation Control of an Exoskeleton Robot Using Brain Machine Interface and Visual Compressive Sensing
by Zhijun Li, Wei He, Chenguang Yang, Shiyuan Qiu, Longbin Zhang and Chunyi Su

3. TJ Tarn Best Student Paper Award

(1) Optimization-Based Compliance Control Strategy of Redundant Robot for ORU Replacements
by Li Jiang, Xijian Huo, Yiwei Liu and Hong Liu
(2) Robust Trajectory Tracking Control for a Quadrotor Unmanned Aerial Vehicle Using Disturbance Observer
by Yi Yang, Qingxian Wu and Mou Chen
(3) 3D Vision Based Fast Badminton Localization with Prediction and Error Elimination for Badminton Robot
by Ziyu Chen, Hong Qiao, Rui Li, Chao Ma, Xiaoqing Li and Konggeng Zeng

(4) Distributed Robust Attack Detection and Reconstruction for a Class of Uncertain Nonlinear Interconnected CPSs
by Wei Ao, Yongduang Song and Changyun Wen
(5) Optimal Torque Coordinating Control Strategy Applied in Downshifting Process of a Novel Seamless Automatic Transmission
by Jie Ye, Kegang Zhao and Man Xu
(6) Partial Blurred Object Segmentation for Non-uniform Motion Degraded Images
by Shaobo Zhang, Sheng Liu, Yiyuan Jiang and Xiaoyan Wang

4. Steve and Rosalind Hsia Best Biomedical Paper Award

(1) Bogdanov-Takens Bifurcation for a Predator-Prey System with Holling Type IV Function
by Jinling Wang and Jinling Liang
(2) A Classification-Based Fault Detection Method for Continuous Glucose Monitoring (CGM)
by Guangjian Song, Chunhui Zhao and Youxian Sun
(3) Model-Free Robust Optimal Feedback Mechanisms of Biological Motor Control
by Tao Bian and Zhongping Jiang
(4) A Visual Attention Based Convolutional Neural Network for Image Classification
by Yaran Chen, Dongbin Zhao, Le Lv and Chengdong Li
(5) A Programmable Electrical Stimulator for Suppressing Pathological Tremor
by Wei Xin, Yongsheng Gao, Shengxin Wang and Jie Zhao
(6) Rapid Detection of Chinese Liquors Using a Portable E-nose Based on C-SVM
by Peifeng Qi, Qinghao Meng, Yaqi Jing, Ming Zeng and Shugen Ma

5. SUPCON Best Paper Award on Industrial Automation

(1) Robust Hashing Learning via Multi-View Subspace Learning
by Yang Liu, Lin Feng and Shenglan Liu
(2) FPGA-Based Active Disturbance Rejection Control for Antenna Servo Systems
by Zhiqiang Zuo, Yao Li and Yijing Wang
(3) Soft Measurement Method for Froth Layer Thickness Based on Multi Visual Features
by Degang Xu, Xiao Chen, Ailian Ma, Yongfang Xie, Chunhua Yang and Weihua Gui
(4) Optimal Balancing Control of Bipedal Robots Using Reinforcement Learning
by Fang Peng, Lijia Ding, Zhijun Li, Chenguang Yang and Chunyi Su
(5) Time-Optimal Path Tracking for Coordinated Dual-Robot System Using Sequential Convex Programming
by Pengfei Cao, Yahui Gan, Jinjun Duan and Xianzhong Dai
(6) Optimization Algorithm of Serial Manipulator Structure Based on Posture Manipulability
by Shiyuan Jia, Yinghong Jia and Shijie Xu

Technical Program

Monday, June 13, 1:30PM–3:30PM

3:00PM *A Weighted Heteroscedastic Gaussian Process Modeling via Particle Swarm Optimization*
Xiaodan Hong, Yongsheng Ding, Lihong Ren, Lei Chen and Biao Huang

3:15PM *A New Index in Vehicular Ad-hoc Networks Connectivity Analysis Based on Generalized Packet Loss Rate Model*
Kaizhe Hou, Jianming Hu, Yizhi Wang and Danya Yao

Monday, June 13, 1:30PM–5:50PM

Plenary Poster Session: P1 Poster Session 1, Chair: Tianping Zhang and Yang Yang, Room: Poster Area 80

P101 *Temperature Compensation of Eddy Current Sensor Based on Temperature-Voltage Model*
Yaojia Zheng, Jun Wu and Yu Yang

P102 *Automatic Single-Line Diagram Generation of Distrib-Ution Network with Rings Based on GA*
Boxi Zhou, Lianxi Sun, Hongwei Zhang, Yongfei Yin, Ding Wei and Wenzhen Huang

P103 *Perceptual Weighting Deep Neural Networks for Single-Channel Speech Enhancement*
Wei Han, Xiongwei Zhang, Gang Min, Xingyu Zhou and Wei Zhang

P104 *Information Fusion Full-Order Kalman Filter for Multisensor Descriptor System*
Chenjian Ran and Yinfeng Dou

P105 *Fast Adaptive Electrical Capacitance Volume Tomography*
Jinchuang Zhao, Xingxing Zou, Wenli Fu and Hao Zhang

P106 *A High-Order Disturbance Observer Based Sliding Mode Velocity Control of Mobile Wheeled Inverted Pendulum Systems*
Songhyok Ri, Jian Huang, Chunjing Tao, Myonghyok Ri, Yongsok Ri and Daeho Han

P107 *Traffic Emission Control Based on Emission Pricing and Signal Timing*
Chang Liu and Hui Wang

P108 *Design of Multi-Parameter Embedded Biological Information Measurement System*
Jinchuang Zhao, Hao Zhang, Wenli Fu and Xingxing Zou

P109 *Backstepping Sliding Mode Force/Position Control for Constrained Reconfigurable Manipulator Based on Extended State Observer*
Shuai Wu, Bo Dong, Guibin Ding, Guogang Wang, Guangjun Liu and Yuanchun Li

P110 *Kalman Filtering with Multiplicative and Additive Noises*
Yilin Wu, Qian Zhang and Zhiping Shen

P111 *Neural Adaptive Dynamic Surface Control of Nonlinear System with Input Saturation and Unknown Function*
Zijun Jia, Tengfei Zhang, Danyong Li and Qi Song

P112 *A New Efficient Real-Time Arbitrary Colored Ball Recognition Method for a Humanoid Soccer Robot*
Jiteng Mu and Yunxuan Li

P113 *On Delay-Dependent Stability for Linear Systems with Interval Time-Varying Delays*
Liansheng Zhang, Shuxia Wang and Dianjun Wang

P114 *Study of Fuel Film Parameter Identification in Gasoline Engine Transient Conditions Based on Weighted Recursive Instrumental Variable Method*
Taixiong Zheng, Ju Tao, Yongfu Li, Bin Yang, Lichen Shi and Rui Tan

P115 *Application of Optimization Control Based on RBF Neural Network in VSC-HVDC*
Xiumei Zhang, Jiangyang Chen, Yang Liu and Weibo Yu

P116 *The Non-probabilistic Reliability-Based Design Optimization Based on Imperialistic Competitive Algorithm and Interval Model*
Xiaoning Fan and Zhiyong Cui

P117 *A Video Saliency Detection Framework Using Spatiotemporal Consistency Optimization*
Yunfei Zheng, Xiongwei Zhang, Tieyong Cao, Lei Bao, Yonggang Hu and Yong Wang

P118 *A Fast Non-dominated Sorting Algorithm for Real-Time Multi-Objective Particle Swarm Optimization*
Weijian Kong, Tianyou Chai, Jinliang Ding and Yongsheng Ding

P119 *Design of Interval Type-2 Fuzzy Logic Controller for Mobile Wheeled Inverted Pendulum*
Myonghyok Ri, Jian Huang, Songhyok Ri, HyonSu Yun and ChangSik Kim

Monday, June 13, 3:50PM–5:50PM

Tuesday, June 14, 1:30PM–3:30PM

Tuesday, June 14, 1:30PM–5:50PM

Plenary Poster Session: P2 Poster Session 2, Chair: Jun Chen and Haibin Sun, Room: Poster Area 113

P301 *Ear Recognition with Occlusion via Discrimination Dictionary and Occlusion Dictionary Based Sparse Representation*
Li Yuan, Fen Li and Wei Liu

P302 *Passivity Control Based on Euler-Lagrangian Model for D-STATCOM with LCL Filter*
Jinmu Lai, Xianggen Yin, Ertao Lei, Yu Chen and Xin Yin

P303 *A Comprehensive Control Strategy Suitable for Reactive Power Compensation and Harmonic Elimination*
Jian Dai, Minghao Wen, Ertao Lei, Yu Chen, Haihuan Wu and Xianggen Yin

P304 *An Improved Probabilistic Principal Component Analysis Approach for Process Monitoring and Fault Diagnosis*
Zhengdao Zhang, Bican Peng and Linbo Xie

P305 *A Simulation Study on Air Traffic Control Strategies*
Xiaobing Hu, Jianqin Liao and Ezequiel Di Paolo

P306 *Experimental Method of Three-Dimensional Velocity Field Measurement in Circular Pipe Based on PIV*
Dandan Zheng, Guang Lu, Jiaodan Zhang and Mi Wang

P307 *An Improved Load Shedding Model Based on Power Flow Tracing*
Guoyan Chen, Yong Wang, Guojun Lu, Jin Hu, Dahai You, Feng Zhang and Zhe He

P308 *An Economic Dispatch Model Based on Scenario Tree in Industrial Micro-Grid with Solar Power and Storage*
Jing Cai, Feng Gao, Xiaohong Guan, Kun Liu, Nana Yao and Xingrui Cheng

P309 *Charging and Discharging Control for Flywheel Battery Driven by Switched Reluctance Machine*
Hongwei Fang, Dan Wang, Huimin Chu and Ting Jia

P310 *Stereoscopic Image Generation Based on Region-Wise Rendering for 2D to 3D Conversion*
Wei Liu, Dehua Zhang, Mingyue Cui and Yu Zhang

P311 *A New Kind of Learning Algorithm with the Mechanism of Intrinsic Motivation*
Xiaoping Zhang, Xiaogang Ruan, Yao Xiao and Jing Huang

P312 *Distributed Optimization Strategy for Multi-Region Power Scheduling Based on Alternating Direction Method of Multipliers*
Chenlin Sun, Jiang Wu, Feng Gao and Xiaohong Guan

P313 *Adaptive Output Feedback Dynamic Surface Control of Nonlinear Systems with Actuator Failures and Unmodeled Dynamics*
Jun Mao, Tianping Zhang and Qikun Shen

P314 *Reactive Power Compensation in Microgrids via Distributed Control Strategy*
Xiong Hu, Hong Zhou, Zhi-Wei Liu, Zhi-Hong Guan and Ming Chi

P315 *Combustion Timing Control of HCCI Engine Based on FNN-PID and Black-Box Model*
Taixiong Zheng, Song Pan, Yongfu Li, Bin Yang, Lichen Shi and Zuyao Li

P316 *Output Feedback Tracking Control of a Class of Continuous Nonlinear Systems via Adaptive Dynamic Programming Approach*
Yang Yang, Dong Yue and Jing Shi

P317 *Analysis of Coupling Effects between Flight and Propulsion Systems for DPC Aircraft*
Jing Zhang, Xianfa Zeng and Lingyu Yang

P318 *Rolling Element Bearing Diagnostic Based on EEMD and SVM*
Nan Xie, Fei Ma and Beirong Zheng

P319 *Imperialist Competitive Algorithm for Design Optimization of Crane Metallic Structure*
Xiaoning Fan and Zhiyong Cui

P320 *Modeling of Spacecraft with Flexible Solar Panel Considering Thermally Induced Motion*
Lijun Li and Liang Tang

P321 *A Novel Spatial Approach for Classification of High-Resolution Image Scene*
Yuxia Sheng and Xiaoyong Bian

Tuesday, June 14, 3:50PM–5:50PM

Wednesday, June 15, 1:30PM–3:30PM

3:15PM *Multivariate Directed Weighted Complex Network for Characterizing 3D Wind Speed Signals in Indoor and Outdoor Environments*
Ming Zeng, Mingyuan Zhao, Qinghao Meng and Biao Sun

Wednesday, June 15, 1:30PM–5:50PM

Plenary Poster Session: P3 Poster Session 3, Chair: Jun Wu and Zhuqing Hu, Room: Poster Area 146

P501 *Adaptive PD Approach For Semi-Active Suspension Control of High Speed Trains*
Xiaochun Yuan, Yongduan Song and Zijun Jia

P502 *Model Predictive Torque Control of PMSM Systems Based on Sliding Mode Control*
Shuyuan Li, Qingfang Teng and Guofei Li

P503 *Evaluation, Test and Research on Driver's Multi-Task Mental Load Characteristics for Road Traffic Safety*
Huiying Wen, Haiwei Wang, Min Liu and Wuning Lai

P504 *Ray Trace Model of Solidification Shell Thickness Non-destructive Testing for Automatic Continuous Casting*
Qi Ouyang, Ximeng Chen, Song Peng, XingLan Zhang and ShuaiCheng Hou

P505 *Advanced VSC and Intelligent Control Algorithms Applied to SVM_DTC for Induction Motor Drive: A Comparative Study*
Sadhana Jadhav and Kirankumar Jaladi

P506 *Evaluation Model of Enterprise Business Model Reconstruction in Mobile Internet Era*
Xiao Xue, Donghua Liu and Shufang Wang

P507 *Traffic Detectors Deployment Modeling and Optimization under Urban Road Network*
Hanjie Ye, Jianming Hu, Xudong Xie and Yi Zhang

P508 *Simulation Design of Rolling Tube Machine Mandrel Support Device Hydraulic System*
Shuang Zhao and Wei Yuan

P509 *Improved Delay-Range-Dependent Stability for Linear Systems with Time-Varying Delays Based on Affine Function*
Liansheng Zhang and Qiang Liu

P510 *Agile Satellite Scheduling Based on Hybrid Coding Genetic Algorithm*
Xiyingzhi Geng, Jufang Li, Wenyuan Yang and Hongtao Gong

P511 *An Improved Dehazing Method Based on the Transmission Compensation*
Haitao Liu, Jin Guo and Chang-Yin Sun

P512 *Distributed MPC of the Standalone Hybrid Wind and Solar Generation System Based on Neural Network Modeling*
Mei Han, Xiaobing Kong and Xiangjie Liu

P513 *Permutation Flow Shop Scheduling with Delay Time Under Time-of-Use Electricity Tariffs*
Xingrui Cheng, Feng Gao, Chaobo Yan, Xiaohong Guan, Kun Liu, Siyun Chen, Nana Yao and Jing Cai

P514 *A Modified Hill Detouring Algorithm for Hinging Hyperplanes Minimization*
Kuangyu Liu, Zhiming Xu, Xiangming Xi and Shuning Wang

P515 *Probabilities Modeling of Multi-Class Based on Relevance Vector Machine*
Rui Li, Xiaodan Wang, Lei Lei and Zhengchong Zhao

P516 *An Accelerometer Modeling Approach Based on Mixed-Kernel Support Vector Machine*
Tao Yu, Baoya Hao, Jianlin Wang, Liqiang Zhao and Qingxuan Wei

P517 *Analysis for a Class of Discrete-Time Switched Systems via Approximate Bisimulations*
Guoqi Ma and Xinghua Liu

P518 *A Approach on UAV Ground Target Localization Based on Multi-sensor Fusion*
Yifeng Niu, Zhiwei Zhong, Daibing Zhang, Xun Wang and Jianhong Liang

P519 *A Real-Time People Number Detection Algorithm of Scenic Spot Based on Density Center Clustering*
Yaomin Wen, Junping Du, Meiyu Liang, Dan Fan and JangMyung Lee

P520 *High-Performance Three-Phase High-Power Three-Level Rectifier Using DSP-Based Digital Control Technique*
Zhi Zhang, Xueliang Liu, Ming Jiang and Yuan Yao

P521 *Deep Neural Networks for Head Pose Classification*
Yang Lu, Shujuan Yi, Nan Hou, Jingfu Zhu and Tiemin Ma

P522 *DCCA Cross-Correlation Analysis of 3D Wind Field Signals in Indoor and Outdoor Environments*
Ming Zeng, Xiaonei Zhang, Jinghai Li and Qinghao Meng

P523 *Multiscale Entropy Analysis of the 3D Near-Surface Wind Field*
Ming Zeng, Shan Zhang, Erhong Wang and Qinghao Meng

P524 *Effects of Sampling Frequency on Magnitude and Sign Correlations in Small-Scale Wind Speed Fluctuations*
Ming Zeng, Xiaonei Zhang, Jinghai Li and Qinghao Meng

P525 *Multiscale Multifractal Analysis of Near-Surface Wind Speed Time Series*
Ming Zeng, Xiaonei Zhang, Jinghai Li and Qinghao Meng

P526 *Comparison of Complexity Between Indoor and Outdoor Wind Speed Time Series*
Ming Zeng, Shan Zhang, Jing Lu, Qinghao Meng and Jiaying Wang

P527 *A Method of Diagnosing Leakage of Boiler Steam and Water Pipe Based on Genetic Neural Network*
Yan Wang, Xianglei Yin and Boying Wang

P528 *Path Planning of Unmanned Aerial Vehicles for Farmland Information Monitoring Based on WSN*
Jing Yang, Xiao Wang, Zetao Li, Ping Yang, Xuemei Luo, Kai Zhang, Shanshan Zhang and Lingfang Chen

P529 *UGM-Based High-Accuracy Multi-Sensor Image Registration*
Ce Xiong, Hao Fu and Meiping Shi

P530 *Design of High Frequency and High Power Supply for Ohmic Heating Based on ARM*
Shaogang Wang, Yin-Fa Yan, Fa-de Li and Zhanhua Song

P531 *The Research and Comparison on the Combination Technology of Models Based on HLA Simulation*
Guohua Zhu and Yang Dai

P532 *A Filter Feature Selection Method Based LLRFC and Redundancy Analysis for Tumor Classification Using Gene Expression Data*
Jiangeng Li, Xiaodan Li and Wei Zhang

P533 *Fault Diagnosis Method Based on Probability Extended SDG and Fault Index*
Yingjie Liu, Qinghao Meng, Ming Zeng and Shugen Ma

P534 *Parameter Identification of Linear Time-Invariant Systems with Large Measurement Noises*
Chyun-Chau Fuh, Hsun-Heng Tsai and Hung-Che Lin

P535 *Fire Smoke Detection Based on Texture Features and Optical Flow Vector of Contour*
Yakun Wang, Aiguo Wu, Jie Zhang, Meng Zhao, Wenshuai Li and Na Dong

P536 *Estimation for Globally Exponentially Attractive Set of a Hyperchaotic Lorenz-Type Systems and Its Application*
Xuezhen Liu

P537 *Terminal Sliding Mode Cascade Control for Tracking and Synchronization of a Dual-Motor Driving System*
Minlin Wang, Xuemei Ren and Qiang Chen

P538 *Parameter Estimation of Gaussian Mixture Model and Its Application in Multimode Process Monitoring*
Junfeng Gao, Lingke Zhou and Baozhu Du

P539 *Automatic Detection and Counting of Circular Shaped Overlapped Objects Using Circular Hough Transform and Contour Detection*
Jianjun Ni, Zubair Khan, Shihao Wang, Kang Wang and Syed Kamran Haider

P540 *Direct Torque Control for BLDCM Based on Optimized Sliding Mode Observer*
Wenshuai Li, Aiguo Wu, Na Dong and Yakun Wang

P541 *Density Difference-Based Variable Speed Limit Control for Expressways under Rainfall Conditions*
Yuguang Chen, Jianming Lei, Wei Cheng, Linyong Su and Ying Liu

P542 *Recursive Least Squares Algorithm for Parameter Identification of Multi-Input Output Systems Using the Data Filtering*
Jiling Ding

Wednesday, June 15, 3:50PM–5:50PM

4:20PM *Unscented Kalman Filter-Based Adaptive Tracking Control for Wheeled Mobile Robots in the Presence of Wheel Slipping*
Mingyue Cui, Wei Liu, Hongzhao Liu and Xiaodong Lv

4:35PM *Optimization Current Computation of IPMSM Drive system for Electric Vehicles Based on the Projected Dynamic System*
Qinmu Wu, Linjie An and Min Cao

4:50PM *Active Noise Control Using STF for Time-Vary Delay Estimation in Secondary Path Based on DFxLMS*
Jia Sun, Chang-Yin Sun and Yao Yu

5:05PM *Optimization Algorithm for Vehicle Braking Force Distribution of Front and Rear Axles Based on Brake Strength*
Jinlong Xu and Xiangwen Zhang

5:20PM *Stochastic Linear Quadratic Control with Regional Pole Placement*
Jie Wang, Ting Hou and Hongji Ma

5:35PM *Coordinated Traffic Signal Control Method of Urban Expressway On-Ramp and Ground Intersections*
Yuguang Chen, Manrong Yuan, Wei Cheng, Haicheng Xiao and Huabao Ye

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- Autonomous Control of Unmanned Aerial Vehicles (2015, Vol.2, No.1)
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June 25-29, 2018, Changsha, China

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Important Dates:

- **Jan. 10, 2018** **Submission of original PDF full papers**
- **Jan. 10, 2018** **Submission of organized session proposals**
- **Feb. 20, 2018** **Notification of paper and organized session acceptance**
- **Ma. 20, 2018** **Submission of final papers and advance registration**

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