2011 ICAMechS

International Conference on Advanced Mechatronic Systems

August 11-13, 2011

Zhengzhou, China

PROGRAM

Organizers:

International Journal of Advanced Mechatronic Systems

Zhongyuan University of Technology

Tokyo University of Agriculture and Technology

Sponsors:

IEEE Systems, Man, and Cybernetics Society

International Journal of Modelling, Identification and Control

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	Akira Inoue (Okayama University, Japan)
	Tsu-Tian Lee (National Taipei University of Technology, Taiwan)
	David H. Owens (University of Sheffield, UK)
	Quanmin Zhu (University of the West of England, UK)
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Ohmori, Hiromitsu (Keio University, Japan)

Oya, Masahiro (Kyusyu Institute of Technology, Japan)

Peng, Hui (Central South University, China)

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Qiao, Feng (Shenyang JianZhu University, China)

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Vasant, Pandian(University Technology Petronas, Malaysia)

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Wang, Ruili (Massey University, New Zealand)

Wang, Wei (Dalian University of Technology, China)

Wang, Wenhui (University of Canterbury, New Zealand)

Wang, Xiaolei (Zhongyuan University of Technology, China)

Wang, Zhongjie (Tongji University, China)

Xiao, Huimin (Henan Univ. of Finance and Economics, China)

Xiao, Junming (Zhongyuan University of Technology, China)

Yamashita, Yoshiyuki (Tokyo Univ. of Agriculture and Tech., Japan)

Yao, Jing (Tongji University, China)

Yi, Jianqiang (Institute of Automation, China)

Yu, Haibin (Chinese Academy of Sciences, China)

Yue, Dong (Nanjing Normal University, China)

Zhang, Jianhua (North China Electric Power University, China)

Zhang, Mingjun (The University of Tennessee, USA)

Zhang, Qian (Zhongyuan University of Technology, China)

Zhang, Wuyi (Zhongyuan University of Technology, China)

Zhang, Yu Ming (University of Kentucky, USA)

Zhao, Qiangfu (The University of Aizu, Japan)

2011 International Conference on
Advanced Mechatronic Systems

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GREETINGS FROM THE GENERAL CHAIRS

It is our great pleasure and honor to welcome you to the 2011 International Conference on Advanced Mechatronic Systems. The conference is held on August 11-12, 2011 at Zhengzhou, China, sponsored by International Journal of Advanced Mechatronic Systems, Zhongyuan University of Technology, Tokyo University of Agriculture and Technology, IEEE Systems, Man and Cybernetics Society and International Journal of Modelling, Identification and Control.

This conference provides an international forum for professionals, academics, and researchers to present latest developments from interdisciplinary theoretical studies, computational algorithm development and applications of advanced mechatronic systems. Reflecting these methodological and technological trends, this conference includes presentations of excellent and interesting papers in all theoretical studies and applications of advanced mechatronic systems. Novel quantitative engineering and science studies are considered as well.

Zhengzhou is the capital and largest city of Henan Province in North-Central China, as well as being a major transportation hub for Central China. The city centre lies on the southern bank of the Yellow River, and the city is one of the Eight Great Ancient Capitals of China. There are many sight-seeing places to go, Shaolin Monastery, Longmen Grottoes and so on. We hope all of the participants enjoy your stay in the city of Zhengzhou and mutual exchange of scientific/technical information at the conference.

We would like to present our sincere thanks to the three invited speakers for the special lectures, authors of presented papers, participants, the members of Program Committee and Organizing Committee.

General Chairs

Mingcong Deng   Dongyun Wang   Hong Wang

CONFERENCE HIGHLIGHTS

A total of 152 papers were submitted to the 2011 ICAMechS from different parts of the world. Each paper was reviewed by two or three reviewers. The final program includes 115 papers among which 64 are the contributed papers and 51 are special papers. There are three plenary speeches, 11 special sessions and 11 lecture sessions. Each session consists of 4-6 papers. Papers were assigned with the sole purposed of forming coherent sessions.

CONFERENCE REGISTRATION

The conference registration desk, located at the first floor hallway of Yinbin Building (No. 1 Building) in Songshan Hotel, will be opened during the following time:

15:00-18:00, August 10, 2011 (Wednesday)

08:30-18:00, August 11, 2011 (Thursday)

08:30-18:00, August 12, 2011 (Friday)

09:30-11:00, August 13, 2011 (Saturday)

The full registration includes Welcome Reception, Conference Banquet, Closing Reception and Conference CD-ROM Proceedings.

Additional sets of CD-ROM proceedings may be purchased at the registration desk ($50 USD for CD-ROM proceedings).

SOCIAL EVENTS

Welcome Reception (Songshan Hotel, 18:30 - 20:00, August 11, 2011)

Conference Banquet (Songshan Hotel, 18:30 - 20:30, August 12, 2011)

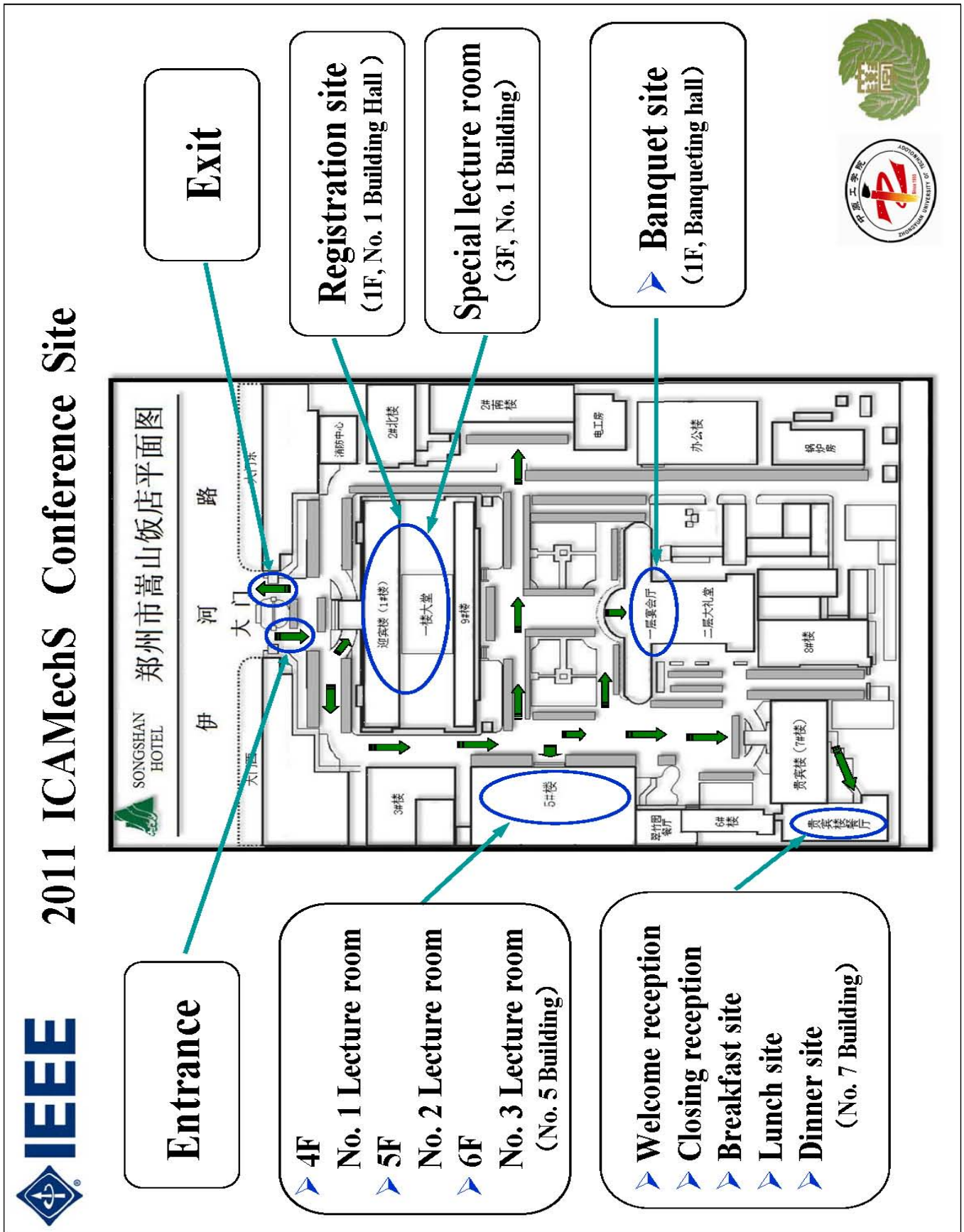Closing Reception (Songshan Hotel, 11:30 - 13:00, August 13, 2011)

HOTEL RESERVATIONS

The information on hotel reservation is available at

http://www.tuat.ac.jp/~deng/icamechs2011/icamechs2011.html

CONFERENCE LOCATION

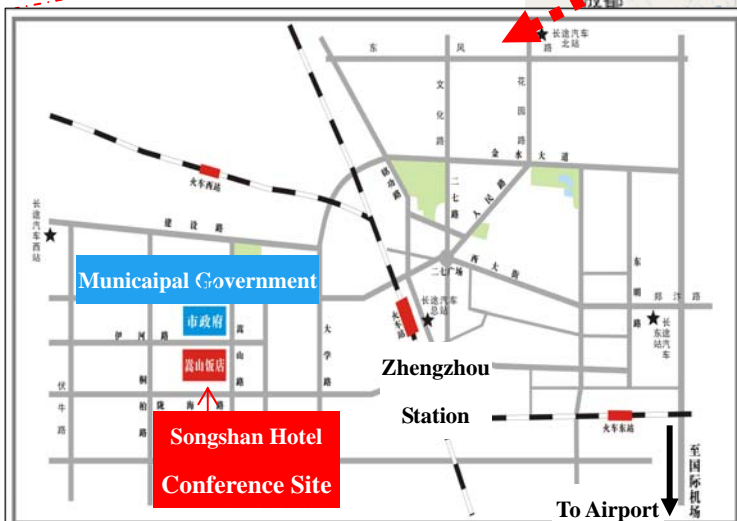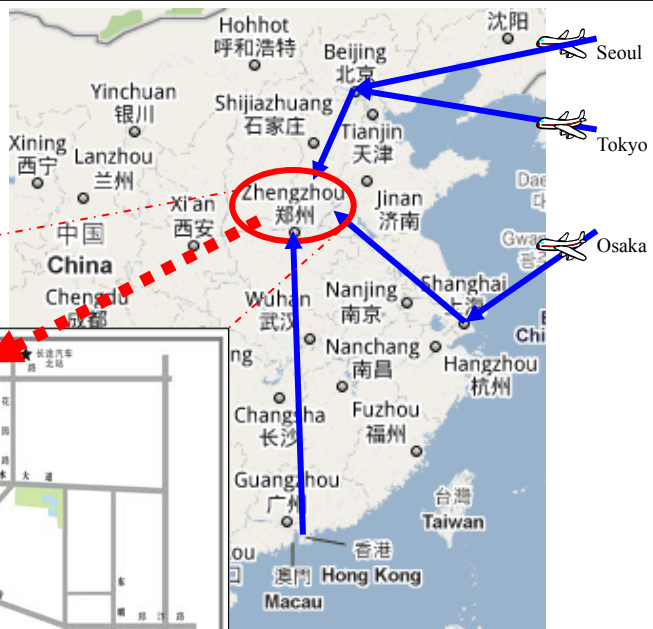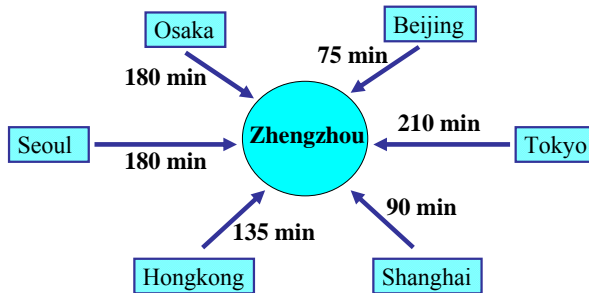The conference site map is given below.

TRANSPORTATION

Transportation from Xinzheng International Airports to Conference Site (Songshan Hotel, Zhengzhou)

- Zhengzhou Xinzheng Airport

  →(Taxi, 45minutes, about 150RMB; Limousine Bus, Civil Aviation Hotel Zhengzhou, and then take a Taxi, 80minutes, about 50 RMB)

  → Conference Site (Songshan Hotel, Zhengzhou)

- Zhengzhou Station

  →(Taxi, 12 minutes, about 15RMB; Bus, Zhengzhou Station, Bus Line No. 201, 25 minutes, about 1RMB)

  →Conference Site (Songshan Hotel, Zhengzhou)

PLENARY SPEAKERS

Prof. Eric Rogers, University of Southampton, UK

Professor Eric Rogers received the BSc degree in Mechanical Engineering from Queen's University Belfast, UK, and the postgraduate masters and PhD degrees in control systems from the University of Sheffield, UK. In 2004 he was awarded the DSc degree by Queens University Belfast, UK, for research in control systems. Currently he is Professor of Control Systems Theory and Design in the School of Electronics and Computer Science, University of Southampton, UK. His research interest currently include multidimensional systems theory and applications, the control of processes with repetitive dynamics, iterative learning control and its applications in engineering and healthcare, flow control, and the control of underwater vehicles. Much of this research involves substantial collaborations with other groups in the University of Southampton, elsewhere in the UK, and overseas. A major theme of his current research is collaboration with colleagues from Health Sciences on the use of iterative learning for upper limb stroke rehabilitation which has already led to successive clinical trials and the best paper award at the 2009 IEEE 11th International Conference on Rehabilitation Robotics.

His main contribution to the control systems community at large currently is as Editor-in-Chief of the International Journal of Control.

Title:

Iterative Learning Control from Analysis to Engineering to Robotic-assisted Upper Limb Stroke Rehabilitation

Abstract:

Iterative learning control can be applied to systems that repeat the same task over a finite duration with resetting to the starting point once each one is complete. The idea of iterative learning control is to make use of information from previous executions of the task in order to update the control signal applied during the current execution and thereby sequentially improve performance. Since the idea was first proposed a very large volume of research has appeared in the engineering literature with follow through to experimental testing of some of the resulting algorithms and actual implementations. The first part of this lecture will review the steps in this for one algorithm class from the theory through to actual implementation and the second part will describe recent work where the same algorithms have been used in robotic-assisted upper limb stroke rehabilitation with supporting clinical trials.

Prof. Tsu-Tian Lee, National Taipei University of Technology, Taiwan

Professor Tsu-Tian Lee is currently the National Endow Chair of Ministry of Education, National Taipei University of Technology. He received his Ph.D. degree in Electrical Engineering from the University of Oklahoma, OK, in 1975. Previously, he had served as Professor and Chairman of the Department of Control Engineering at National Chiao Tung University, as a Visiting Professor (1987), as a Full Professor of Electrical Engineering at the University of Kentucky, KY (1988-1990), as Professor and Chairman of the Department of Electrical Engineering, National Taiwan University of Science and Technology (NTUST), as Dean of the Office of Research and Development, NTUST, and as a Chair Professor of the Department of Electrical and Control Engineering, NCTU. From February 1, 2004 to January 31, 2011, he has severed as the President of National Taipei University of Technology (NTUT). He received the Distinguished Research Award from the National Science Council, Taiwan, during 1991–1998, the Academic Achievement Award in Engineering and Applied Science from the Ministry of Education, Taiwan, in 1997, the National Endow Chair from the Ministry of Education, Taiwan, in 2003 and 2006, respectively, and the TECO Science and Technology Award from TECO Technology Foundation in 2003. He was elected to the grade of IEEE Fellow in 1997 .He became a Fellow of IET in 2000, a Fellow of New York Academy of Sciences (NYAS) in 2002, and a Fellow of Chinese Automatic Control Society (CACS) in 2007. In 2003, he received the IEEE SMC Society Outstanding Contribution Award, and in 2009, IEEE SMC Society Norbert Wiener Award. He has served as Vice President for Membership for the IEEE Systems, Man, and Cybernetics Society, and General Chair, General Co-Chair, Program Chair, and Invited Session Chair in many IEEE sponsored international conferences.

Title:

Intelligent Transportation Systems in Taiwan

Abstract:

In the 21st century, the technology development mainstream is the interdisciplinary integration, together with the human-centered technologies (i.e., Human-Technologies, HT) that emphasizes on friendly service for human rather than the forced adaptation by human. Intelligent Transportation Systems (ITS) represents a typical human-centered large-scale and highly complex dynamic system, while it is the mainstream of the development of next-generation technologies. ITS is an integrated discipline of sensing, controls, computers, electronics, communications and traffic management.

This lecture discusses some achievements of HT-ITS in Taiwan, including ITS information and communication platform, traffic dynamics simulation platform, driving safety assistance systems, and intelligent control technologies applied to next generation smart vehicles. Some real-life demonstrations of Advanced Traveler Information Systems (ATIS) and Advanced Vehicle Control and Safety Systems (AVCSS) on our experimental car are also included in this lecture.

Prof. Akira Inoue, Okayama University, Japan

Professor Akira Inoue received the B.S., M.S. and Ph.D degrees in applied mathematics and physics from Kyoto University in 1966, 1968, 1977 respectively. In 1970, he was appointed research associate at Department of Applied Mathematics and Physics in Kyoto University, Japan. From 1977 to 1978, he was a visiting research associate at Department of Chemical Engineering, University of Alberta, Canada. He was an associate professor at Department of Mechanical Engineering, Kumamoto University in 1978, and he became a professor at Department of Applied Mathematics, Kumamoto University, Japan in 1982. From 1987 to 1997, he was a professor at department of Information Technology and from 1997 to 2008, at Department of Systems Engineering, Okayama University, Japan. In 2006, he was visiting professor at Control Systems Centre, the University of Manchester, UK, Nanjing Normal University and Zhongyuan University of Technology, China. In 2009, he became Professor Emeritus, Okayama University.

Dr. Inoue authored 100 journal papers and 180 conference papers. He received SICE-ICCAS Best Paper Award in 2006, Gugao Applied Research Award in 2004 and Paper Award from the Institute of Systems, Control, and Information Engineers in 1997. He is Fellow of SICE and JSME and a senior member of IEEE. He served as General Chairs of SICE Annual Conference in 2005 and International Conference on Networking, Sensing and Control. He received research grant under of "Grants-in-Aid for Scientific Research" from JSPS on "Safety in Industrial Complex". His research interest is in adaptive control, adaptive observer, nonlinear control, control of mechanical systems, fault detection and plant safety control.

Title:

Integrated Information Systems for Safety and Supporting Functions of Plants in Complex Industrial Area

Abstract:

At March 11, 2011, huge earthquake hit north-east Japan. More than 23,000 people died or still are missing by this earthquake and more than 170,000 houses were damaged or swept away by tsunami. In this way, disaster such as the earthquake impacts deeply people daily life. Also, the earthquake influenced severely on industry and economy. For example, factories of car parts makers in the area were damaged and the supply of the pars stopped, This shortage of the parts caused shutdown of many factories of car makers even in outside of Japan. It is said that the earthquake is so huge that it occurs once in one thousand years. But earthquakes or other disasters that influence heavily on industry occur in several years and we need to have countermeasure to prevent the influence on industry.

In Japan, there are several complex industrial areas where many factories and plants are integrated. When a disaster such as earthquake hits one of the areas, even if the earthquake is not so large as the quake hit at March 11, the impact on the area is large. The influence is not only halt of production of the plants in the area, but also it affects industries outside of the area and also safety and natural environment of the surrounding areas, Actually companies having plants in the area took some countermeasures to prevent the effect on other plants or surrounding areas. But the measures need to be wide range including such as safe storage and prevention of contaminated chemicals, training of employee, fault detection, control of the plants and management of process information. To realize such measures, it is necessary to construct an integrated information system for safety and supporting plants. The speaker with other researchers established a plan of the integrated information system. The system is constructed on a computer network and consists of agents connected by the network. The agents have functions to process simulation, production management, control and fault detection. The agents are planned based on activity models.

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CONFERENCE PROGRAM

Wednesday, August 10, 2010

15:00 - 18:00	**Registration**
18:30 - 20:00	**Welcome Reception (Songshan Hotel, Zhengzhou)**

Thursday, August 11, 2011

08:30 - 08:40 **Opening Remarks**	

08:40 - 09:40   **Plenary Speech 1 (PS01)**   Special lecture room

Title: Iterative learning control from analysis to engineering to robotic-assisted upper limb stroke rehabilitation
Speaker: Eric Rogers, *University of Southampton, UK*

09:40 - 10:00   *Break*

10:00 - 12:00   **Parallel Paper Sessions**

No. 1 lecture room	No. 2 lecture room	No. 3 lecture room	Special lecture room
ThuA01	**ThuA02**	**ThuA03**	**ThuA04**
Robotics and mechatronics	Information processing	Genetic algorithm, neural network and PSO	Process modeling, optimization and system design

12:00 - 13:00   *Lunch*

13:00 - 14:00   **Plenary Speech 2 (PS02)**   Special lecture room

Title: Integrated information systems for safety and supporting functions of plants in complex industrial area
Speaker: Akira Inoue, *Okayama University, Japan*

14:00 - 14:20   *Break*

14:20 - 16:00   **Parallel Paper Sessions**

No. 1 lecture room	No. 2 lecture room	No. 3 lecture room	Special lecture room
ThuM01	**ThuM02**	**ThuM03**	**ThuM04**
Motor control	Optimization, prediction and control	Novel control techniques	Process control

16:00 - 16:20   *Break*

16:20 - 18:00   **Parallel Paper Sessions**

No. 1 lecture room	No. 2 lecture room	No. 3 lecture room	Special lecture room
ThuP01	**ThuP02**	**ThuP03**	**ThuP04**
Human adaptive mechatronics	Industrial hazards and system safety	Industrial application	Distributed system

Friday, August 12, 2011

08:40 - 09:40	**Plenary Speech 3 (PS03)**	Special lecture room

Title: Intelligent transportation systems in Taiwan
Speaker: Tsu-Tian Lee, *National Taipei University of Technology, Taiwan*

09:40 - 10:00	*Break*

10:00 - 12:00	**Parallel Paper Sessions**

No. 1 lecture room	No. 2 lecture room	No. 3 lecture room	Special lecture room
FriA01	**FriA02**	**FriA03**	**FriA04**
Adaptive and advanced control systems - theory and applications	Information techniques for control	Measurement and sensors	Mobile robots

12:00 - 13:00	*Lunch*

13:00 - 13:30	*Break*

13:30 - 15:10	**Parallel Paper Sessions**

No. 1 lecture room	No. 2 lecture room	No. 3 lecture room3
FriM01	**FriM02**	**FriM03**
Mechatronics, dynamic systems and controls in bio-mechanics and biomedical engineering	Modeling, control and applications of nonlinear dynamic systems	Discrete time control systems

15:10 - 15:30	*Break*

15:30 - 17:10	**Parallel Paper Sessions**

No. 1 lecture room	No. 2 lecture room	No. 3 lecture room3
FriP01	**FriP02**	**FriP03**
New development in cooperative and distributed control: theory and applications	Fuzzy and neural methodologies	Advanced techniques for control

18:30 - 20:30	**Banquet (Songshan Hotel, Zhengzhou)**

Saturday, August 13, 2011

09:30 - 11:00	**Plenary Panel Discussion**	Lounge

Title: New developments in advanced mechatronic systems
Organizer: Mingcong Deng, *Tokyo University of Agriculture and Technology, Japan*

11:30 - 13:00 **Closing Reception (Songshan Hotel, Zhengzhou)**

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TECHNICAL PROGRAM

ICAMechS 2011
Wednesday, August 10, 2011

15:00 - 18:00

Registration

18:30 - 20:00

Welcome Reception

ICAMechS 2011
Thursday, August 11, 2011

08:40 - 09:40   Special lecture room

Plenary Speech 1

Iterative learning control from analysis to engineering to robotic-assisted upper limb stroke rehabilitation

Eric Rogers

University of Southampton, UK

Chair: Hongnian Yu   Staffordshire Univ., UK

09:40 - 10:00   **Break**

Morning Technical Sessions
10:00-12:00, Thursday, August 11, 2011

ThuA01   No. 1 lecture room
Robotics and mechatronics   Lecture Session
Chair: Shinji Wakui   Tokyo Univ. of Agriculture and Tech., Japan
Co-Chair: Hongnian Yu   Staffordshire Univ., UK

10:00-10:20	ThuA01-01

A geometric method for calibration of the image center

Yongchun Fang	Nankai Univ., China
Xuebo Zhang	Nankai Univ., China
Baoquan Li	Nankai Univ., China
Ning Sun	Nankai Univ., China

10:20-10:40	ThuA01-02

Experimental validation of control for a positioning stage by feedback error learning

| Yukinori Nakamura | Tokyo Univ. of Agriculture and Tech., Japan |
| Kazuki Morimoto | Tokyo Univ. of Agriculture and Tech., Japan |

Shinji Wakui   Tokyo Univ. of Agriculture and Tech., Japan

10:40-11:00	ThuA01-03

Control of human hand considering uncertainties

M. Moavenian	Ferdowsi Univ. of Mashhad, Iran
M.R. Gharib	Ferdowsi Univ. of Mashhad, Iran
A. Daneshvar	Ferdowsi Univ. of Mashhad, Iran
S. Alimardani	Ferdowsi Univ. of Mashhad, Iran

11:00-11:20	ThuA01-04

The design of intelligent robot based on embedded system

Mingliang Liang	Zhengzhou Railway Vocational & Technical College, China
Xinqiang Wang	Zhongyuan Univ. of Tech., China

11:20-11:40	ThuA01-05

Design of two optimal controllers for mechatronic suspension system

Sallehuddin Mohamed Haris	Univ. Kebangsaan Malaysia, Malaysia
Wajdi S. Aboud	Univ. Kebangsaan Malaysia, Malaysia

ThuA02   No. 2 lecture room
Information processing   Lecture Session

Chair: Xinkai Chen   Shibaura Institute of Tech., Japan
Co-Chair: Dongyun Wang   Zhongyuan Univ. of Tech., China

10:00-10:20	ThuA02-01

Research on selection system based on bayesian recommendation model

Guiqin Dou	Zhongyuan Univ. of Tech., China
Yansong Zhu	Zhongyuan Univ. of Tech., China
Yumin Han	Zhongyuan Univ. of Tech., China

10:20-10:40	ThuA02-02

Stabilization for fractional-order networked control systems with input time-varying delays

Xiaona Song	Henan Univ. of Science and Tech., China
Ines Tejado	Univ. of Extremadura, Spain
Yangquan Chen	Utah State Univ., USA

10:40-11:00	ThuA02-03

Algorithm on detection and identification of foreign fibers in raw cotton

Dongyun Wang	Zhongyuan Univ. of Tech., China
Hongtao Peng	Zhongyuan Univ. of Tech., China
Yongping Dan	Zhongyuan Univ. of Tech., China
Fanghua Liu	Zhongyuan Univ. of Tech., China
Liusong Wang	Zhongyuan Univ. of Tech., China

11:00-11:20	ThuA02-04

Optimal path planning for material and products transfer in steel works using ACO

Mingcong Deng	Tokyo Univ. of Agriculture and Tech., Japan
Akira Inoue	Okayama Univ., Japan

Satoru Kawakami   GS Uasa Corp., Japan

11:20-11:40	ThuA02-05

Radar equation of high-speed weak target

Cunsuo Pang	North Univ. of China., China
Nan Zhang	Second Research Academy of CASIC, China
Xiangyang Lu	Zhongyuan Univ. of Tech., China

ThuA03   No. 3 lecture room
Genetic algorithm, neural network and PSO
    Lecture Session

Chair: Masahiro Oya   Kyusyu Institute of Tech.., Japan
Co-Chair: Wudai Liao   Zhongyuan Univ. of Tech., China

10:00-10:20	ThuA03-01

Exponential stability analysis for the switched stochastic hopfield neural networks with time-varying delays

Huimin Xiao	Henan Univ.of Economics and Law, China
Chunhua Wang	Ocean Univ.of China, China

10:20-10:40	ThuA03-02

Optimized fuzzy PDC controller for nonlinear systems with T-S model mismatch

A. Zeiaee	Tabriz Univ., Iran
H. Kharrati	Tabriz Univ., Iran
S. Khanmohammadi	Tabriz Univ., Iran

10:40-11:00	ThuA03-03

On zeros of sampled-data system with relative degree two

Shan Liang	Chongqing Univ., China
Mitsuaki Ishitobi	Kumamoto Univ., Japan
Tomoki Koga	Kumamoto Univ., Japan
Sadaaki Kunimatsu	Kumamoto Univ., Japan

11:00-11:20	ThuA03-04

Design of PSO-based fuzzy gain scheduling PI controller for four-area interconnected AGC system after deregulation

Guolian Hou	North China Electric Power Univ., China
Lina Qin	North China Electric Power Univ., China
Xinyan Zheng	North China Electric Power Univ., China
Jianhua Zhang	North China Electric Power Univ., China

11:20-11:40	ThuA03-05

Improved particle swarm optimization algorithms

Wudai Liao	Zhongyuan Univ. of Tech., China
Junyan Wang	Zhongyuan Univ. of Tech., China
Xingfeng Wang	Zhongyuan Univ. of Tech., China
Jiangfeng Wang	Zhongyuan Univ. of Tech., China

11:40-12:00	ThuA03-06

The global existence of the solution and impulsive synchronization for m-dimensional reaction-diffusion system

Wanli Yang	Academy of Armored Forces Engineering, China
Suwen Zheng	Academy of Armored Forces Engineering, China

ThuA04   Special lecture room
Process modeling, optimization and system design
                                              Lecture Session
Chair: Chun-Yi Su   Concordia Univ., Canada
Co-Chair: Zi-Jiang Yang   Ibaraki Univ., Japan

10:00-10:20	ThuA04-01

An overview of modelling and simulation of thermal power plant

Changliang Liu	North China Electric Power Univ., China
Hong Wang	The Univ. of Manchester, UK
Jinliang Ding	Northeastern Univ., Chian
Chenggang Zhen	North China Electric Power Univ., China

10:20-10:40	ThuA04-02

Fast algorithm of supervisory predictive control

Guolian Hou	North China Electric Power Univ., China
Yi Sun	North China Electric Power Univ., China
Jingbin Liu	North China Electric Power Univ., China
Jianhua Zhang	North China Electric Power Univ., China

10:40-11:00	ThuA04-03

Intelligent stochastic quality control of non-Gaussian chemical processes

A. Ahammed	The Univ. of Manchester, UK
A. Wang	Anhui Univ., China
Hong Wang	The Univ. of Manchester, UK

11:00-11:20	ThuA04-04

Elementary siphons in a class of generalized petri nets and their application

Yifan Hou	Xidian Univ., China
Zhiwu Li	Xidian Univ., China
Ding Liu	Xidian Univ., China
Mi Zhao	Shihezi Uni., China

11:20-11:40	ThuA04-05

Network based robust adaptive thermal control design for aluminum plate

Masahiro Sanada	Okayama Univ., Japan
Mingcong Deng	Tokyo Univ. of Agriculture and Tech., Japan
Shengjun Wen	Tokyo Univ. of Agriculture and Tech., Japan

11:40-12:00	ThuA04-06

Modeling and simulation for parallel hybrid electric vehicle power train

Zhumu Fu	Henan Univ. of Science and Tech., China
Gaolei Hou	Xuji Metering Limited Company, China
Aiyun Gao	Henan Univ. of Science and Tech., China

12:00 - 13:00   Lunch

13:00 - 14:00   Special lecture room

Plenary Speech 2
Integrated information systems for safety and supporting functions of plants in complex industrial area

Akira Inoue
Okayama University, Japan
Chair: Ikuro Mizumoto   Kumamoto Univ., Japan

14:00 - 14:20   Break

Early Afternoon Technical Sessions
14:20-16:00, Thursday, August 11, 2011

ThuM01   No. 1 lecture room
Motor control   Special Session
Organizer: Hao Chen   China University of Mining and Tech., China
Chair: Hao Chen   China University of Mining and Tech., China
Co-Chair: Shiro Masuda   Tokyo Metropolitan University, Japan

14:20-14:40	ThuM01-01

Study on simulation model of switched reluctance startor/generator system based on wavelet neural network

| Xiaoshu Zan | China Univ. of Mining and Tech., China |
| Fangnan Xie | China Univ. of Mining and Tech., China |

14:40-15:00	ThuM01-02

Switched reluctance generator system based on single neuron adaptive PID controller

| Xiaoshu Zan | China Univ. of Mining and Tech., China |
| Fangnan Xie | China Univ. of Mining and Tech., China |

15:00-15:20	ThuM01-03

Comparative study on the dynamic behaviors of SRD operated at two control modes

| D.S. Yu | China Univ. of Mining and Tech., China |
| Hao Chen | China Univ. of Mining and Tech., China |

15:20-15:40	ThuM01-04

Reference model output following control design for a direct current servo control system

Yuguo Chen	Zhongyuan Univ. of Tech., China
Dongyun Wang	Zhongyuan Univ. of Tech., China
Peixue Wang	Zhongyuan Univ. of Tech., China

15:40-16:00	ThuM01-05

Cascade high gain observers without mechanical sensor for the asynchronous machine

Chouya Ahmed	Center University of Khemis-Miliana, Algeria
Chenafa Mohammed	ENSET of Oran, Algeria
Mansouri Abdellah	ENSET of Oran, Algeria
Bouhenna Abdelrahmane	ENSET of Oran, Algeria

ThuM02   No. 2 lecture room
Optimization, prediction and control Lecture Session

Chair: Hong Wang   The Univ. of Manchester, UK
Co-Chair: Yukinori Nakamura

Tokyo Univ. of Agriculture and Tech., Japan

14:20-14:40	ThuM02-01

Thermal energy minimisation in papermaking via MD control approach

P. Afshar	The Univ. of Manchester, UK
J. Mack	Perceptive Engineering Ltd., UK
P. Austin	Cambridge Univ., UK
M. Brown	The Univ. of Manchester, UK
J. Maciejowski	Cambridge Univ., UK
Hong Wang	The Univ. of Manchester, UK

14:40-15:00	ThuM02-02

Feedback control of a class of nonlinear discrete systems with state time-varying delay

| Cunchen Gao | Ocean Univ. of China, China |
| Yan Xu | Ocean Univ. of China, China |

15:00-15:20	ThuM02-03

Numerical study of phase change problem with periodic boundary condition

| Lianghui Qu | Zhongyuan Univ. of Tech., China |
| Feng Ling | Zhaoqing Univ., China |

15:20-15:40	ThuM02-04

Robust control for a class of nonlinear systems with unknown perturbations

| Ni Bu | Tokyo Univ. of Agriculture and Tech., Japan |
| Mingcong Deng | Tokyo Univ. of Agriculture and Tech., Japan |

15:40-16:00	ThuM02-05

Modelling and fault diagnosis for DFIGs with multi-phase inter-turn short circuit

Qian Lu	The Univ. of Manchester, UK
Timofei Breikin	The Univ. of Manchester, UK
Hong Wang	The Univ. of Manchester, UK

ThuM03   No. 3 lecture room
Novel control techniques   Lecture Session

Chair: Zi-Jiang Yang   Ibaraki Univ., Japan
Co-Chair: Krzysztof Galkowski   The Univ. of Wuppertal, Germany

14:20-14:40	ThuM03-01

A simulation model of focusing type three GaAs solar cells in the condition of following sun

| Erqiang Xu | Henan Electric Power Bureau of State Grid Corp., China |
| Lei Liu | Henan Electric Power Bureau of State Grid Corp., China |

Xiaolei Wang	Zhongyuan Univ. of Tech., China

14:40-15:00	ThuM03-02

Pareto optimization of serial-batching scheduling problems on two agents

Qi Feng	Zhengzhou Univ., Chian
	Zhongyuan Univ. of Tech., China
Zhiyun Yu	Zhongyuan Univ. of Tech., China
Weiping Shang	Zhongyuan Univ. of Tech., China

15:00-15:20	ThuM03-03

Compensation of hysteresis nonlinearity for a piezoelectric actuator using a stop operator-based Prandtl-Ishlinskii model

Zhi Li	Northeastern Univ., China
	Concordia Univ., Canada
Omar Aljanaideh	Concordia Univ., Canada
Chun-Yi Su	Concordia Univ., Canada
Subhash Rakheja	Concordia Univ., Canada
Mohammad Al Janaideh	Concordia Univ., Canada

15:20-15:40	ThuM03-04

2D systems based iterative learning control revisited

Lukasz Hladowski	Univ. of Zielona Gora, Poland
Krzysztof Galkowski	The Univ. of Wuppertal, Germany
Eric Rogers	Univ. of Southampton, UK
Anton Kummert	Univ. of Wuppertal, Germany

15:40-16:00	ThuM03-05

Decentralized adaptive robust control of robot manipulators

Zi-Jiang Yang	Ibaraki Univ., Japan
Youichirou Fukushima	Kyushu Univ., Japan
Pan Qin	Kyushu Univ., Japan

ThuM04   Special lecture room
Process control   Lecture Session

Chair: Zhi-Cong Deng   Intel Japan Co. Ltd., Japan
Co-Chair: Guolian Hou   North China Electric Power Univ., China

14:20-14:40	ThuM04-01

The analysis for the leaking flowate in the spherical valveplate sector considering the influence of the flow inertia

Renxi Hu	Mechanical Engineering College, China
Wentong Xin	Mechanical Engineering College, China
Zhizun Li	Mechanical Engineering College, China
Fengqi Han	Mechanical Engineering College, China

14:40-15:00	ThuM04-02

Neuro-PID control of heat exchanger in an organic rankine cycle system for waste heat recovery

Rui Wang	North China Electric Power Univ., China
Chao Wang	North China Electric Power Univ., China
Xiang Zhao	North China Electric Power Univ., China
Wenfang Zhang	North China Electric Power Univ., China

15:00-15:20	ThuM04-03

Simulation research of the multi-variable generalized predictive control in 500MW unit plant coordinated control system

Guolian Hou	North China Electric Power Univ., China
Yuan Xi	North China Electric Power Univ., China
Jingbin Liu	North China Electric Power Univ., China
Jianhua Zhang	North China Electric Power Univ., China

15:20-15:40	ThuM04-04

Application of self-tuning control based on generalized minimum variance method in evaporator for ORCS

Guolian Hou	North China Electric Power Univ., China
Guoqiang Hu	North China Electric Power Univ., China
Rui Sun	North China Electric Power Univ., China
Jianhua Zhang	North China Electric Power Univ., China

15:40-16:00	ThuM04-05

Operator based networked nonlinear control for a Peltier actuated thermal process with time-varying delays

Shengjun Wen	Tokyo Univ. of Agriculture and Tech., Japan
Mingcong Deng	Tokyo Univ. of Agriculture and Tech., Japan
Shuhui Bi	Tokyo Univ. of Agriculture and Tech., Japan

16:00 - 16:20　　　　Break

Late Afternoon Technical Sessions
16:20-18:00, Thursday, August 11, 2011

ThuP01　　　　　　　No. 1 lecture room
Human adaptive mechatronics　　Special Session

Organizers: Hongbo Wang	Yanshan Univ., China
Hongnian Yu	Staffordshire Univ., UK
Chair: Hongbo Wang	Yanshan Univ., China
Co-Chair: Hongnian Yu	Staffordshire Univ., UK

16:20-16:40	ThuP01-01

Catheter intervention manipulation system of minimally invasive robotic surgery

Hongbo Wang	Yanshan Univ., China
Xue Yang	Yanshan Univ., China
Guoqing Hu	Yanshan Univ., China
Zengguang Hou	Chinese Academy of Sciences, China
Hongnian Yu	Staffordshire Univ., UK

16:40-17:00	ThuP01-02

Design, modelling and control of a light touch mechanism

Y. Dong	Shanghai Jiao Tong Univ., China
Hongnian Yu	Staffordshire Univ., UK
F. Gao	Shanghai Jiao Tong Univ., China

17:00-17:20	ThuP01-03

SEMG feature extraction methods for pattern recognition of upper limbs

Feng Zhang	Institute of Automation Chinese Academy of Sciences, China
Pengfeng Li	Institute of Automation Chinese Academy of Sciences, China
Zengguang Hou	Institute of Automation Chinese Academy of Sciences, China
Yixiong Chen	Institute of Automation Chinese Academy of Sciences, China
Fei Xu	China Univ. of Mining and Tech., China
Jin Hu	Institute of Automation Chinese Academy of Sciences, China
Qingling Li	Institute of Automation Chinese Academy of Sciences, China
Min Tan	Institute of Automation Chinese Academy of Sciences, China

17:20-17:40	ThuP01-04

The petri nets and markov chains approach for the walking robots dynamical stability control

Luige Vladareanu	Institute of Solid Mechanics of the Romanian Academy, Romanian
Gabriela Tont	Univ. of Oradea, Romanian
Hongnian Yu	Staffordshire Univ., UK
Danut A. Bucur	Institute of Solid Mechanics of the Romanian Academy, Romanian

17:40-18:00	ThuP01-05

Key issues in studying parallel manipulators

Jianzheng Zhang	Shanghai Jiao Tong Univ., China
Hongnian Yu	Staffordshire Univ., UK
Feng Gao	Shanghai Jiao Tong Univ., China
Xianchao Zhao	Shanghai Jiao Tong Univ., China

ThuP02　　　　　　　No. 2 lecture room
Industrial hazards and system safety
　　　　　　　　　　Special Session

Organizers: Zongxiao Yang	Henan Univ. of Science & Tech., China
Jianhai Han	Henan Univ. of Science & Tech., China
Chair: Zongxiao Yang	Henan Univ. of Science & Tech., China
Co-Chair: Jianhai Han	Henan Univ. of Science & Tech., China

16:20-16:40	ThuP02-01

The longest side elimination solution for solving steiner minimum tree problems

Lili Xu	Henan Univ. of Science and Tech., China
Zongxiao Yang	Henan Univ. of Science and Tech., China
Youlin Shang	Henan Univ. of Science and Tech., China
Tingting Wang	Henan Univ. of Science and Tech., China

16:40-17:00	ThuP02-02

Research and development of a simple straight-flow wind tunnel test equipment for vertical axis wind turbines

Ruitao Deng	Henan Univ. of Science and Tech., China
Lei Song	Henan Univ. of Science and Tech., China
Zongxiao Yang	Henan Univ. of Science and Tech., China
Hanghang Yang	Henan Univ. of Science and Tech., China
Longbiao Wang	Henan Univ. of Science and Tech., China

17:00-17:20	ThuP02-03

The conditions of frame for the shift-invariant system

Dewu Yang	Henan Univ. of Science and Tech., China
Xiuge Zhu	Henan Univ., China

17:20-17:40	ThuP02-04

Application of grey system theory to MTPV system optimization

Bin Xu	Henan Univ. of Science and Tech., China
Jun Wu	Henan Univ. of Science and Tech., China
Jian Wu	Henan Univ. of Science and Tech., China
Hong Xue	Henan Univ. of Science and Tech., China

17:40-18:00	ThuP02-05

Structure design and trajectory control on gait rehabilitation training robot system driven by pneumatic actuators

Jianhai Han	Henan Univ. of Science and Tech., China
Binjing Guo	Henan Univ. of Science and Tech., China
Shushang Zhao	Henan Univ. of Science and Tech., China

ThuP03 — No. 3 lecture room
Industrial application — Lecture Session

Chair: Ken Nagasaka	Tokyo Univ. of Agriculture and Tech., Japan
Co-Chair: Hansheng Wu	Hiroshima Prefectural Univ., Japan

16:20-16:40	ThuP03-01

Shortest path algorithm based on city emergency system

Guiqin Dou	Zhongyuan Univ. of Tech., China
Yansong Zhu	Zhongyuan Univ. of Tech., China
Yumin Han	Zhongyuan Univ. of Tech., China

16:40-17:00	ThuP03-02

The research and implementation of mid-frequency power supply with high power factor and multi-closed loop feedback

Fuzhuan Wu	Zhongyuan Univ. of Tech., China
Dongyun Wang	Zhongyuan Univ. of Tech., China
Haibo Ma	Zhongyuan Univ. of Tech., China

17:00-17:20	ThuP03-03

Off-shore wind power potential evaluation of entire Japan using GIS technology

Asifujiang Abudureyimu	Tokyo Univ. of Agriculture and Tech., Japan
Yoshiki Hayashi	Tokyo Univ. of Agriculture and Tech., Japan
Ken Nagasaka	Tokyo Univ. of Agriculture and Tech., Japan

17:20-17:40	ThuP03-04

Design of wireless medical liquid-level monitoring and controlling system based on RF technology

Pingjun Wei	Zhongyuan Univ. of Tech., China
Jiangbo Zhu	Zhongyuan Univ. of Tech., China
Xiangzhi Wang	Maternal and Child Health Hospital of Zhengzhou, China

17:40-18:00	ThuP03-05

Research on low-cost vehicular integrated navigation

Jingyang Wen	Beijing Institute of Tech., China
Xiangyang Lu	Zhongyuan Univ. of Tech., China

ThuP04 — Special lecture room
Distributed system — Lecture Session

Chair: Cunchen Gao	Ocean Univ. of China, China
Co-Chair: Ikuro Mizumoto	Kumamoto Univ., Japan

16:20-16:40	ThuP04-01

Modeling and model order reduction of evaporator in organic rankine cycle for waste heat recovery

Rui Wang	North China Electric Power Univ., China
Xiang Zhao	North China Electric Power Univ., China
Chao Wang	North China Electric Power Univ., China
Ying Li	North China Electric Power Univ., China

16:40-17:00	ThuP04-02

Variable structure sliding mode control for a class of uncertain distributed parameter systems with time delay

Cunchen Gao	Ocean Univ. of China, China
Fei Li	Ocean Univ. of China, China
Lin Zhao	Ocean Univ. of China, China

17:00-17:20	ThuP04-03

The stabilized least-squares nonconforming mixed finite element approximation for the convection-diffusion problem

Zhiyun Yu	Zhongyuan Univ. of Tech., China
Jinhuan Chen	Zhongyuan Univ. of Tech., China

17:20-17:40	ThuP04-04

Supervisory predictive control of evaporator in organic rankine cycle (ORC) system for waste heat recovery

Guolian Hou	North China Electric Power Univ., China
Rui Sun	North China Electric Power Univ., China
Guoqiang Hu	North China Electric Power Univ., China
Jianhua Zhang	North China Electric Power Univ., China

End of the 1st Day

08:40 - 09:40   Special lecture room
Plenary Speech 3

Intelligent transportation systems in Taiwan

Tsu-Tian Lee

National Taipei University of Technology, Taiwan
Chair: Hong Wang   The Univ. of Manchester, UK

09:40 - 10:00   Break

**Morning Technical Sessions
10:00-12:00, Friday, August 12, 2011**

FriA01   No. 1 lecture room
Adaptive and advanced control systems - theory and applications   Special Session
Organizers: Toru Yamamoto   Hiroshima Univ., Japan
            Ikuro Mizumoto   Kumamoto Univ., Japan
Chair: Toru Yamamoto   Hiroshima Univ., Japan
Co-Chair: Ikuro Mizumoto   Kumamoto Univ., Japan

10:00-10:20   FriA01-01
Design of a self-adjust controller using multiple local linear models for nonlinear systems

    Shinichi Imai   Hiroshima National College of Maritime
                                                Tech., Japan
    Toru Yamamoto   Hiroshima Univ., Japan

10:20-10:40   FriA01-02
A nonlinear model predictive control using a continuation method and a step input constraint

    Kota Kogiso   Tokyo Metropolitan University, Japan
    Shiro Masuda   Tokyo Metropolitan University, Japan
    Takao Sato   Univ. of Hyogo, Japan

10:40-11:00   FriA01-03
Disturbance attenuation property for random disturbances in two-degree-of freedom optimal servo control systems

    Yusuki Kishimoto   Tokyo Metropolitan University, Japan
    Shiro Masuda   Tokyo Metropolitan University, Japan
    Akira Yano   Okayama Univ., Japan

11:00-11:20   FriA01-04
Adaptive control scheme for MI-MO systems with input saturations

    Jinxin Zhuo   Kyushu Institute of Tech., Japan
    Qiang Wang   Shanghai Dianji Univ., China
    Masahiro Oya   Kyushu Institute of Tech., Japan

11:20-11:40   FriA01-05
Performance-driven adaptive output feedback control system with a PFC designed via FRIT approach

    Ikuro Mizumoto   Kumamoto Univ., Japan
    Sota Fukui   Kumamoto Univ., Japan
    Kenshi Yamanaka   Kumamoto Univ., Japan
    Sirish L. Shah   Univ. of Alberta, Canada

11:40-12:00   FriA01-06
Stable fault-tolerant control based on fuzzy performance evaluation

    Masanori Takahashi   Tokai Univ. at Kumamoto, Japan
    Taro Takagi   Kumamoto Univ., Japan

FriA02   No. 2 lecture room
Information techniques for control

                            Lecture Session
Chair: Yegui Xiao   Prefectural University of Hiroshima., Japan
Co-Chair: Lihua Jiang   Northeastern Univ., China

10:00-10:20   FriA02-01
A V2G vector control model of electric car charging and discharging machine

    Xiaolei Wang   Zhongyuan Univ. of Tech., China
    Pan Yan   Zhongyuan Univ. of Tech., China
    Liang Yang   Zhongyuan Univ. of Tech., China
    Wendao Yao   Zhongyuan Univ. of Tech., China
    Guangwen Shi   Zhongyuan Univ. of Tech., China

10:20-10:40   FriA02-02
Research progress on agronomic parameter estimation based on spectral analysis technology

    Zhe Xu   Beijing Univ. of Tech., China
    Na Yang   Beijing Univ. of Tech., China

10:40-11:00   FriA02-03
Spectrum signal de-noising based on wavelet packet

    Zhe Xu   Beijing Univ. of Tech., China
    Na Yang   Beijing Univ. of Tech., China

11:00-11:20   FriA02-04
A new hybrid active noise control system in the presence of wideband and narrowband noise components

    Yegui Xiao   Prefectural Univ. of Hiroshima, Japan
    Jing Wang   Beihang Univ., China
    Hongyun Wei   Akita International Univ., Japan

11:20-11:40   FriA02-05
Design of low cost embedded system for automation of a parallel processing plant

    Zahid Ali Siddiqui   ED Univ. of Engineering & Tech., Pakistan
    Ahmed Munir   ED Univ. of Engineering & Tech., Pakistan
    M. Faizan Sherazi   ED Univ. of Engineering & Tech., Pakistan
    S. M. Danish   ED Univ. of Engineering & Tech., Pakistan

Design of PV power station remote monitoring system data acquisition device

Junming Xiao	Zhongyuan Univ. of Tech., China
Pengcheng Liu	Zhongyuan Univ. of Tech., China
Lingyun Jiao	Zhongyuan Univ. of Tech., China
Haiming Zhu	Zhongyuan Univ. of Tech., China
Yinghu Du	Zhongyuan Univ. of Tech., China

FriA03   No. 3 lecture room
Measurement and sensors   Lecture Session

Chair: Bijnan Bandyopadhyay

                 Indian Institute of Tech. Bombay, India

Co-Chair: Akira Inoue   Okayama Univ., Japan

10:00-10:20	FriA03-01

Effects of back electromotive force in an absolute displacement sensor and improvement using current-feedback-type driver

Takashi Kai	Tokyo Univ. of Agriculture and Tech., Japan
Masaya Akiyama	Tokyo Univ. of Agriculture and Tech., Japan
Yukinori Nakamura	Tokyo Univ. of Agriculture and Tech., Japan
Shinji Wakui	Tokyo Univ. of Agriculture and Tech., Japan

10:20-10:40	FriA03-02

Remote sensing image fusion for dim target detection

Zanxia Qiang	Zhongyuan Univ. of Tech., China
Xianfeng Du	Zhongyuan Univ. of Tech., China
Liwu Sun	Zhongyuan Univ. of Tech., China

10:40-11:00	FriA03-03

The design research on the storage structures for large amount of data of the database

Huaqiang Zhou	Zhongyuan Univ. of Tech., China
Zhihong Yao	Henan Shangqiu Medical College, China
Han Xiao	Henan Electric Power Research Institute, China

11:00-11:20	FriA03-04

Research of physical sediment measurement instruments

Huanlin He	Zhongyuan Univ. of Tech., China
Yuguo Chen	Zhongyuan Univ. of Tech., China

11:20-11:40	FriA03-05

A new direction on auto-building database application system--model on automatically generating database application system from interface controls descriptions

Guoliang Tang	Henan Univ. of Traditional Chinese Medicine, China
Feng Yang	Henan Univ. of Traditional Chinese Medicine, China
Zhiyong Zhang	Henan Univ. of Science and Tech., China
Jiexin Pu	Henan Univ. of Science and Tech., China

11:40-12:00	FriA03-06

Reflective ultrathin membrane model of hydrogen sensor based on multicomponent alloy

Lujun Cui	Zhongyuan Univ. of Tech., China
Huichao Shang	Zhongyuan Univ. of Tech., China
Gang Zhang	Zhongyuan Univ. of Tech., China
Youping Chen	Zhongyuan Univ. of Tech., China
Zexiang Zhao	Zhongyuan Univ. of Tech., China

FriA04   Special lecture room
Mobile robots   Special Session

Organizer: Valeri Kroumov   Okayama Univ. of Science, Japan

Chair: Valeri Kroumov   Okayama Univ. of Science, Japan

Co-Chair: Ken Nagasaka   Tokyo Univ. of Agriculture and Tech., Japan

10:00-10:20	FriA04-01

Detection of flat ground area by single camera on mobile vehicles

Masahiro Tanaka	Konan Univ., Japan
Shintaro Onishi	Konan Univ., Japan

10:20-10:40	FriA04-02

Adaptive modular reinforcement learning

Tsubasa Asano	Okayama Univ. of Science, Japan
Satoshi Yamada	Okayama Univ. of Science, Japan

10:40-11:00	FriA04-03

Localization and position correction for mobile robot using artificial visual landmarks

Kimihiro Okuyama	Okayama Univ. of Science, Japan
Tohru Kawasaki	Nihon Tokusyu Rozai Co., Ltd., Japan
Valeri Kroumov	Okayama Univ. of Science, Japan

11:00-11:20	FriA04-04

Path planning of robotic fish based on genetic algorithm and modified dynamic programming

Qian Yang	North China Electric Power Univ., China
Mei Yu	North China Electric Power Univ., China
Shu Liu	North China Electric Power Univ., China
Zhongming Chai	North China Electric Power Univ., China

11:20-11:40	FriA04-05

DECR: dynamic and energy effective clustering based routing algorithm for prolonging the lifetime of wireless sensor networks

Bahram Lotfimanesh	Islamic Azad Univ., Iran
Nazanin Seyedgogani	Islamic Azad Univ., Iran

11:40-12:00	FriA04-06

Automatic mapping and localization of a tour guide robot by fusing active RFID and ranging laser scanner

Hung-Hsing Lin	Hsiuping Institute of Tech., Taiwan
Wen-Yu Tsao	Chin-Yi Univ. of Tech., Japan

12:00 - 13:00   Lunch

13:00 - 13:30   Break

Early Afternoon Technical Sessions
13:30-15:10, Friday, August 12, 2011

FriM01
No. 1 lecture room

Mechatronics, dynamic systems and controls in bio-mechanics and biomedical engineering

Special Session

Organizer: Jin-Oh Hahn	University of Alberta, Canada
Chair: Jin-Oh Hahn	University of Alberta, Canada
Co-Chair: Shuhui Bi	Tokyo Univ. of Agriculture and Tech., Japan

13:30-13:50	FriM01-01

Wavelet packet entropy based brain activation mapping using near infrared spectroscopy

Xiao-Su Hu	Pusan National Univ., Korea
Keum-Shik Hong	Pusan National Univ., Korea
Shuzhi Sam Ge	The National Univ. of Singapore, Singapore

13:50-14:10	FriM01-02

Comparison and evaluation of robotic strength rehabilitation algorithms: isokinetic, isotonic and shared control method

MinKi Sin	Seoul National Univ., Korea
DaeGeun Park	Seoul National Univ., Korea
Kyu-Jin Cho	Seoul National Univ., Korea

14:10-14:30	ThuM01-03

System identification and closed-loop control of end-tidal CO_2 partial pressure in mechanically ventilated patients

Jin-Oh Hahn	Univ. of Alberta, Canada
Guy A. Dumont	Univ. of British Columbia, Canada
J. Mark Ansermino	Univ. of British Columbia, Canada

14:30-14:50	FriM01-04

Artifact detection and data reconciliation in multivariate ventilatory variables measured during anesthesia: a case study

Ping Yang	Chinese Academy of Sciences, China
Guy Dumont	Univ. of British Columbia, Canada
Yuan-Ting Zhang	Chinese Academy of Sciences, China
J. Mark Ansermino	Univ. of British Columbia, Canada

14:50-15:10	FriM01-05

AED training algorithm for the CPR simulator

In Bae Chang	Kangwon National Univ., Korea
Hyun Woo Cho	Kangwon National Univ., Korea
Seung Hun Jeong	BT Inc., Korea
Seung Jin Yang	BT Inc., Korea

FriM02
No. 2 lecture room

Modeling, control and applications of nonlinear dynamic systems

Special Session

Organizers: Yonghong Tan	Shanghai Normal Univ., China
Xinkai Chen	Shibaura Institute of Tech., Japan
Chair: Yonghong Tan	Shanghai Normal Univ., China
Co-Chair: Xinkai Chen	Shibaura Institute of Tech., Japan

13:30-13:50	FriM02-01

The high efficiency digital virtue experimental platform for complex mechatronics system

T. H. Yan	China Jiliang Univ., China
J. Q. Han	Huazhong Univ. of Science and Tech., China
X. S. Xu	China Jiliang Univ., China
X. D. Chen	China Jiliang Univ., China

13:50-14:10	FriM02-02

Positioning control strategy design for AFM based nanomanipulation systems

Yongchun Fang	Nankai Univ., China
Xiao Ren	Nankai Univ., China
Yudong Zhang	Nankai Univ., China

14:10-14:30	FriM02-03

High precision adaptive control for XY-table driven by piezo-actuator

Xinkai Chen	Shibaura Institute of Tech., Japan

14:30-14:50	FriM02-04

State-estimation of sandwich systems with dead zone

Zhupeng Zhou	Xi'dian Univ., China
Yonghong Tan	Shanghai Normal Univ., China
Ruili Dong	Shanghai Normal Univ., China
Yangqiu Xie	Xi'dian Univ., China

14:50-15:10	FriM02-05

Signal analysis and hysteresis modeling of meridian systems

Yanyan Gong	Shanghai Normal Univ., China
Ruili Dong	Shanghai Normal Univ., China
Yonghong Tan	Shanghai Normal Univ., China

FriM03
No. 3 lecture room

Discrete time control systems
Lecture Session

Chair: Akira Inoue	Okayama Univ., Japan
Co-Chair: Shan Liang	Chongqing Univ., China

13:30-13:50	FriM03-01

Stability analysis and robust passive control for uncertain discrete-time singular systems

Jumei Wei	Zhengzhou Univ., China
Qi Feng	Zhengzhou Univ., China
Rui Ma	Zhongyuan Univ. of Tech., China

13:50-14:10	FriM03-02

Optimal sliding mode control for linear discrete singular system

Cunchen Gao	Ocean Univ., China
Nan Xiang	Ocean Univ., China

14:10-14:30	FriM03-03

Discrete-time sliding mode control using infrequent output measurements

Bijnan Bandyopadhyay	Indian Institute of Tech. Bombay, India
P. S. Lal Priya	Indian Institute of Tech. Bombay, India

14:30-14:50	FriM03-04

Super-twisting-like algorithm in discrete time nonlinear systems

I. Salgado	Professional Interdisciplinary Unit of Biotechnology, Mexico
S. Kamal	Indian Institute of Tech. Bombay, India
I. Chairez	Professional Interdisciplinary Unit of Biotechnology, Mexico
Bijnan Bandyopadhyay	Indian Institute of Tech. Bombay, India
L. Fridman	National Autonomous University of Mexico, Mexico

14:50-15:10	FriM03-05

Collaborative fault tolerant control for stochastic distribution systems

Yuwei Ren	Institute of Automation Chinese Academy of Sciences, China
Aiping Wang	Anhui Univ., China
Hong Wang	The Univ. of Manchester, UK Northeastern Univ., China

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15:10 - 15:30   Break

Late Afternoon Technical Sessions
15:30-17:10, Friday, August 12, 2011

FriP01   No. 1 lecture room
New development in cooperative and distributed control: theory and applications   Special Session

Organizers: Jianhua Zhang	North China Electric Power Univ., China
Guisheng Zhai	Shibaura Institute of Tech., Japan
Chair: Jianhua Zhang	North China Electric Power Univ., China
Co-Chair: Guisheng Zhai	Shibaura Institute of Tech., Japan

15:30-15:50	FriP01-01

Design of evaporator control system using fuzzy sliding mode controller

Jianhua Zhang	North China Electric Power Univ., China
Wenfang Zhang	North China Electric Power Univ., China
Ying Li	North China Electric Power Univ., China
Guolian Hou	North China Electric Power Univ., China

15:50-16:10	FriP01-02

Dynamic characteristics and predictive control for evaporator

Jianhua Zhang	North China Electric Power Univ., China
Ying Li	North China Electric Power Univ., China
Wenfang Zhang	North China Electric Power Univ., China
Guolian Hou	North China Electric Power Univ., China

16:10-16:30	FriP01-03

Fuzzy identification based on improved T-S fuzzy model and its application in evaporator

Jianhua Zhang	North China Electric Power Univ., China
Ying Li	North China Electric Power Univ., China
Wenfang Zhang	North China Electric Power Univ., China
Guolian Hou	North China Electric Power Univ., China

16:30-16:50	FriP01-04

Neural PID control strategy for superheated steam temperature based on minimum entropy

Jianhua Zhang	North China Electric Power Univ., China
Fenfang Zhang	North China Electric Power Univ., China
Hong Wang	The Univ. of Manchester, UK

16:50-17:10	FriP01-05

A notion of generalized graph laplacian and its application to distributed consensus algorithm

Guisheng Zhai	Shibaura Institute of Tech., Japan

FriP02   No. 2 lecture room
Fuzzy and neural methodologies

Special Session

Organizer: Tsu-Tian Lee	National Taipei Univ. of Tech., Taiwan
Chair: Tsu-Tian Lee	National Taipei Univ. of Tech., Taiwan
Co-Chair: Masanori Takahashi	Tokai Univ. at Kumamoto, Japan

15:30-15:50	FriP02-01

Characteristic analysis and modeling of a miniature pneumatic curling rubber actuator

Mingcong Deng	Tokyo Univ. of Agriculture and Tech., Japan
Aihui Wang	Tokyo Univ. of Agriculture and Tech., Japan
Shuichi Wakimoto	Okayama Univ., Japan
Toshihiro Kawashima	Tokyo Univ. of Agriculture and Tech., Japan

15:50-16:10	FriP02-02

An observer-based adaptive type-2 fuzzy-neural controller for a class of MIMO systems with uncertainties

I-Hsum Li	Lee-Ming Institute of Tech., Taiwan
Lian-Wang Lee	Lunghwa Univ. of Science and Tech., Taiwan
Wei-Yen Wang	National Taiwan Normal Univ., Taiwan
Kai-Wei Hsu	Lunghwa Univ. of Science and Tech., Taiwan

16:10-16:30	FriP02-03

Fuzzy-rule-based behavior control for collaborative human/robot navigation in unknown environments

Yan-Chang Lee	Fu Jen Catholic Univ., Taiwan
Zong-Lun Lee	Fu Jen Catholic Univ., Taiwan
Hisn-Han Chiang	Fu Jen Catholic Univ., Taiwan
Tsu-Tian Lee	Taipei Univ. of Tech., Taiwan

16:30-16:50	FriP02-04

Direct adaptive control of faulty UAVs based on the paralleled integral

and fuzzy control

Rui Hou	Nanjing Univ. of Aeronautics and Astronautics, China
Fuyang Chen	Nanjing Univ. of Aeronautics and Astronautics, China
Wenli Luan	Nanjing Univ. of Aeronautics and Astronautics, China

| 16:50-17:10 | FriP02-05 |

Robust adaptive control for uncertain nonlinear systems with multiple state and input time delays

| Cunchen Gao | Ocean Univ. of China, China |
| Yue Ma | Ocean Univ. of China, China |

FriP03 No. 3 lecture room

Advanced techniques for control Lecture Session

Chair: Xiaolei Wang   Zhongyuan Univ. of Tech., China

Co-Chair: Changan Jiang   Kagawa Univ., Japan

| 15:30-15:50 | FriP03-01 |

Controlling strategy of batteries imbalance based on the SOC and voltage

Xiaolei Wang	Zhongyuan Univ. of Tech., China
Liang Yang	Zhongyuan Univ. of Tech., China
Pan Yan	Zhongyuan Univ. of Tech., China
Guangwen Shi	Zhongyuan Univ. of Tech., China
Wendao Yao	Zhongyuan Univ. of Tech., China

| 15:50-16:10 | FriP03-02 |

Focusing type three gallium arsenide solar cells model in the condition of following sun & MPPT control

Lei Liu	Henan Electric Power Bureau of State Grid Corp., China
Erqiang Xu	Henan Electric Power Bureau of State Grid Corp., China
Xiaolei Wang	Zhongyuan Univ. of Tech., China

| 16:10-16:30 | FriP03-03 |

Development of vision based tactile display system using shape memory alloys

Changan Jiang	Kagawa Univ., Japan
Keiji Uchida	SCA Corp., Japan
Hideyuki Sawada	Kagawa Univ., Japan

| 16:30-16:50 | FriP03-04 |

Alterable integral control algorithm for shunt active power filter

Qian Zhang	Zhongyuan Univ. of Tech., China
Binbin Wang	Zhongyuan Univ. of Tech., China
Haiyun Zhu	Zhongyuan Univ. of Tech., China
Haibo Ma	Zhongyuan Univ. of Tech., China

| 16:50-17:10 | FriP03-05 |

A control system of electric vehicle based on CAN bus

Xiaolei Wang	Zhongyuan Univ. of Tech., China
Wendao Yao	Zhongyuan Univ. of Tech., China
Guangwen Shi	Zhongyuan Univ. of Tech., China

18:30-20:30

Conference Banquet (Songshan Hotel)

End of the 2nd Day

09:30 - 11:00   Lounge

Plenary Panel Discussion

New developments in advanced mechatronic systems

Organizer: Mingcong Deng

Tokyo University of Agriculture and Technology, Japan

11:30 - 13:00

Closing Reception

End of the Conference

ABSTRACT
Robotics and mechatronics

10:00-10:20 ThuA01-01

A geometric method for calibration of the image center

Yongchun Fang, Xuebo Zhang, Baoquan Li, and Ning Sun
(Nankai Univ., China)

A geometric approach is proposed to calibrate the image center (also called principle point) of a camera, which is independent of other intrinsic parameters such as the focal length, distortion coefficients, and so on. The basic idea arises from intuitive experience that when the camera moves backward, the path of a static feature point will evolute as a straight line toward the principle point in the image space. The presented method does not require a precise calibration block, and it is insensitive to radical distortion and the variation of focal length. Both linear and nonlinear least square methods are exploited to obtain stable and accurate calibration results. Experiments are conducted to validate the proposed technique.

10:20-10:40 ThuA01-02

Experimental validation of control for a positioning stage by feedback error learning

Yukinori Nakamura, Kazuki Morimoto, and Shinji Wakui
(Tokyo Univ. of Agriculture and Tech., Japan)

This paper considers precision positioning of a stage. To compensate uncertainties of the stage, feedback error learning (FEL) is employed. In FEL algorithm, parameters of feedback error learning are updated by using an output of a feedback controller. After learning, the feedforward controller with an inverse system of a plant is obtained. To shorten learning time, implementation methods of FEL are proposed. In our methods, free parameters in the feedforward controller are determined by using the inverse system. Furthermore, information on the inverse system is utilized for the learning. Proposed methods are demonstrated by experiments with the stage.

10:40-11:00 ThuA01-03

Control of human hand considering uncertainties

M. Moavenian, M.R. Gharib, A. Daneshvar, and S. Alimardani
(Ferdowsi Univ. of Mashhad, Iran)

The control issue of mechanical systems with man- machine interactions is discussed in this paper. First, a hand of a human is simulater. Then dynamical equations of the proposed system are obtained from the simulation. Stability of the systems is investigated by through displacement equations and by comparing the system with a modern control method. Also Robust Control of human hand is investigated considering uncertainties using quantitative feedback theory (QFT) method.

11:00-11:20 ThuA01-04

The design of intelligent robot based on embedded system

Mingliang Liang (Zhengzhou Railway Vocational & Technical College, China)
Xinqiang Wang (Zhongyuan Univ. of Tech., China)

The design of intelligent robot is based on ARM microprocessor and AVR microcontroller which control Four-wheel drive robot. The design of the intelligent robot includes system design, the hardware design and software design. The core of master controller is composed of the processor which is S3C2440A belonging to ARM9 series and peripheral equipments of master controller consist of tracing module, sensor detection module, CMOS camera module, Wi-Fi wireless module and so on. Driving circuit uses ATmega16L, which is high-performance and low-power AVR 8-bit microcontroller, to control DC motor for speed governing and steering. Intelligent robot, using the operating system of Linux and based on PID algorithm of the C programming language, has realized automatic tracing, intelligent obstacle avoidance, temperature detection, image acquisition, wireless communications, and other functions. Intelligent robot is characteristic of flexible design, accurate control and stable operation.

11:20-11:40 ThuA01-05

Design of two optimal controllers for mechatronic suspension system

Sallehuddin Mohamed Haris and Wajdi S. Aboud

(Univ. Kebangsaan Malaysia, Malaysia)

The purpose of mechatronic suspension system, or customary name active suspension system, is to improve ride comfort and road handling. In this research an analytical investigation of a two degree of freedom quarter car model, subjected to a bump road disturbance was performed, and the advantages of mechatronic over conventional passive suspension systems were examined. Two types of optimal controller schemes namely, PID and LQR were utilized, subjected to three different load cases. In this work MATLAB/SIMULIK was used for simulate the system. Both the passive and active systems were compared in time domain analysis. Results show body acceleration, tire load and suspension deflection were reduced, indicating that the mechatronic suspension system has better potential in improving both comfort and road holding. Additionally, it can also be concluded that LQR controller is better than the PID controller scheme due to significant settling time reduction as well as peak reduction.

Information processing

10:00-10:20   ThuA02-01

Research on selection system based on bayesian recommendation model

Guiqin Dou, Yansong Zhu, and Yumin Han
(Zhongyuan Univ. of Tech., China)

Existing course selection systems of institution of higher education are mainly aims at credits statistics, and are short of function of course selection independently that aims at students' personal professional interesting. For the purpose of better effect of learning, we have improved existing system. This paper discusses improvement of existing course selection system, the improved system employ Bayesian network recommendation technology, establishes a Bayesian course selection network recommendation model, and designed a recommendatory engine based on the model, so we have achieved individualized course selection recommendation according to students' personal professional interesting. So that enhance students' ability of subjective activity, make learning passively become perceive initiatively, subsequently greatly improves educational quality of institution of higher education.

10:20-10:40   ThuA02-02

Stabilization for fractional-order networked control systems with input time-varying delays

Xiaona Song (Henan Univ. of Science and Tech., China)
Ines Tejado (Univ. of Extremadura, Spain)
Yangquan Chen (Utah State Univ., USA)

In this study, the problem of remote stabilization for fractional-order (FO) systems with input time-varying delay via communication networks is investigated. The order of the FO system denoted by α considered in this paper is in the range of 0 to 2. Additionally, the network induced timevarying delay is considered as being generated by a known FO dynamic system. We design state feedback and output feedback controller, respectively, and show how the delay dynamics can be explicitly incorporated into the Networked Control System controller design. The basic idea is to use linear matrix inequality and receding horizon control framework. We use the receding horizon method to design a stabilizing control law that sets the poles of the closed-loop system. The proposed control law explicitly takes into account an estimation of the delay dynamics.

10:40-11:00   ThuA02-03

Algorithm on detection and identification of foreign fibers in raw cotton

Dongyun Wang, Hongtao Peng, Yongping Dan, Fanghua Liu, and Liusong Wang
(Zhongyuan Univ. of Tech., China)

Foreign fibers accounted for a small proportion in cotton, but there is serious impact on the quality of textile. Foreign fibers are removed by hand, which is low efficiency. To meet the requirements of accuracy and real-time, the identification of foreign fibers base on machine vision is proposed. The traditional algorithm of identification is generally complex and large amount of calculation, so real-time is bad. In this paper, according to the character of image gray of foreign fibers, and mathematical model is established. Further, important image features are enhanced by image processing, foreign fibers' characters are drawn. At last, foreign fibers in cotton are identified by algorithm, and algorithm is simple and efficient.

11:00-11:20   ThuA02-04

Optimal path planning for material and products transfer in steel works using ACO

Mingcong Deng (Tokyo Univ. of Agriculture and Tech., Japan)
Akira Inoue (Okayama Univ., Japan)
Satoru Kawakami (GS Uasa Corp., Japan)

In steel works, steel production from raw material to final product includes several processes. In the processes, pit iron from blast furnace is transported from furnace to storing yards going through factories. For the transportation, because of weight and high temperature of pit iron, torpedo cars towed by a locomotive on a railway in the compounds are used. For effective production, optimal scheduling of transportation is necessary. The transportation includes many constraints; there exist several factories where they should step by, an order among the factories to step by, restricted transportation time, and minimum working time in factories. Hence, to plan the schedule requires complicated calculation and computation time. Also, when an accident occurs and some paths in the plan are closed, they need calculate a new detour in short time period.

In this paper, a method to plan schedule for railway train in steel works is proposed. First, a node-arc model of railway systems in steel works is given. Then derived is an optimal path for materials transportation problem. The path goes through specified places in the works in a given order in the shortest steps.

In this paper, an algorithm based on Ant Colony Optimization (ACO) is proposed to solve the problem and the ACO method is modified to apply the scheduling problems. The proposed method is applied to a steel works model, and the route generation simulation is given. Finally, the route derived by the proposed method is compared with the route derived by Q-learning method.

11:20-11:40   ThuA02-05

Radar equation of high-speed weak target

Cunsuo Pang (North Univ. of China., China)
Nan Zhang (Second Research Academy of CASIC, China)
Xiangyang Lu (Zhongyuan Univ. of Tech., China)

Without considering the echo signal power changes caused by target distance changes during the accumulated time the traditional radar equation is hardly applied. We take account of the effects of velocity, signal-to-noise ratio during the processing time; a modified radar equation is built which can be used for long-time integration of weak targets with high speed. After analyzing the relation between detection range and target velocity, integration time with processing time, we draw the constraint conditions and the corresponding conclusions.

Genetic algorithm, neural network and PSO

10:00-10:20   ThuA03-01

Exponential stability analysis for the switched stochastic hopfield neural networks with time-varying delays

Huimin Xiao (Henan Univ.of Economics and Law, China)
Chunhua Wang (Ocean Univ.of China, China)

In this paper, the robust exponential stability analysis is considered for a class of switched stochastic Hopfield neural systems with parameter uncertainties and stochastic perturbations. The parameter uncertainties are assumed to be norm bounded. Firstly, based on Lyapunov-Krasovskii functional and linear matrix inequality (LMI) tools, by employing multiple Lyapunov function techniques, a delay-dependent sufficient condition is derived for the switched stochastic neural networks with time-varying delays under an appropriate switching law. Secondly, the sufficient criteria is given to guarantee the uncertain switched stochastic Hopfield neural systems to be mean-square exponentially stable for all admissible parametric uncertainties. Finally, numerical examples are provided to illustrate the effectiveness of the proposed theory.

10:20-10:40   ThuA03-02

Optimized fuzzy PDC controller for nonlinear systems with T-S model mismatch

A. Zeiaee, H. Kharrati, and S. Khanmohammadi
(Tabriz Univ., Iran)

In this paper, a heuristic method based on Genetic Algorithms (GA) is proposed to improve the performance of Fuzzy Logic Controllers (FLCs) designed for Takagi-Sugeno (T-S) model of nonlinear plants by Parallel Distributed Compensation (PDC) technique. Generally, T-S models might not represent the dynamics of nonlinear plants accurately. Due to this mismatch, sometimes the response of the controlled nonlinear plant is not as desirable as the response of the corresponding T-S model controlled by the same FLC. Despite the fact that there is a flurry of research on the stability of FLCs applied to T-S model of nonlinear systems, the stability matters of FLCs applied to nonlinear systems is still a challenge. It is obvious that the performance of FLCs is entirely affected by the characteristics of membership functions. Thus, by tuning the type or parameters of fuzzy controller's membership functions using GA, the drawbacks caused by model mismatch can be decreased. In fact, the proposed method concerns the applicability of fuzzy PDC controllers to nonlinear plants and does not confide itself to dealing with T-S models. Thus, the improved fuzzy PDC controller is a fine-tuned PDC controller that can compensate the nonlinear plant as well as the corresponding T-S model. In order to verify the introduced strategy, the problem of balancing and swing up of an inverted pendulum on a cart is considered as a nonlinear case study. The simulation results demonstrate the effectiveness of the improved PDC.

10:40-11:00   ThuA03-03

On zeros of sampled-data system with relative degree two

Shan Liang (Chongqing Univ., China)
Mitsuaki Ishitobi, Tomoki Koga, and Sadaaki Kunimatsu
(Kumamoto Univ., Japan)

Unstable zeros limit the achievable control per-formance. When a continuous-time system with relative degree greater than or equal to three is discretized using a zero-order hold, at least one of the zeros of the resulting sampled-data model is unstable for small sampling periods. Thus, attention is here focused on continuous-time systems with relative degree equal to two. This paper analyzes the zeros of the sampled-data models corresponding to the continuous-time systems mentioned above and gives approximate expressions of the zeros in the form of a power series expansions up to the fourth order term of sampling period. Meanwhile, the stability of the zeros is discussed for small sampling periods and a new stability condition is derived. It is further extension of the previous result.

11:00-11:20   ThuA03-04

Design of PSO-based fuzzy gain scheduling PI controller for four-area interconnected AGC system after deregulation

Guolian Hou, Lina Qin, Xinyan Zheng, and Jianhua Zhang
(North China Electric Power Univ., China)

A fuzzy gain scheduling PI controller based on particle swarm optimization (PSO) is proposed for multi-area interconnected automatic generation control (AGC) system after deregulation in this paper. Approved PSO algorithm has been used for optimizing parameters of fuzzy logic controller to maintain global optimum. This control scheme adopts new area control error (ACE) which takes time error and inadvertent interchange accumulation into account. Distribution company (DISCO) participation matrix (DPM) is introduced to simulate the bilateral contracts. The proposed approach achieves better dynamic performance compared with conventional proportional and integral (PI) controller and fuzzy logic controller (FLC) in four-area reheat thermal and hydro AGC system.

11:20-11:40   ThuA03-05

Improved particle swarm optimization algorithms

Wudai Liao, Junyan Wang, Xingfeng Wang, and Jiangfeng Wang
(Zhongyuan Univ. of Tech., China)

In this paper, first of all, we introduce the normal particle swarm optimization algorithms (PSO), for this kind of algorithms, there are problems like it easily stuck at a local minimum point and its convergence speed is slow. To overcome this, an improved particle swarm optimization algorithms is presented for improving global and local search ability of PSO. That is, the rate of particle convergence changing was introduced in this new algorithm and the inertia weight was formulated as a function of this factor according to its impact on the search performance of the swarm to adjust its convergence speed and jump over local minimum points. To show effectiveness of this method, the simulations of four benchmark examples are carried out by the proposed method, as a result, this indicates that the proposed method is very useful.

11:40-12:00   ThuA03-06

The global existence of the solution and impulsive synchronization for m-dimensional reaction-diffusion system

Wanli Yang and Suwen Zheng
(Academy of Armored Forces Engineering, China)

In this paper, an m-dimensional impulsive reaction-diffusion system is studied. Sufficient conditions are obtained for the global existence of solution for the impulsive system. By considering the equi-attractivity property of the impulsive error system, the impulsive synchronization of the mdimensional reaction-diffusion system is investigated, and the sufficient conditions leading to the equi-attractivity property are obtained.

Process modeling, optimization and system design

Time: 10:00-12:00, Thursday, August 11, 2011   Chair: Chun-Yi Su (Concordia Univ., Canada)
ThuA04, Special Lecture Room   Co-Chair: Zi-Jiang Yang (Ibaraki Univ., Japan)

10:00-10:20   ThuA04-01

An overview of modelling and simulation of thermal power plant

Changliang Liu (North China Electric Power Univ., China)
Hong Wang (The Univ. of Manchester, UK)
Jinliang Ding (Northeastern Univ., China)
Chenggang Zhen (North China Electric Power Univ., China)

Thermal power plants constitute the largest proportion of installed capability in global power generation system, which consumes large quantities of coal. Therefore achieving optimal operation of thermal power units, improving its efficiency and reducing the coal consumption is of great significance for the reduction of greenhouse gas and pollutants emissions. Modelling and simulation is the base of optimal operation and control in thermal power unit and plays an important role in energy saving in thermal power plants. In this paper, research results of modelling and simulation of thermal power units are reviewed. Firstly, several common models which are used for researches of thermal power control systems are analyzed, including simplified turbine and furnace models for unit coordinated control system (CCS) as well as local equipment models; Then the system structure, function and application of thermal power stimulated simulator are described; Finally, the structure and function of digital power plant is introduced. The challenges of modelling and simulation of thermal power plant researches in the future are discussed.

10:20-10:40   ThuA04-02

Fast algorithm of supervisory predictive control

Guolian Hou, Yi Sun, Jingbin Liu, and Jianhua Zhang
(North China Electric Power Univ., China)

A new fast supervisory predictive control algorithm (FSPC) is proposed in this paper. In this algorithm, off-line approximate computation of the future optimize variable and only calculating of the current control action at k time instant exactly is presented. Compared with the supervisory predictive control algorithm, the fast algorithm decreases dimensions of the variables and reduces the computational burden. The proposed controller is successfully applied to a boiler model, simulation studies demonstrate good behaviors.

10:40-11:00   ThuA04-03

Intelligent stochastic quality control of non-Gaussian chemical processes

A. Ahammed (The Univ. of Manchester, UK)
A. Wang (Anhui Univ., China)
Hong Wang (The Univ. of Manchester, UK)

In this paper a real time quality control strategy is studied for non-Gaussian chemical processes using the molecular weight distribution control of styrene polymerization process as a case study. At first the system model is derived and this is then followed by the model reduction and then the required controller design. Simulated results have been obtained to show the effectiveness of the proposed method.

11:00-11:20   ThuA04-04

Elementary siphons in a class of generalized petri nets and their application

Yifan Hou, Zhiwu Li, and Ding Liu (Xidian Univ., China)
Mi Zhao (Shihezi Uni., China)

As a structural object of Petri nets, siphons play a significant role in the development of deadlock prevention policies for resource allocation systems. Elementary siphons are a novel methodology in Petri nets, which have been extensively studied in siphon-based liveness-enforcing supervisor designs. This paper aims to extend elementary siphons to generalized Petri nets. It can find a set of reasonable and compact elementary siphons. For a class of generalized Petri nets, the concept of augmented siphons is proposed to obtain a set of augmented elementary siphons by thoroughly investigating the structure information. The controllability of augmented dependent siphons is proposed on condition that their augmented elementary siphons are properly supervised. Finally, an example is used to illustrate the proposed method and indicate its advantages.

11:20-11:40   ThuA04-05

Network based robust adaptive thermal control design for aluminum plate

Masahiro Sanada (Okayama Univ., Japan)
Mingcong Deng and Shengjun Wen
(Tokyo Univ. of Agriculture and Tech., Japan)

In this paper, the main purpose is to stabilize the system with network delay and to achieve satisfactory output following performance. One of the most important problems is the time delay in networked control system (NCS). Firstly, the time-delay is approximated by Pade Approximation. Secondly, by using robust parallel compensator (RPC), an augmented process satisfying almost strictly positive real (ASPR) condition is obtained and adaptive output following control based on command generator tracker (CGT) method is proposed. Finally, network based robust adaptive temperature control for an aluminum plate thermal process is realized by using the proposed design scheme, and the effectiveness of that is confirmed.

11:40-12:00   ThuA04-06

Modeling and simulation for parallel hybrid electric vehicle power train

Zhumu Fu (Henan Univ. of Science and Tech., China)
Gaolei Hou (Xuji Metering Limited Company, China)
Aiyun Gao (Henan Univ. of Science and Tech., China

Hybrid Electric Vehicles, HEV, are an attractive opportunity to use new energy sources in road transportation, not only to minimize fuel consumption but also to reduce air pollution. This paper presents a discussion of mathematical modeling, analysis, and simulation of parallel hybrid electric vehicle powertrain system. Theory basis of modeling PHEV powertrain has been analyzed. Using ADVISOR software based on the Matlab/Simulink environment as simulation platform, main models of PHEV powertrain are established. The models are simulated on SP-PHEV2000. The result shows that SP-PHEV2000 excels Santane 2000 GLi in vehicle performance. The model and simulation method are verified reasonable and feasible. These provide reference for PHEV parameter optimization and matching.

Motor control

14:20-14:40   ThuM01-01

Study on simulation model of switched reluctance startor/generator system based on wavelet neural network

Xiaoshu Zan and Fangnan Xie
(China Univ. of Mining and Tech., China)

This paper presents a novel integrated simulation model of switched reluctance startor/generator system based on wavelet neural network. The switched reluctance startor/generator system is hard to obtain good simulation model due to its critical nonlinearity. Relatively accurate mathematical model would be built by the wavelet neural network due to its powerful learning, approximation and prediction abilities. The nonlinear mapping relation of the flux-linkage, current and rotor position has been realized by the wavelet neural network and the simulation model of switched reluctance startor/generator system is established meanwhile. The simulation has high operation speed and can be modified conveniently. The effectiveness of the proposed simulation model has been confirmed both by simulation and experiment results.

14:40-15:00   ThuM01-02

Switched reluctance generator system based on single neuron adaptive PID controller

Xiaoshu Zan and Fangnan Xie
(China Univ. of Mining and Tech., China)

A novel single neuron adaptive PID controller has been used for the switched reluctance generator system in this paper. The switched reluctance generator system is hard to obtain good control performance by the traditional linear control theory due to its serious nonlinearity. The single neuron adaptive PID controller is suitable for the switched reluctance generator system because of its simple structure, adaptive ability and strong robust performance. The simulation model of the system adopting the proposed control strategy based on MATLAB/SIMULINK has been established firstly and the simulation results has been given. The experimental results have been given too on the switched reluctance generator system experimental platform. Both the simulation and the experimental results show that the system has the advantages of quick voltage establishing, small voltage vibration and rapid dynamic response. The single neuron adaptive PID controller has good applied prospect in the switched reluctance generator system.

15:00-15:20   ThuM01-03

Comparative study on the dynamic behaviors of SRD operated at two control modes

D.S. Yu and Hao Chen
(China Univ. of Mining and Tech., China)

In this paper, dynamic behaviors in three phases Switched Reluctance Drive (SRD) operated respectively at digital and analog control modes are studied comparatively. By making use of Fourier Series, mathematic description of the system under proportional-integral (PI) compensation is presented based on the equivalent linear inductance model. After giving the waveforms of system output-variables in the continuous time domain, the bifurcation diagrams are derived in terms of proportional compensation coefficient. Lastly, the bifurcation characteristics of digitally controlled SRD are discussed along with its analog controlled counterpart to highlight the diversities between digital and analog control modes.

15:20-15:40   ThuM01-04

Reference model output following control design for a direct current servo control system

Yuguo Chen, Dongyun Wang, and Peixue Wang
(Zhongyuan Univ. of Tech., China)

In this paper, reference model output following control method is proposed for a direct current servo system. In details, the properties of the direct current servo system are described, which shows that a fast-acting tracking performance is required in the system. As a result, right coprime factorization technique is used to guarantee the stability of the control system and command generator tracker based model output following control method is presented to realize the tracking control. Finally, simulation results are given to show the effectiveness of the proposed method.

15:40-16:00   ThuM01-05

Cascade high gain observers without mechanical sensor for the asynchronous machine

Chouya Ahmed (Center University of Khemis-Miliana, Algeria)
Chenafa Mohammed, Mansouri Abdellah, and Bouhenna Abdelrahmane
(ENSET of Oran, Algeria)

It is well-known that there are not systematic methods for the observers design for a given nonlinear system. However, several methods of observation are available according to specific characteristic's of the studied nonlinear system. In particular the nonlinear system considered as an interconnection between several subsystems. This article treats two high gain observers interconnected applied to the asynchronous machine.

Optimization, prediction and control

Time: 14:20-16:00, Thursday, August 11, 2011   Chair: Hong Wang (The Univ. of Manchester, UK)
ThuM02, No. 2 Lecture Room   Co-Chair: Yukinori Nakamura (Tokyo Univ. of Agriculture and Tech., Japan)

14:20-14:40   **ThuM02-01**

Thermal energy minimisation in papermaking via MD control approach

P. Afshar (The Univ. of Manchester, UK)
J. Mack (Perceptive Engineering Ltd., UK)
P. Austin (Cambridge Univ., UK), M. Brown (The Univ. of Manchester, UK)
J. Maciejowski (Cambridge Univ., UK)
Hong Wang (The Univ. of Manchester, UK)

This paper reports the application of Advanced Process Control (APC) techniques for improving the thermal energy efficiency of a paperboard-making process by regulating the Machine Direction (MD) profile of the basis weight and moisture content of the paperboard. A Model Predictive Controller (MPC) is designed so that the sheet moisture and basis weight tracking errors along with variations of the sheet moisture and basis weight are reduced. Also, the drainage is maximized through improved wet-end stability which can facilitate driving the sheet moisture set-point closer to its upper specification limit over time. It is shown that the proposed strategy can result in reducing steam usage by 8-10%. A simulation study based on a UK board machine is presented to show the effectiveness of the proposed technique.

14:40-15:00   **ThuM02-02**

Feedback control of a class of nonlinear discrete systems with state time-varying delay

Cunchen Gao and Yan Xu
(Ocean Univ. of China, China)

In this paper, the robust stability under the feedback control of a class of nonlinear discrete systems with state time-varying delay is studied. Firstly, the robust stability's sufficient condition of this system is given in the form of Linear Matrix Inequalities. Secondly, a state feedback controller of the system is designed, and the design method is a linear matrix inequality constrained optimization problem. In addition, the designed state feedback controller can make the closed loop system asymptotically stable. Finally, a numerical example and a simulation are given to illustrate the method's feasibility and effectiveness.

15:00-15:20   **ThuM02-03**

Numerical study of phase change problem with periodic boundary condition

Lianghui Qu (Zhongyuan Univ. of Tech., China)
Feng Ling (Zhaoqing Univ., China)

A finite difference approach to spherical and cylindrical phase change problem with periodic boundary condition is established by using an invariant-space-grid method. The motion of the moving interface and the temperature field are simulated numerically. Also the effects of the Stefan number, the amplitude and frequency of the periodically oscillating surface temperature on the motion of the moving interface and the temperature distribution are analyzed. Numerical experiments show that, for given amplitude and frequency, the Stefan number strongly influences the temperature distribution and the evolution of the moving interface, while the effect of the oscillating boundary temperature on the evolution of the moving interface is more pronounced when the phase change domain is small and diminishes as the domain grows. And comparing with spherical phase change, cylindrical phase change is influenced more strongly by the Stefan number.

15:20-15:40   **ThuM02-04**

Robust control for a class of nonlinear systems with unknown perturbations

Ni Bu and Mingcong Deng
(Tokyo Univ. of Agriculture and Tech., Japan)

This paper is concerned with operator-based robust control for nonlinear feedback system with unknown perturbations. By the designed robust stabilizing controllers, not only the nonlinear system with nominal plant but also that with perturbed plant can be stabilized. Moreover, the plant output can be guaranteed to asymptotically track to the reference input. The effectiveness of the proposed design scheme is verified by the simulation results.

15:40-16:00   **ThuM02-05**

Modelling and fault diagnosis for DFIGs with multi-phase inter-turn short circuit

Qian Lu, Timofei Breikin, and Hong Wang
(The Univ. of Manchester, UK)

In this paper, a new dynamic model of a DFIG subjected to the multiphase inter-turn short circuit fault (ITSC) is proposed. This model can quantitatively describe the faults occurring in multiple phases of the stator and rotor. What's more, a state-space representation of this faulty model is also derived. Base on this model, an adaptive observer is developed which can provide an online diagnosis of the fault position and level by estimating the amount of the shorted turns for each phase.

Novel control techniques

14:20-14:40   ThuM03-01

A simulation model of focusing type three GaAs solar cells in the condition of following sun

Erqiang Xu and Lei Liu
(Henan Electric Power Bureau of State Grid Corp., China)
Xiaolei Wang (Zhongyuan Univ. of Tech., China)

This paper studied the output characteristics of the three GaAs solar cells in the condition of following sun. Then we established the simulation model of the solar cells in Matlab2009b/Simulink. The simulation results show that GaAs solar cell has good I-U output characteristics under spotlights. The highlight intensity lead to solar cells with the narrow width, short-circuit current (ISC) and output power increasing, but at the same time depletion layer compound rate changed, open voltage (UOC) reduced, and restricted the output power of array. At the same time the solar array's temperature and resistance increases in series. The temperature of the array has a lot of negative effects to its output power, so this paper used the compulsory cooling way to ensure that the output of the panels efficiency.

14:40-15:00   ThuM03-02

Pareto optimization of serial-batching scheduling problems on two agents

Qi Feng (Zhengzhou Univ., Chian, Zhongyuan Univ. of Tech., China)
Zhiyun Yu and Weiping Shang (Zhongyuan Univ. of Tech., China)

This paper studies the two-agent scheduling on an unbounded serial-batching machine. In the problem, there are two agents A and B each having their respective job sets. The jobs of different agent cannot be processed in a common batch. Moreover, each agent has an objective function to be minimized. The objective function of agent A is the makespan of his jobs and the objective function of agent B is maximum lateness of his jobs. The target is to find all Pareto optimal solutions for the two agents. We present a polynomial-time algorithm for finding all Pareto optimal solutions of this two-agent serialbatching scheduling problem.

15:00-15:20   ThuM03-03

Compensation of hysteresis nonlinearity for a piezoelectric actuator using a stop operator-based Prandtl-Ishlinskii model

Zhi Li (Northeastern Univ., China, Concordia Univ., Canada)
Omar Aljanaideh, Chun-Yi Su, Subhash Rakheja, and Mohammad Al Janaideh
(Concordia Univ., Canada)

Piezoelectric actuators exhibit limited tracking performance in precision control due to their inherent hysteresis nonlinearity. In this paper, the hysteresis behavior is described by a play operator-based Prandtl-Ishlinskii (PPI) model. And a corresponding stop operator-based Prandtl-Ishlinskii (SPI) model is utilized as a feedforward compensator for canceling the hysteresis effect in piezoelectric actuators. For this purpose, the two parameters describing the SPI model, the thresholds and the weights, are analytically derived from the PPI model, which constitutes a main contribution of the paper. As an illustration, the effectiveness of the compensator is demonstrated through simulation and experimental results attained with a piezoelectric micro-positioning stage. Both the simulation and experimental results show that the SPI model can serve as an effective feedforward hysteresis compensator and can thus enhance the tracking/positioning precision of the piezoelectric actuators.

15:20-15:40   ThuM03-04

2D systems based iterative learning control revisited

Lukasz Hladowski (Univ. of Zielona Gora, Poland)
Krzysztof Galkowski (The Univ. of Wuppertal, Germany)
Eric Rogers (Univ. of Southampton, UK)
Anton Kummert (Univ. of Wuppertal, Germany)

Iterative learning control can be applied to systems that repeat the same task over a finite duration with resetting to the starting point once each one is complete. The idea of iterative learning control is to make use of information from previous executions of the task in order to update the control signal applied during the current execution and thereby sequentially improve performance. This form of control can be treated as a class of 2D systems. In this paper, a critical overview of progress on this application area for 2D systems theory is given, including results from experimental verification on a gantry robot, and discussion of some open research questions.

15:40-16:00   ThuM03-05

Decentralized adaptive robust control of robot manipulators

Zi-Jiang Yang (Ibaraki Univ., Japan)
Youichirou Fukushima and Pan Qin (Kyushu Univ., Japan)

In this paper, we propose a decentralized adaptive robust controller for trajectory tracking of robot manipulators. In each local controller, a disturbance observer (DOB) is introduced to compensate the low-passed coupled uncertainties, and an adaptive sliding mode control term is employed to handle the fast-changing components of the uncertainties beyond the passband of the DOB. In contrast to most of the local controllers using DOB for robot manipulators that are based on linear control theory, in this study, by some special nonlinear damping terms, the boundedness of the signals of the overall nonlinear system is first ensured. This paves the way to analyze how the DOB and adaptive sliding mode control play in a cooperative way in each local subsystem to achieve an excellent control performance. Simulation results are included to confirm the theoretical results.

Process control

14:20-14:40　　　　　　　　　　　　　　　　　　**ThuM04-01**

The analysis for the leaking flowate in the spherical valveplate sector considering the influence of the flow inertia

Renxi Hu,Wentong Xin, Zhizun Li, and Fengqi Han
(Mechanical Engineering College, China)

A new computation for the leaking flowate in the spherical valveplate sector of the pistons pump considering the influence of the flow inertia is proposed. Establish the theoretical math model about the flow field, based in the N-S equation and the sequence equation, and the leaking flowate in the spherical valveplate sector considering the influence of the flow inertia is computed in the boundary conditions of the press and the velocity. It is not the same as the common formula that the leaking flowate computation formula established in this paper includes the factor of the flow inertia in the spherical valveplate sector, which can reflect the influence of the flow inertia. The theory computation is checked by the FEM simulation. The theory computation result is approximate with the simulation result. The computing results indicate that the leaking flowate of the spherical valveplate sector increases when the press and the height of the seam increase, just as the other conditions are the same. And the flow inertia leads to the increase of the leaking flowate, the influence is obvious in some conditions.

14:40-15:00　　　　　　　　　　　　　　　　　　**ThuM04-02**

Neuro-PID control of heat exchanger in an organic rankine cycle system for waste heat recovery

Rui Wang, Chao Wang, Xiang Zhao, and Wenfang Zhang
(North China Electric Power Univ., China)

Organic Rankine Cycle (ORC) has been applied for generating power from different waste heat sources with higher thermodynamic efficiency. And the ORC's energy efficiency is closely dependent on the heat exchanger's operation. In this paper, a neuro-PID controller is proposed for the heat exchanger in ORC system for waste heat recovery. Compared with traditional control strategy, the proposed method could achieve better dynamics characteristic and have strong robustness against parameter and external disturbances. Finally, the simulation results illustrate the validity and superiority of the proposed approach.

15:00-15:20　　　　　　　　　　　　　　　　　　**ThuM04-03**

Simulation research of the multi-variable generalized predictive control in 500MW unit plant coordinated control system

Guolian Hou, Yuan Xi, Jingbin Liu, and Jianhua Zhang
(North China Electric Power Univ., China)

It's a key problem to design an effective control strategy for unit plant coordinated control system to improve the automatic control level in thermal engineering. The algorithm of the generalized predictive control (GPC) is extensively used in academic and industrial fields for its simple modular parameters, distinctive robustness and stability. In this paper, from the model of a 500MW boiler-turbine coordinated control system, the multi-variable GPC control strategy has been designed according to this linearized model. The simulation results indicate that, compared with PID, the proposed method can not only track the input set value smoothly and rapidly with smaller overshoot and shorter adjusting time, but also has stronger robust.

15:20-15:40　　　　　　　　　　　　　　　　　　**ThuM04-04**

Application of self-tuning control based on generalized minimum variance method in evaporator for ORCS

Guolian Hou, Guoqiang Hu, Rui Sun, and Jianhua Zhang
(North China Electric Power Univ., China)

In order to solve uncertainty and time-varying problems of evaporator which is non-minimum phase object, direct self-tuning control based on generalized minimum variance method combined with the forgetting factor recursive least squares(FFRLS)parameter estimation is investigated in this paper. Firstly, self-tuning control has the ability to tune its own parameters. It is well suited for handling time-varying and uncertain system. Secondly, Generalized minimum variance control (GMV) is one of the most flexible and successful approaches to self-tuning control. GMV employs a cost function that incorporates system inputs, outputs and reference signals, and thus enables controller to provide an elegant way of tracking reference signals and handling non-minimum phase systems. Thirdly, forgetting factor recursive least squares (FFRLS) parameter identification method is very simple, fast and suitable for time-varying system. This algorithm is applied to control the temperature of evaporator's outlet under various disturbances. Simulations indicate good stationary and dynamic performance along with good tracking property.

15:40-16:00　　　　　　　　　　　　　　　　　　**ThuM04-05**

Operator based networked nonlinear control for a Peltier actuated thermal process with time-varying delays

Shengjun Wen, Mingcong Deng, and Shuhui Bi
(Tokyo Univ. of Agriculture and Tech., Japan)

In this paper, operator based networked nonlinear control is considered for a Peltier actuated thermal process with time-varying delays. For the networked Peltier actuated thermal process, the networked property based on distributed control system is described. Then, by using robust right coprime factorization approach, the robust stability of the networked system is guaranteed. Also, a feedforward tracking technique is given to compensate the delay and ensure tracking performance. That is, the robust stable tracking control design of the networked Peltier actuated thermal process is realized by combining robust right coprime factorization approach and feedforward tracking technique.

Human adaptive mechatronics

16:20-16:40   ThuP01-01

Catheter intervention manipulation system of minimally invasive robotic surgery

Hongbo Wang, Xue Yang, and Guoqing Hu (Yanshan Univ., China)
Zengguang Hou (Chinese Academy of Sciences, China)
Hongnian Yu (Staffordshire Univ., UK)

This paper presents a novel catheter intervention manipulation system of minimally invasive robotic surgery which includes a catheter intervention manipulation device and a catheter intervention device. The structure and feature of the system are described, and the ways of realizing force feedback and disinfection are proposed. Moreover, the clamping force of rotating finger giving to the catheter is analyzed, which provides an optimizing target to the mechanism optimization.

16:40-17:00   ThuP01-02

Design, modelling and control of a light touch mechanism

Y. Dong (Shanghai Jiao Tong Univ., China)
Hongnian Yu (Staffordshire Univ., UK)
F. Gao (Shanghai Jiao Tong Univ., China)

Extensive researches have demonstrated that a light touch with the fingertip has a significant stabilizing effect on postural sway during stance. However there are rare researches on evaluation of the effect of the light touch when people are walking. To conduct this type of work, a light touch robot that can follow people and can maintain a constant force contact is needed. This paper proposes a novel light touch mechanism to conduct the task. The kinematics and dynamics analyses of the mechanism are provided. A simple computed torque based control approach is developed to simulate and validate the proposed mechanism. The simulation results show the contacting force can be well controlled around a constant value.

17:00-17:20   ThuP01-03

SEMG feature extraction methods for pattern recognition of upper limbs

Feng Zhang, Pengfeng Li, Zengguang Hou, and Yixiong Chen
(Institute of Automation Chinese Academy of Sciences, China)
Fei Xu (China Univ. of Mining and Tech., China)
Jin Hu, Qingling Li, and Min Tan
(Institute of Automation Chinese Academy of Sciences, China)

In this paper, a new feature of surface electromyo- graphy (sEMG) by using discrete wavelet transform (DWT) is proposed for motion recognition of upper limbs, and this method can be eventually used for rehabilitation robot control. Seven traditional features of sEMG are also extracted for comparative study, they are integral of absolute value (IAV), difference absolute mean value (DAMV), zero crossing (ZC), variance (VAR), mean power spectral density (MPSD), mean frequency (MF) and median frequency (MDF) respectively. For comparing the recognition rate of the different motions of the upper limb, each feature or their combination are used to construct the feature vectors, and the BP neural network with variable learning rate back propagation with momentum (GDX) algorithm is used to classify these motion modes. The experimental results summarize that the new feature extracted by using DWT presents a higher recognition rate (98.9%) than all of the traditional features, and the traditional features combination can also greatly improve the recognition rate (99%).

17:20-17:40   ThuP01-04

The petri nets and markov chains approach for the walking robots dynamical stability control

Luige Vladareanu
(Institute of Solid Mechanics of the Romanian Academy, Romanian)
Gabriela Tont (Univ. of Oradea, Romanian)
Hongnian Yu (Staffordshire Univ., UK)
Danut A. Bucur
(Institute of Solid Mechanics of the Romanian Academy, Romanian)

This paper investigate Zero Movement Point (ZPM) dynamic control of walking robots and develop an open architecture of real time control multiprocessor systems, in view of obtaining new capabilities for walking robots. Considering the complexity of the movement mechanism of a walking robot being a repetitive tilting process with numerous instable movements can lead to its turnover on an uneven terrain. The control system architecture for the dynamic robot walking is presented in correlation with a stochastic model of assessing system probability of unidirectional or bidirectional transition states, applying the non-homogeneous/non-stationary Markov chains. The capability of the time-dependent method for describing a multi-state system and assessing theoperational situation of a robotic system is evaluated based on a case study. The rationality and validity of the proposed model are demonstrated via an example of quantitative assessment of states probabilities of an autonomous robot. The results show that the proposed new strategy of the walking robot control systems for slope movement and walking by overtaking or going around obstacles has increased the robot's mobility and stability in real.

17:40-18:00   ThuP01-05

Key issues in studying parallel manipulators

Jianzheng Zhang (Shanghai Jiao Tong Univ., China)
Hongnian Yu (Staffordshire Univ., UK)
Feng Gao and Xianchao Zhao (Shanghai Jiao Tong Univ., China)

This paper reviews several key issues on the trends and open research problems of parallel manipulators. The research of a parallel manipulator structure is an essential question. It includes two research issues: design of a novel parallel robot mechanism and performance indexes. This paper reviews the methods on the two aspects and presents the research directions. The paper discusses the functions and roles of the kinematics and dynamics in parallel manipulators. Especially, the methods of developing dynamics are categorized and summarized. The paper also proposes a method to set up the control system, including the hardware and software, and evaluates the importance of a sensor with multi-information. The paper introduces two main new applications of parallel manipulators: as heavy-duty equipment and a micro-operation device, and highlights several questions to be solved.

Industrial hazards and system safety

16:20-16:40   ThuP02-01

The longest side elimination solution for solving steiner minimum tree problems

Lili Xu, Zongxiao Yang, Youlin Shang, and Tingting Wang
(Henan Univ. of Science and Tech., China)

The Steiner minimum tree (SMT) problem is one of the classic nonlinear combinatorial optimization problems for centuries. A novel solution, longest side elimination solution method (LSEM), is proposed in this paper. Firstly, the minimum spanning trees is defined as convex road and external side. Secondly, LSESM is constructed for solving the full SMT by using Melzak geometric composition principle to choose several points convex road which can satisfied certain conditions in the minimum spanning tree. And lastly, we can construct point set's full SMT according to visualization experiment results and Melzak geometric composition principle, combining with LSEM. A subsection-inserting points algorithm (SIPA) is described for eliminating the longest side in the convex road and solving the system shortest path sequentially. The global shortest path can be obtained by SIPA successfully compared with experimental results of visualization instrument.

16:40-17:00   ThuP02-02

Research and development of a simple straight-flow wind tunnel test equipment for vertical axis wind turbines

Ruitao Deng, Lei Song, Zongxiao Yang, Hanghang Yang, and Longbiao Wang
(Henan Univ. of Science and Tech., China)

As a renewable energy, wind energy has attracted great attention all over the world. To study the aerodynamic performance of new vertical axis wind energy conversion systems, a type of simple straight-flow wind tunnel test equipment for vertical axis wind turbines has been developed. The performance of the power section, diffusing section, rectification section and the contraction section of the wind tunnel is analyzed and calculated, and an integrated test bed is established, with which, the performance of a new wind wheel is tested and analyzed. The results show that the test equipment is simple structured, convenient to manufactured, reliable to operate, and able to get a stepless speed regulation of the wind speed with 0.5-15m/s, which also provides corresponding design parameters for the permanent magnetic generators matched.

17:00-17:20   ThuP02-03

The conditions of frame for the shift-invariant system

Dewu Yang (Henan Univ. of Science and Tech., China)
Xiuge Zhu (Henan Univ., China)

A necessary condition and two sufficient conditions ensuring that the shift-invariant system is a frame for $L2(Rn)$ are established. The proofs of presented results rely on elementary properties of the periodic function and the Cauchy-Schwarz inequality. As some applications, the results are used to obtain some known conclusions about wavelet frames.

17:20-17:40   ThuP02-04

Application of grey system theory to MTPV system optimization

Bin Xu, Jun Wu, Jian Wu, and Hong Xue
(Henan Univ. of Science and Tech., China)

Combustors are core parts of the Micro-thermo photovoltaic System (MTPV), and their operation process has a significant influence on energy conversion efficiency of the whole system. Introduction of the grey system theory quantifies the tube length and selection point of internal sudden step in the combustor in MTPV system, optimizing the conversion efficiency of the whole system and providing a basis for actual applications in future. In this paper, overall optimization of the MTPV system was achieved by grey forecasting with the GM (1,1) forecasting model, combining with raw data provided by external wall temperature of MgO radiator.

17:40-18:00   ThuP02-05

Structure design and trajectory control on gait rehabilitation training robot system driven by pneumatic actuators

Jianhai Han, Binjing Guo, and Shushang Zhao
(Henan Univ. of Science and Tech., China)

In this paper, a new type of gait rehabilitation training robot system driven by pneumatic actuators is designed, which can guide the patient legs to move in a preprogrammed gait pattern on the special treadmill. The hip and knee joints are actuated by cylinders which position is controlled by regulating high-speed ON/OFF valve's duty with PWM. The ankle joint is powered by two pneumatic artificial muscles. The partial body weight supported device is also actuated by two cylinders in parallel and the supported force value is set by adjusting the supply pressure. The target gait trajectory is tracked by the coordinating movements of all joints. The gait tracking experiments are also tested with the special control strategies. The feasibility and effectiveness of the proposed gait rehabilitation robot system is confirmed by the experimental results.

Industrial application

16:20-16:40   ThuP03-01

Shortest path algorithm based on city emergency system

Guiqin Dou, Yansong Zhu, and Yumin Han
(Zhongyuan Univ. of Tech., China)

It requires that the savers get to the spot with the quickest speed when the accidents take place in the City Emergency System, therefore the Shortest Path problem is one of the pivotal technology to satisfy the system. This paper put forward a real-time and effective algorithm realization of Shortest Path, according to the characteristics of City Emergency System, taking fire fighting information system as an example, being combined with GIS technology application and analyzing the Shortest Path Algorithm that is used in many systems.

16:40-17:00   ThuP03-02

The research and implementation of mid-frequency power supply with high power factor and multi-closed loop feedback

Fuzhuan Wu, Dongyun Wang, and Haibo Ma
(Zhongyuan Univ. of Tech., China)

The harmonic current of nonlinear rectifier can generate the grid pollution and reduce the power factor on the structure of AC / DC / AC of the 400Hz mid-frequency power supply. To solve this problem the paper proposes to adopt active power factor correction (APFC) circuit on the input side to reduce harmonic and improve the power factor. When the inverter power output is with nonlinear loads and dead zone etc., it can cause the distortion of the output voltage waveform and the poor real-time of RMS feedback. For this the article adopts a multi-closed loop feedback control strategy, i.e. the capacitor current is the inner loop, voltage is mid-loop and root meam square (RMS) or the amplitude is the outer loop. And it also uses the instantaneous reactive power theory abc/dq0 on the current and voltage detection to improve the real time. Finally the system is verified on the experimental platform controlled by DSP2812, the software flow and test results are also given.

17:00-17:20   ThuP03-03

Off-shore wind power potential evaluation of entire Japan using GIS technology

Asifujiang Abudureyimu, Yoshiki Hayashi, and Ken Nagasaka
(Tokyo Univ. of Agriculture and Tech., Japan)

The off-shore wind energy has been drawing interest recently. This research is focusing on the potential analysis of off-shore wind energy surrounding entire Japan coast using GIS technology. Base on the economy and environment assessment, this research is evaluating the current situation and forecasting on future of wind energy technology in Japan. In order to reduce the green-house gas emission, renewable energy (such as wind energy, solar energy, fuel cell…) will gradually substitute can be installed the primary energy resource (such as coal, oil, scale gas..). Based on GIS technique, wind power turbines in the surrounding area of Japanese coast-line. In the study, 2000kW rated wind turbines are considered for further installation. As the result of this study, we have determined that 108,067 in 330 places number of off-shore with annual generation of 180.0 TWh are expected. This is equal to 20% of annual total generated power of Japan in 2010.

17:20-17:40   ThuP03-04

Design of wireless medical liquid-level monitoring and controlling system based on RF technology

Pingjun Wei and Jiangbo Zhu (Zhongyuan Univ. of Tech., China)
Xiangzhi Wang (Maternal and Child Health Hospital of Zhengzhou, China)

This paper introduces a wireless medical liquid-level monitoring and controlling system based on RF technology, in which liquid levels beyond limits are monitored by using the principle of different refractive indexes of light rays in air and in liquid and adopting the non-contact photoelectric monitoring method, and 8051 single chip computer were used as main MCU, through controlling RF module RF905 to transmit and receive alarm signals, also control the nixie tubes and buzzer to give sound and light alarms.

17:40-18:00   ThuP03-05

Research on low-cost vehicular integrated navigation

Jingyang Wen (Beijing Institute of Tech., China)
Xiangyang Lu (Zhongyuan Univ. of Tech., China)

Bei-Dou (BD) passive locating has been widely used with the successful launch of BD navigation satellites. This paper analyzes BD passive locating, GSM wireless location and dead reckoning (DR) and proposes an integrated navigation based on these three low-cost location technologies by Federal Kalman Filtering (FKF), which makes full use of their own advantages. The FKF applies both the GPS and GSM locating information to solve the equation of position, thus the state of DR system is modified in the process of filtering, and the output of integrated position can provide accurate initial location and direction.

Distributed system

16:20-16:40	ThuP04-01

Modeling and model order reduction of evaporator in organic rankine cycle for waste heat recovery

Rui Wang, Xiang Zhao, Chao Wang, Ying Li
(North China Electric Power Univ., China)

The moving boundary method is used to model the evaporator in waste heat recovery system. Four reducing algorithms, balanced truncation reducing method, its modified balanced singular perturbation approximation, time scale method and time scale method combined with singular perturbation are discussed in detail. For the practical application of evaporator, the low-order models are obtained by four model reduction methods, respectively. Simulation results show that the models after order reduction can reflect the dynamic characteristics of moving boundary model.

16:40-17:00	ThuP04-02

Variable structure sliding mode control for a class of uncertain distributed parameter systems with time delay

Cunchen Gao, Fei Li, and Lin Zhao
(Ocean Univ. of China, China)

This paper considers sliding mode control of a class of parabolic uncertain distributed parameter systems with time delay. A sufficient condition of asymptotic stability for the sliding motion is derived. The sliding mode controller is designed to drive the state trajectory of the system to the sliding manifold in finite time. A simulation example is presented to illustrate effectiveness and feasibility of the proposed method.

17:00-17:20	ThuP04-03

The stabilized least-squares nonconforming mixed finite element approximation for the convection-diffusion problem

Zhiyun Yu and Jinhuan Chen
(Zhongyuan Univ. of Tech., China)

In this paper, we use a nonconforming mixed finite element to approximate the convection-diffusion problem by the stabilized least-squares method. We convert the original system of second-order partial differential equations into a first-order system formulation by a additional variable. The existence and uniqueness of the approximate solutions are proved. The convergence analysis is presented and the optimal error estimates for the stress in H(div)-norm and the displacement in broken H1-norm are derived.

17:20-17:40	ThuP04-04

Supervisory predictive control of evaporator in organic rankine cycle (ORC) system for waste heat recovery

Guolian Hou, Rui Sun, Guoqiang Hu,and Jianhua Zhang
(North China Electric Power Univ., China)

Organic Rankine Cycle (ORC) system has shown its superiority among different ways of recycling waste heat . Evaporator, as the key component of ORC system, has a great impact on efficiency and circulation. The dynamics of evaporator include many uncertainties because of random changes of heat sources and other factors. Traditional control strategy could not offer satisfactory results. In this paper, Supervisory Predictive Control is proposed to have satisfactory control of the evaporator. Comparisons with traditional PID control are made. Simulation result shows excellent tracking results.

Adaptive and advanced control systems - theory and applications

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10:00-10:20   FriA01-01

Design of a self-adjust controller using multiple local linear models for nonlinear systems

Shinichi Imai (Hiroshima National College of Maritime Tech., Japan)
Toru Yamamoto (Hiroshima Univ., Japan)

Almost all real-world plants are represented by nonlinear systems. Therefore, it is important to consider control schemes to cope with such systems. In this paper, a control method for nonlinear systems is newly proposed. Some local linear models on typical equilibrium points are first designed, followed by linear controllers corresponding to these models. The distances between the query and these local models are calculated, and the weights are computed in proportion to the distances. These weights are put for local controllers, and the controller corresponding to the query can be designed. According to the proposed scheme, the good control performance can be easily obtained. The effectiveness of the control scheme is illustrated by some simulation examples.

10:20-10:40   FriA01-02

A nonlinear model predictive control using a continuation method and a step input constraint

Kota Kogiso and Shiro Masuda
(Tokyo Metropolitan University, Japan)
Takao Sato (Univ. of Hyogo, Japan)

The nonlinear model predictive control (MPC) needs to solve a two-point boundary-value problem (TP-BVP) at every sample time based on the receding horizon control strategy. However, solving a nonlinear algebraic equation for the TP-BVP requires high computational load, so developing an efficient computation method of the control law in real-time is a significant issue on the research of the nonlinear model predictive control. This paper proposes an efficient calculation method of the control law for nonlinear MPC. The proposed approach searches an optimal step-type input signal for a given performance index beforehand, then the input signal is successively updated using a continuation method. Hence, it can reduce the computation load because the number of the parameter to be optimized becomes one in the SISO case or the number of the inputs in the MIMO case, and solving TP-BVP can be avoided by a continuation method. In addition, the accuracy of the nonlinear algebraic equation, which gives the optimal condition, keeps well by analytically deriving the updating law of the MPC control law. A numerical example shows that the proposed method can reduce the computation load of the nonlinear MPC, while the accuracy of the optimal conditions given by the nonlinear algebraic equations keeps a tolerance level.

10:40-11:00   FriA01-03

Disturbance attenuation property for random disturbances in two-degree-of freedom optimal servo control systems

Yusuki Kishimoto and Shiro Masuda
(Tokyo Metropolitan University, Japan)
Akira Yano (Okayama Univ., Japan)

The two-degrees-of-freedom optimal servo control systems have advantages that the integral gain can be tuned for improving feedback properties such as disturbance attenuation properties, while tracking property is independently designed of feedback properties using nominal controlled process model. However, the earlier works have not studied the effect of the integral. This paper considers the effect of the integral gain in the two-degrees-of-freedom optimal servo control systems in the presence of random disturbances. From the simulation study, there exist a tradeoff relation between the tracking property and output variance depression.

11:00-11:20   FriA01-04

Adaptive control scheme for MI-MO systems with input saturations

Jinxin Zhuo (Kyushu Institute of Tech., Japan)
Qiang Wang (Shanghai Dianji Univ., China)
Masahiro Oya (Kyushu Institute of Tech., Japan)

In all actual systems, there exist certainly input saturations. If an adaptive adjusting law is designed in disregard of input saturations, the designed adaptive controller may give poor performance or lead instability of the closed loop system. To overcome the problem, in this paper, we propose an adaptive control scheme for multi-input multi-output linear systems with input saturations. It is assumed that there exist the leading principal minors of the high frequency gain matrix of the controlled object and the signs of leading principal minors are known. Under the assumptions, even for unstable controlled objects, the proposed adaptive controller can assure asymptotic stability of the tracking error between the controlled object and a reference model.

11:20-11:40   FriA01-05

Performance-driven adaptive output feedback control system with a PFC designed via FRIT approach

Ikuro Mizumoto, Sota Fukui, and Kenshi Yamanaka
(Kumamoto Univ., Japan)
Sirish L. Shah (Univ. of Alberta, Canada)

This paper deals with a design problem of a performance-driven adaptive output feedback control system with a parallel feedforward compensator (PFC) designed for making the augmented controlled system ASPR. In the proposed adaptive control system, for systems in which the properties are changing during the operation, the PFC will be redesigned through FRIT approach and the output feedback gain will be readjusted according to a performance index.

11:40-12:00   FriA01-06

Stable fault-tolerant control based on fuzzy performance evaluation

Masanori Takahashi (Tokai Univ. at Kumamoto, Japan)
Taro Takagi (Kumamoto Univ., Japan)

This paper proposes a new design method for a fault-tolerant control system (FTCS) based on performance evaluation. The FTCS utilizes the two actuators against faults, and has a switching mechanism to select the healthy actuator. Also, the activation ratio of the failed actuator is determined by the Fuzzy inference from *a priori* input-data in the healthy condition. The stability of the FTCS can be guaranteed by switching to the extra control-mode with static redundancy. To confirm the effectiveness of the proposed method, several numerical simulation results are shown in this paper.

Information techniques for control

Time: 10:00-12:00, Friday, August 12, 2011   Chair: Yegui Xiao (Prefectural University of Hiroshima., Japan)
FriA02, No. 2 Lecture Room   Co-Chair: Lihua Jiang (Northeastern Univ., China)

10:00-10:20   FriA02-01

A V2G vector control model of electric car charging and discharging machine

Xiaolei Wang, Pan Yan, Liang Yang, Wendao Yao and Guangwen Shi
(Zhongyuan Univ. of Tech., China)

A new control strategy and circuit topology structure of electric vehicle charging and discharging inverter based on space vector is presented. The control strategy uses rotation vector of the directional three-phase active tide reversible PWM converter, and the circuit topology is two-way control DC/DC converter with double buck reversible structure. In order to improve the efficiency of the charging and discharging machine, the main circuit of the machine adopts isolation method, which is suitable for high power direct voltage battery group. Simulation and experimental results show that the double buck reversible structure has the function of electric power flowing with two-way, the transmission power factor is 1, and the harmonic is under control within 2%, the effectiveness of the proposed method is confirmed.

10:20-10:40   FriA02-02

Research progress on agronomic parameter estimation based on spectral analysis technology

Zhe Xu and Na Yang
(Beijing Univ. of Tech., China)

Based on the spectral analysis technology, agronomic parameter estimation which can obtain information on crop growth and nutrition, is efficient technology guarantee for the development of precision agriculture. On the basis of introducing the crop spectral theory , from mechanism model, experience and mechanism combination model, empirical model three parts, the research progress on agronomic parameter estimation by spectral analysis technology was discussed in detail, and the characteristics of various models were pointed out. In future, model optimization on the internal level and level of smoothness of leaves should be strengthened, and the range of crops and the amount of data collected also should be increased, to expand the applicability of the model and improve the prediction accuracy of agronomic parameter.

10:40-11:00   FriA02-03

Spectrum signal de-noising based on wavelet packet

Zhe Xu and Na Yang
(Beijing Univ. of Tech., China)

The de-noising effects of wavelet transform, soft threshold, hard threshold and the new threshold wavelet packet were compared by simulation experiments in the paper. It is concluded that the wavelet packet has a good time and frequency domain localization properties and multi-resolution analysis, and the new threshold method can de-noise noisy spectrum effectively, overcome the constant bias and discontinuity defects of soft and hard threshold function.

11:00-11:20   FriA02-04

A new hybrid active noise control system in the presence of wideband and narrowband noise components

Yegui Xiao (Prefectural Univ. of Hiroshima, Japan)
Jing Wang (Beihang Univ., China)
Hongyun Wei (Akita International Univ., Japan)

The conventional broadband active noise control (ANC) system may perform very poorly if its primary and reference noise signals contain both wideband and narrowband components simultaneously. In this paper, we propose a new feedforward hybrid ANC system capable of reducing noise signals with both wideband and narrowband components. First, some basic analysis is provided to show why the conventional broadband ANC system may indicate poor performance in the presence of both wideband and narrowband components. Next, a new hybrid ANC system is proposed to tackle this problem. The new system consists of three subsystems, i.e., a sinusoidal noise canceller using IIR notch filters, a broadband and a narrowband ANC subsystem, which work in harmony. Extensive simulations are conducted to confirm the effectiveness of the proposed system.

11:20-11:40   FriA02-05

Design of low cost embedded system for automation of a parallel processing plant

Zahid Ali Siddiqui, Ahmed Munir, M. Faizan Sherazi, and S. M. Danish
(ED Univ. of Engineering & Tech., Pakistan)

This paper unfolds the successful implementation of a microcontroller based embedded system for the complete automation of a plant which was intended for cutting, counting & sorting of steel sheets. This embedded system provides greater flexibility, robustness, cost effectiveness & ease in portability. This paper states the working of plant, technique of noise free data acquisition from plant sensors, design considerations & working of embedded system. The paper also discusses how the speedy microcontroller can overcome parallel occurrences of events in the plant.

11:40-12:00   FriA02-06

Design of PV power station remote monitoring system data acquisition device

Junming Xiao, Pengcheng Liu, Lingyun Jiao, Haiming Zhu, and Yinghu Du
(Zhongyuan Univ. of Tech., China)

This paper mainly introduced the basic structure and design process of hardware and software of PV power station remote monitoring system data acquisition device, collected and monitored the photovoltaic power generation system voltage，current，temperature，gave the bidirectional current sensing circuit, temperature detection circuit, serial communications interface circuit and remote communication diagram of PC and single chip microcomputer, the conditioning circuit of inverter AC voltage and current, data acquisition flow chart and so on. Aiming at the large scale parallel centralized development trend of PV power station, using group control technology, in the case of low sunshine data acquisition centralized control inverter to make inverter turns operation, greatly extend the service life of the inverter. The system could complete the data acquisition and processing of PV power station operating parameters and the instantaneous value of electrical equipment operating status, realized dynamic curves and report shows and print function of realize real-time and historical data.

Measurement and sensors

10:00-10:20	FriA03-01

Effects of back electromotive force in an absolute displacement sensor and improvement using current-feedback-type driver

Takashi Kai, Masaya Akiyama, Yukinori Nakamura, and Shinji Wakui
(Tokyo Univ. of Agriculture and Tech., Japan)

An absolute displacement sensor, which can simultaneously detect acceleration, velocity, and displacement signals, has been proposed for vibration control of semiconductor manufacturing equipments. Based on state feedback, a control model of the sensor is previously designed in order to calculate the feedback gains using optimal regulator. However, characteristics in simulations have been different from experiments in low frequency region. This difference is due to modeling of a driver circuit. In this paper, a voltage-feedback type driver is replaced by a current-feedback-type driver in actual circuits of the sensor. The latter driver can ignore the effect of back electromotive force from a forcer coil. After the driver and the force are remodeled, simulation parameters are identified. As a result, the simulations are corresponding to the experiments.

10:20-10:40	FriA03-02

Remote sensing image fusion for dim target detection

Zanxia Qiang, Xianfeng Du, and Liwu Sun
(Zhongyuan Univ. of Tech., China)

In order to resolve the problem of dim target detection, a novel approach based on image fusion and mathematical morphology was proposed. First, the characteristics of steerable pyramid were described. Second, the original images were fused using steerable pyramid transform technique based on effective fusion scheme. The targets can be enhanced and clearer in fused image. Finally, mathematical morphology method was applied to detect the target based on the fused image. The experimental results show that the effect of our method is satisfactory.

10:40-11:00	FriA03-03

The design research on the storage structures for large amount of data of the database

Huaqiang Zhou (Zhongyuan Univ. of Tech., China)
Zhihong Yao (Henan Shangqiu Medical College, China)
Han Xiao (Henan Electric Power Research Institute, China)

As a running core of the corporate data, the performance and efficiency of the database play an important role during the daily productive process. The technicians usually concentrate on some technical questions, such as the query algorithm, SQL Tuning, the underlying principle of the database software, etc. However, they have overlooked the importance of completely understanding the storage and design of the initial data. On the basis of the real features of the data, the Data Storage Design Patterns have closely analysed the data direction, the features of the data access, the data quantity, the increment of the data, and the life circle of the data. After classifying the data, the Data Storage Design Patterns will design storage policies for different types of data. If the Data Storage Design Patterns have been properly used, the efficiency of the data access will be doubled.

11:00-11:20	FriA03-04

Research of physical sediment measurement instruments

Huanlin He and Yuguo Chen
(Zhongyuan Univ. of Tech., China)

Based on multifarious (various) direct reading instruments of measuring sand, its working principles and applications are introduced. The test dates at field and indoors are given. The results show that the physical technology of measuring sand is effective now, and the further research is necessary at the same time.

11:20-11:40	FriA03-05

A new direction on auto-building database application system --model on automatically generating database application system from interface controls descriptions

Guoliang Tang and Feng Yang
(Henan Univ. of Traditional Chinese Medicine, China)
Zhiyong Zhang and Jiexin Pu
(Henan Univ. of Science and Tech., China)

At present, the Database Application System Interface and access logic are all auto-generated by dragging the data table object from the database server view in the database application system development environment, or by linking the well-designed interface controls with the fields of the table in the database. A new direction of Interface Controls Descriptions (ICD method) is proposed, which is designed to a control level SQL, directly and automatically generating the back-end database and tables from the well designed application interface controls, automatically generating the rich-functions codes, to reduce the steps and difficulties in developing database application system, to help the designer develop itself database application system efficiently and simply. The new way can make it easier for the non-computer professional designers to develop the database application software based on their own professions, without the necessity of studying and using the programming language in the whole process.

11:40-12:00	FriA03-06

Reflective ultrathin membrane model of hydrogen sensor based on multicomponent alloy

Lujun Cui, Huichao Shang, Gang Zhang, Youping Chen, and Zexiang Zhao
(Zhongyuan Univ. of Tech., China)

The present work investigates reflectivity of reflective surface for optical fiber hydrogen sensor. High reflectivity and low light scattering of multilayer electrolyte reflective membrane in two optical paths could increase signal to noise ratio of hydrogen sensor, and provide longer operational lifetime for hydrogen sensor. When the multi-layer electrolyte total reflection membrane was made up of TiO_2 and SiO_2, it was found that the reflectivity of membrane could reach almost 100% through a series of simulation experiments, the design of multilayer electrolyte reflective membrane benefits to the subsequent weak signal processing for optical fiber hydrogen sensor.

Mobile robots

10:00-10:20   FriA04-01

Detection of flat ground area by single camera on mobile vehicles

Masahiro Tanaka and Shintaro Onishi
(Konan Univ., Japan)

For moving robots of outdoor use, it is essential to detect the movable road area. In this research, we propose a new method of making distinction between road points and off-road points that are detected as feature points. Namely, we are to build the projection transformation model of the road seen from the robot in advance, the robot detects feature points by SURF or some other methods, and then making correspondence between the consecutive frames. By inverse projection, the points can be classified into on-road and offroad points. In this paper, we propose the principle of this theory and show some examples.

10:20-10:40   FriA04-02

Adaptive modular reinforcement learning

Tsubasa Asano and Satoshi Yamada
(Okayama Univ. of Science, Japan)

The adaptive modular reinforcement learning system was proposed to apply the reinforcement learning into more realistic control problems. It is composed of some control modules and a selection module. Its all modules are calculated by using the incremental normalized Gaussian networks (INGnet). It learned the task, where the "AND" condition of two types of sensor information should be discriminated, more quickly than the previous modular renforcement learning, whose modules were calculated by using CMAC, or the reinforcement learning using INGnet. Since the number of the processing units of the adaptive modular reinforcement learning was smaller than that of the modular renforcement learning was smaller than that of the modular renforcement learning using CMAC or the reinforcement learning using INGnet, it is considered to have the ability to make more appropriate representations for the control.

10:40-11:00   FriA04-03

Localization and position correction for mobile robot using artificial visual landmarks

Kimihiro Okuyama (Okayama Univ. of Science, Japan)
Tohru Kawasaki (Nihon Tokusyu Rozai Co., Ltd., Japan)
Valeri Kroumov (Okayama Univ. of Science, Japan)

This paper presents some preliminary results about improving the precision in localization and position correction of mobile robot. The visual simultaneous localization and mapping (vSLAM^R) algorithm is used for robot navigation. Artificial landmarks are used to improve the positioning of the robot. Experimental results show that, compared to other techniques, the proposed method has several advantages and can improve the robot localization and position calibration when vSLAM algorithm is used.

11:00-11:20   FriA04-04

Path planning of robotic fish based on genetic algorithm and modified dynamic programming

Qian Yang, Mei Yu, Shu Liu, and Zhongming Chai
(North China Electric Power Univ., China)

In this paper, genetic algorithm and modified dynamic programming are applied to path planning of robotic fish for the first time. Using grid method to the environment modeling and applying genetic algorithm to the path planning, an optimal or sub-optimal robot path can be obtained. Since the robotic fish can't track linear motion, the robot path can be seen as several circular arc. Based on the optimal path obtained via genetic algorithm, modified dynamic programming algorithm is proposed to calculate the shortest circular arc path, fish velocity and direction in every step. Finally the experiment on the robotic fish control software shows the effectiveness of the proposed method.

11:20-11:40   FriA04-05

DECR: dynamic and energy effective clustering based routing algorithm for prolonging the lifetime of wireless sensor networks

Bahram Lotfimanesh and Nazanin Seyedgogani
(Islamic Azad Univ., Iran)

Since the energy constraint is one of the most important restrictions in wireless sensor networks so the issue of energy balancing is essential for prolonging the network lifetime. Hence this problem has been considered as a main challenge in the research of scientific communities. In the recent papers many algorithms have been proposed for routing on wireless sensor network to balance the energy consumption such as clustering based routing protocols. In this work we propose the new clustering based routing algorithm namely DECR that is dynamic and hierarchical. Simulation Results show that the DECR prolongs the network lifetime about 23% in comparison to the LEACH protocol.

11:40-12:00   FriA04-06

Automatic mapping and localization of a tour guide robot by fusing active RFID and ranging laser scanner

Hung-Hsing Lin (Hsiuping Institute of Tech., Taiwan)
Wen-Yu Tsao (Chin-Yi Univ. of Tech., Taiwan)

This paper presents a mapping and global pose localization method for a tour guide robot in indoor environments by fusing measurements from an active radio-frequency-identification-device (RFID), one odometric device and a ranging laser scanner. RFID is adopted to quickly initialize the robot's global configuration by recognizing tags in the environment. Mapping is accomplished automatically by using a laser scanner and active RFID which is adopted to initialize tour guide robot's initial posture in real time. Numerous experimental results are provided to show the effectiveness and merits of the proposed mapping and localization systems.

Mechatronics, dynamic systems and controls in bio-mechanics and biomedical engineering

Time: 13:30-15:10, Friday, August 12, 2011
FriM01, No. 1 Lecture Room

Chair: Jin-Oh Hahn (University of Alberta, Canada)
Co-Chair: Shuhui Bi (Tokyo Univ. of Agriculture and Tech., Japan)

13:30-13:50   FriM01-01

Wavelet packet entropy based brain activation mapping using near infrared spectroscopy

Xiao-Su Hu and Keum-Shik Hong
(Pusan National Univ., Korea)
Shuzhi Sam Ge (The National Univ. of Singapore, Singapore)

Near-infrared spectorscopy (NIRS) is a noninvasive neuroimaging technique that recently has been developed to measure the changes of cerebral blood oxygenation associated with brain activities. Conventional NIRS data analysis methods for brain mapping application normally consist of two stages, a preprocessing stage for noise removal followed by a mapping stage. This paper describes a wavelet packet entropy based brain mapping method for NIRS data. The proposed method can skip the preprocessing stage but successfully identify the task related active brain area. Thereby, simplifying the NIRS data analysis process.

13:50-14:10   FriM01-02

Comparison and evaluation of robotic strength rehabilitation algorithms: isokinetic, isotonic and shared control method

MinKi Sin, DaeGeun Park and Kyu-Jin Cho
(Seoul National Univ., Korea)

Strength rehabilitation is an essential treatment for the patient who has motor control disorder. However the strength rehabilitation process is a labor intensive work therefore many people have found a solution in robotics. Many studies propose various strength rehabilitation robots and control methods. It is well known that the high muscle activation during the rehabilitation process can accelerate the progress of the recovery. However there is little quantitative study about the relationship between the control parameters and the muscle activation. This paper shows how the control parameters affect the muscle activation. We use three control methods; isokinetic, isotonic and shared control, widely used control method in rehabilitation robots. With this result, we suggest a method to adjust the exercise intensity.

14:10-14:30   FriM01-03

System identification and closed-loop control of end-tidal CO2 partial pressure in mechanically ventilated patients

Jin-Oh Hahn (Univ. of Alberta, Canada)
Guy A. Dumont and J. Mark Ansermino
(Univ. of British Columbia, Canada)

This paper presents a systematic approach to system identification and closed-loop control of end-tidal carbon dioxide partial pressure ($P_{ET}CO_2$) in mechanically ventilated patients. An empirical model consisting of a linear dynamic system followed by an affine transform is proposed to derive a low-order and high-fidelity representation that can reproduce the positive and inversely proportional dynamic input-output relationship between $P_{ET}CO_2$ and minute ventilation (MV) in mechanically ventilated patients. The predictive capacity of the empirical model was evaluated using experimental respiratory data collected from eighteen mechanically ventilated human subjects. The model predicted $P_{ET}CO_2$ response accurately with a root-mean-squared error (RMSE) of 0.22+/-0.16mmHg and a coefficient of determination (r2) of 0.81+/-0.18 (mean+/-SD) when a second-order rational transfer function was used as its linear dynamic component. Using the proposed model, a closed-loop control method for $P_{ET}CO_2$ based on the proportional-integral (PI) compensator was proposed by the systematic analysis of the system root locus. For the eighteen mechanically ventilated patient models identified, the PI compensator exhibited acceptable closed-loop response with a settling time of 1.27+/-0.20min and a negligible overshoot (0.51+/-1.17%), in addition to zero steady-state $P_{ET}CO_2$ set point tracking.

14:30-14:50   FriM01-04

Artifact detection and data reconciliation in multivariate ventilatory variables measured during anesthesia: a case study

Ping Yang (Chinese Academy of Sciences, China)
Guy Dumont (Univ. of British Columbia, Canada)
Yuan-Ting Zhang (Chinese Academy of Sciences, China)
J. Mark Ansermino (Univ. of British Columbia, Canada)

A ventilation system is usually connected to an anesthetized patient during surgery to replace or support normal respiratory function. Clinician experts monitor the concentration, flow and pressure of the various gases in the airway to maintain adequate ventilation. However, environmental disturbances often perturb the readings of these variables and cause them to deviate far from the true levels, resulting in a biased evaluation of a patient's ventilatory status. Most of the previously proposed signal estimation methods, however, have only utilised the difference of the dynamic characteristics between artifacts and the true physiological variations in each individual variable, without considering the interrelationship between these signals. This has resulted in suboptimal signal estimation. In this paper, we propose the use of the procedure of gross error detection and data reconciliation commonly used in process control, to detect highly cross-correlated artifacts in the ventilation circuit and reconcile the uncontaminated signal measurements. A case study demonstrates that the proposed method has great potential for improving the reliability of ventilatory signals.

14:50-15:10   FriM01-05

AED training algorithm for the CPR simulator

In Bae Chang and Hyun Woo Cho
(Kangwon National Univ., Korea)
Seung Hun Jeong and Seung Jin Yang
(BT Inc., Korea)

Cardiopulmonary resuscitation with use of Automated External Defibrillator (AED) is important for the resuscitation of the patients in cardiac arrest and the significance of training for this is increasing. In Korea, the installation of AED is mandatory in governmental offices and public facilities by legislation; however, the training of this is absolutely lacking, so the demand for simulators for the training of equipment use is increasing rapidly. In this study, Cardiopulmonary resuscitation and AED simulator for patient resuscitation training is developed. This simulator has not only mechanical structures such as chest, respiratory tract and head structures, but also electrical means such as electrocardiograph (ECG) signal generator, AED shock sensing circuit and software for the patient resuscitate scenarios. The functions of the electrical circuits are verified through the commercial AED kit. The developed training simulator can be applied for the Sudden cardiac arrest patient resuscitation training.

Modeling, control and applications of nonlinear dynamic systems

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13:30-13:50   FriM02-01

The high efficiency digital virtue experimental platform for complex mechatronics system

T. H. Yan (China Jiliang Univ., China)
J. Q. Han (Huazhong Univ. of Science and Tech., China)
X. S. Xu and X. D. Chen (China Jiliang Univ., China)

High Efficient CAD/CAE software is one of the most important tools in research and development of modern complex equipments. However, there exists a lots of 3D CAD/CAE softwares for the general equipments/products design and simulation in the commercial market. But for the concrete high-performance build-up mechatronic systems, especially with extremely high requirements on the dynamics characteristics, there has a lot of repeatable works to be carried manually on all kinds of simulations during product developing. Therefore, this paper focuses on the innovative design and development of a high efficiency digital virtue experimental platform (DVEP) for performance analysis on system validation. Firstly, the parts or the subsystems can be assembled automatically. And then, all types of boundary conditions and connection elements, as well as load conditions are defined and included as the options in the build-up system. Lastly, all the kinds of simulating jobs can be defined serially. The DVEP can carry the simulating jobs even at the off time and generate the analytical reports marked with the corresponding computing conditions. Through the practice it can be seen that the DVEP had improved the products developing circle effectively.

14:10-14:30   FriM02-03

High precision adaptive control for XY-table driven by piezo-actuator

Xinkai Chen (Shibaura Institute of Tech., Japan)

The XY-table is composed of two piezo electric actuators (PEA) and a positioning mechanism (PM). Due to existence of hysteretic nonlinearity in the PEA and the friction in the PM, the high precision control for the XY-table is a challenging task. This paper discusses the high precision adaptive control for the XY-table, where the hysteresis is described by Prandtl-Ishlinskii model. The proposed control law ensures the global stability of the controlled stage, and the position error can be controlled to approach to zero asymptotically. Experimental results show the effectiveness of the proposed method.

14:50-15:10   FriM02-05

Signal analysis and hysteresis modeling of meridian systems

Yanyan Gong, Ruili Dong and Yonghong Tan
(Shanghai Normal Univ., China)

Meridian system is one of the very important issues for disease diagnosis and treatment in traditional Chinese medicine. Recently, people have found out that the meridian systems in human body are complex nonlinear and dynamic systems. This paper focuses on the analysis of signals measured form meridian systems. It finds out that the energy values on the meridian points are quite different from those on the non-meridian points. Moreover, the hysteretic phenomenon has been found in the meridian systems. In order to describe the hysteretic behavior of human meridian systems, the modeling procedure based on neural networks is presented. Then, the experimental results of the hysteresis modeling are illustrated.

13:50-14:10   FriM02-02

Positioning control strategy design for AFM based nanomanipulation systems

Yongchun Fang, Xiao Ren and Yudong Zhang
(Nankai Univ., China)

An atomic force microscope (AFM) has been utilized to implement various manipulations with nanometer precision. Unfortunately, an AFM-based nanomanipulation system often meets the problem of low reliability and low efficiency, mainly due to the difficulty of positioning the AFM tip near the sample. In this study, a positioning control strategy is designed to accurately drive the probe to implement nanomanipulation tasks. Specifically, for an AFM piezo-scanner, a novel control strategy consisting of the following three algorithms are proposed to alleviate positioning error caused by such factors as piezo-hysteresis, ross-coupling and other uncertainties: (a) an image-based hysteresis compensation algorithm, which first obtains the voltage-displacement relationship of the hysteresis for the AFM piezo-scanner by analyzing some collected images for a calibration grating, and then utilizes this relationship to compute suitable control inputs to compensate for the positioning error caused by hysteresis nonlinearity; (b) a landmarkbased positioning algorithm addressing cross-coupling effect, which first indents the sample to make regular landmarks by a series of control voltages, based on which a polynomial curve fitting method is then utilized to calculate proper inputs so that cross-coupling effect can be compensated efficiently; (c) a local scannning-based compensator, which addresses the positioning error caused by thermal drift or other uncertainties within the nanomanipulation system successfully. Some experiment results are included to show that precise nanopositioning performance can be achieved by using the presented approach.

14:30-14:50   FriM02-04

State-estimation of sandwich systems with dead zone

Zhupeng Zhou (Xi'dian Univ., China)
Yonghong Tan and Ruili Dong (Shanghai Normal Univ., China)
Yangqiu Xie (Xi'dian Univ., China)

A non-smooth observer is proposed in this paper to estimate the states of the sandwich systems with dead zone. In the scheme, a nonsmooth state-space function is constructed. Then, the corresponding nonsmooth observer is developed based on the obtained state-space model. In this observer, the operating zones are switched based on the characteristic of operation conditions. The convergence of the proposed observer is discussed. Finally, a simulation example is presented.

Discrete time control systems

13:30-13:50   **FriM03-01**

Stability analysis and robust passive control for uncertain discrete-time singular systems

Jumei Wei and Qi Feng
(Zhengzhou Univ., China)
Rui Ma (Zhongyuan Univ. of Tech., China)

The problem of robust passive control is addressed for uncertain discrete-time singular systems. Using the method of generalized Lyapunov function and strict linear matrix inequality, a sufficient condition is presented for the system to be generalized quadratically stable and strictly passive. Moreover, an example is given to illustrate the results.

13:50-14:10   **FriM03-02**

Optimal sliding mode control for linear discrete singular system

Cunchen Gao and Nan Xiang
(Ocean Univ., China)

The optimal sliding mode surface and variable structure control (VSC) are proposed for linear discrete singular system. Firstly, the system is decomposed into two low dimensional subsystems by a restricted system equivalent decomposed method. Secondly, the sliding mode controller is designed based on the restricted equivalent subsystems. The quadratic performance index optimal control technique is introduced to design the optimal sliding mode. By applying reaching law approach, the selected control law ensures that the solution trajectories of the system reach the switching surface in finite time and have low chattering in the sliding motion. Finally, a simulation example is given to illustrate the feasibility and validity of the proposed method.

14:10-14:30   **FriM03-03**

Discrete-time sliding mode control using infrequent output measurements

Bijnan Bandyopadhyay and P. S. Lal Priya
(Indian Institute of Tech. Bombay, India)

This paper presents a new algorithm for discretetime sliding mode control using output feedback. It has been shown that, when the output of the system is sampled slower than the input, a discrete-time sliding mode can be obtained. The method is very general and is applicable to any controllable and observable linear time-invariant single input single output system. The proposed technique is illustrated with a numerical example.

14:30-14:50   **FriM03-04**

Super-twisting-like algorithm in discrete time nonlinear systems

I. Salgado (Professional Interdisciplinary Unit of Biotechnology, Mexico)
S. Kamal (Indian Institute of Tech. Bombay, India)
I. Chairez (Professional Interdisciplinary Unit of Biotechnology, Mexico)
Bijnan Bandyopadhyay (Indian Institute of Tech. Bombay, India)
L. Fridman (National Autonomous University of Mexico, Mexico)

A new discrete time super-twisting-like second order sliding mode algorithm (DSTA) is proposed. The stability proof of the suggested scheme is analyzed in terms of the discrete Lyapunov approach and Linear Matrix Inequalities (LMI) theory. Using these two tools it is proved that, system state trajectory is ultimately bounded in finite time. The state estimation problem for a class of second order discrete time system has been proposed to show the positive settings obtained from the algorithm introduced here. Also, the ultimate boundedness of the estimation error is demonstrated despite the presence of bounded perturbations. Simulation results illustrate the efficacy of this new discrete-time algorithm.

14:50-15:10   **FriM03-05**

Collaborative fault tolerant control for stochastic distribution systems

Yuwei Ren (Institute of Automation Chinese Academy of Sciences, China)
Aiping Wang (Anhui Univ., China)
Hong Wang (The Univ. of Manchester, UK, Northeastern Univ., China)

This paper is concerned with the collaborative fault tolerant controller design problem for m non-Gaussian collaborative stochastic distribution systems which connect in series. The main idea for this paper is that when fault occurs in one of the subsystems, a collaborative fault tolerant controller will be designed for one of the rest healthy subsystems based on the non-fault controller and fault diagnosis value. This controller can accommodate the fault and guarantee that the whole systems still have a good tracking performance.

New development in cooperative and distributed control: theory and applications

15:30-15:50	FriP01-01

Design of evaporator control system using fuzzy sliding mode controller

Jianhua Zhang, Wenfang Zhang, Ying Li, and Guolian Hou
(North China Electric Power Univ., China)

In this paper，fuzzy sliding mode controller is designed to control superheat of the evaporator in a waste heat utilizing system. The proposed method has strong robustness against parameter variation and external disturbances. Furthermore, the chattering produced by sliding mode control can be alleviated effectively. Finally, the simulation results show that the control system can obtain satisfactory performance.

15:50-16:10	FriP01-02

Dynamic characteristics and predictive control for evaporator

Jianhua Zhang, Ying Li, Wenfang Zhang, and Guolian Hou
(North China Electric Power Univ., China)

In this paper, a control-oriented model has been investigated for the evaporator in an Organic Rankine Cycle (ORC) system. Due to the nonlinearity and uncertainty existed in the evaporator, the model parameters of the evaporator have been identified by the recursive least square algorithm with forgetting factor. The improved generalized predictive control algorithm with constraints is then utilized to control the outlet temperature of the evaporator. The simulation results show the effectiveness of the proposed scheme.

16:10-16:30	FriP01-03

Fuzzy identification based on improved T-S fuzzy model and its application in evaporator

Jianhua Zhang, Ying Li, Wenfang Zhang, and Guolian Hou
(North China Electric Power Univ., China)

In this paper, a nonlinear model identification method is applied to a thermal plant. The aim of this work is to develop a moderately complex model with interpretable structure for a complex evaporator, which is the main component of Organic Rankine Cycle System. Based on the subtractive clustering algorithm, the T-S (Takagi-Sugeno) model is derived. The clustering centers can be obtained automatically through the input-output data. Then the cluster centers and cluster radiuses are further modified by the data and consequent parameters are identified by least-square algorithm. The validity of identification algorithm is tested and verified. The simulations show that the identification results are satisfactory.

16:30-16:50	FriP01-04

Neural PID control strategy for superheated steam temperature based on minimum entropy

Jianhua Zhang and Fenfang Zhang
(North China Electric Power Univ., China)
Hong Wang (The Univ. of Manchester, UK)

A novel control algorithm is applied to control superheated steam temperature in a power plant. Since the disturbances existing in practical processes are probably non-Gaussian, the performance index of system is constructed by minimizing the entropy. The optimal parameters of controller are obtained and applied to control superheated steam temperature in a power plant. The simulation results verify its effectiveness.

16:50-17:10	FriP01-05

A notion of generalized graph laplacian and its application to distributed consensus algorithm

Guisheng Zhai (Shibaura Institute of Tech., Japan)

In order to describe the interconnection among agents with multi-dimensional states, we generalize the notion of graph Laplacian by extending the adjacency weights from positive scalars to positive definite matrices. We prove that the generalized graph Laplacian inherits the spectral properties of the graph Laplacian. As an application example, we use the generalized graph Laplacian to establish a distributed consensus algorithm for agents described by multi-dimensional integrators.

Fuzzy and neural methodologies

15:30-15:50   FriP02-01

Characteristic analysis and modeling of a miniature pneumatic curling rubber actuator

Mingcong Deng and Aihui Wang
(Tokyo Univ. of Agriculture and Tech., Japan)
Shuichi Wakimoto (Okayama Univ., Japan)
Toshihiro Kawashima (Tokyo Univ. of Agriculture and Tech., Japan)

Soft actuators driven by pneumatic pressure have been shown to have many potential applications as actuators for mechanical systems in medical, biological, agriculture, welfare fields and so on, for they can ensure high safety for fragile objects from their low mechanical impedance. In this paper, a miniature pneumatic bending soft actuator is reviewed, and a nonlinear model of which is identified using support vector regression (SVR). That is, based on characteristic analysis of miniature pneumatic bending soft actuator, a new output variable is designed, and a nonlinear model is presented. Motion characteristics are studied by experiment, and the nonlinear model is identified based on experimental data.

15:50-16:10   FriP02-02

An observer-based adaptive type-2 fuzzy-neural controller for a class of MIMO systems with uncertainties

I-Hsum Li (Lee-Ming Institute of Tech., Taiwan)
Lian-Wang Lee (Lunghwa Univ. of Science and Tech., Taiwan)
Wei-Yen Wang (National Taiwan Normal Univ., Taiwan)
Kai-Wei Hsu (Lunghwa Univ. of Science and Tech., Taiwan)

An observer-based adaptive controller based on a type-2 fuzzy neural network (type-2 FNN) is developed for a class of multi-input multi-output (MIMO) nonaffine nonlinear system. The interval type-2 fuzzy system is proposed in this paper as an alternative solution when a MIMO system has a large amount of uncertainties or the training data is corrupted by noise. By using implicit function theorem and Lyapunov theorem, the observer-based control law and the weight update law of the adaptive type-2 FNN controller are derived. Based on the design of the type-2 fuzzy neural network, the observer-based adaptive controller can improve its robustness to noise. In this paper, we prove that the proposed observer-based adaptive controller can guarantee that all signals involved are bounded and the outputs of the closed-loop system asymptotically track the desired output trajectories. Simulations results are reported to show the performance of the proposed control system mode and algorithms.

16:10-16:30   FriP02-03

Fuzzy-rule-based behavior control for collaborative human/robot navigation in unknown environments

Yan-Chang Lee (Fu Jen Catholic Univ., Taiwan)
Zong-Lun Lee (Fu Jen Catholic Univ., Taiwan)
Hisn-Han Chiang (Fu Jen Catholic Univ., Taiwan)
Tsu-Tian Lee (Taipei Univ. of Tech., Taiwan)

This paper is to develop an intelligent autonomous mobile robot which also reserves the collaborative navigation ability with human beings. In the strategy for robot navigation in unknown environment, the fuzzy-rule-based algorithm is employed to design the fuzzy behavior controller which coordinates conflicts and competitions among multiple reactive behaviors efficiently. This controller consists three control layers: orientation control layer directing the robot toward the goal frame to move to the destination; obstacle avoidance control layer assists the robot in dodging obstacles and, if necessary, escaping out of the dead-cycle situation; human control layer allows humans to influence navigation for handling emergent behavior. The ultrasonic sensor module provides the distance information between the robot and obstacles, while the compass module indicates the heading direction to the target. Through a wireless-based control panel, collaborative navigation control can be shared between the human and the robot at some specific situations. A low-cost platform has been developed for this mobile robot in a modular design for promoting flexibility from task to task. Experimental results demonstrate the navigation effectiveness of robot in complex and unknown environments.

16:30-16:50   FriP02-04

Direct adaptive control of faulty UAVs based on the paralleled integral and fuzzy control

Rui Hou, Fuyang Chen, and Wenli Luan
(Nanjing Univ. of Aeronautics and Astronautics, China)

In order to achieve the direct self-repairing control for faulty UAVs, a kind of direct adaptive control based on the paralleled integral and fuzzy control is proposed to the fault model of a UAV's flight control system. First, adopting the model reference adaptive control law based on fuzzy control, the control is realized by analyzing the flight control performance when some complex faults occur. Then, the method of a new direct self-repairing control is formulated by the paralleled integral and fuzzy control. Consequently, the stable error, the properties of response, and robustness are improved. The simulation results are given to illustrate that a good dynamic performance of the flight control system with large faults can be maintained with the proposed method.

16:50-17:10   FriP02-05

Robust adaptive control for uncertain nonlinear systems with multiple state and input time delays

Cunchen Gao and Yue Ma
(Ocean Univ. of China, China)

This paper studies robust adaptive control for uncertain nonlinear systems with multiple state and input delays. Perturbations in this system are multiple delayed and nonlinear. A memoryless state feedback controller is designed by using Lyapunov-Krasovskii functional and the closed-loop system is proved uniformly ultimately bounded under certain conditions. An example illustrates the proposed method.

Advanced techniques for control

15:30-15:50   FriP03-01

Controlling strategy of batteries imbalance based on the SOC and voltage

Xiaolei Wang, Liang Yang, Pan Yan, Guangwen Shi, and Wendao Yao
(Zhongyuan Univ. of Tech., China)

This paper analyzed several common methods of calculating the battery's State of Charge (SOC), such as the Open-circuit voltage method, Ampere time method, Neural network method. And this paper puts emphasis on the improving Kalman filter. Then a controlling strategy of batteries imbalance that based on the battery's SOC and voltage is explored. The controlling strategy is effective and feasible through the simulation in Matlab 2009b¥Simulink. At the end of this paper, two different imbalance strategies is analyzed which are Dynamic imbalance and Static imbalance. And a method which can remove the fault battery is proposed through adding auxiliary switch.

15:50-16:10   FriP03-02

Focusing type three gallium arsenide solar cells model in the condition of following sun & MPPT control

Lei Liu and Erqiang Xu
(Henan Electric Power Bureau of State Grid Corp., China)
Xiaolei Wang (Zhongyuan Univ. of Tech., China)

This paper studies focusing type three gallium arsenide solar cells model in the condition of following sun, the output characteristics and the influence factors of output power. The study results show that gallium arsenide battery array has good I-U output characteristics at high magnification under spotlights. In addition, the highlights intensity leads to solar cells with the narrow width, short-circuit current (ISC) and output power increasing, but at the same time depletion layer compound rate change, open voltage (UOC) reduces, and restricts the output power of array. At the same time the photovoltaic array temperature and resistance increases in series. Because the temperature of the array has a lot of negative effects to its output power, this paper used the compulsory cooling way to ensure that the output of the panels efficiency. Finally, using two kinds of reliable maximum power point tracking (MPPT) algorithm verifies the model's reliability.

16:10-16:30   FriP03-03

Development of vision based tactile display system using shape memory alloys

Changan Jiang (Kagawa Univ., Japan)
Keiji Uchida (SCA Corp., Japan)
Hideyuki Sawada (Kagawa Univ., Japan)

In this paper, an innovative vision based tactile display system is presented. Using web camera to get visual information, the developed system captures the shape of an object and transform it to tactile sensation. In order to let people sense the shape of the captured object, tactile display panel is designed with 25 pin-type actuators to provide stimulation sources by using shape memory alloys. By employing higherlevel perception, tactile display panel can represent the shape of the captured object. The effectiveness of the developed vision based tactile display system is verified by experiments.

16:30-16:50   FriP03-04

Alterable integral control algorithm for shunt active power filter

Qian Zhang, Binbin Wang, Haiyun Zhu, and Haibo Ma
(Zhongyuan Univ. of Tech., China)

The pollution of harmonics in power system becomes serious because of power electronic devices used widely. As an important device to eliminate the pollution, Active power filter (APF) becomes more popular. The result of ip iq harmonics current detection method based on instantaneous reactive power theory is the sum of all harmonics current. But sometimes it is not necessary. In response to the problem, a detection algorithm for specified harmonic current is presented in this paper. The tracking accuracy can't meet the requirements when the parameters of PID controller are invariable, An alterable integral PI control algorithm is analyzed in the shunt APF in this paper. The model of three-phase shunt APF based on the two methods is built in Matlab/Simulink, and the simulation results used the two kinds of PI algorithms are shown.

16:50-17:10   FriP03-05

A control system of electric vehicle based on CAN bus

Xiaolei Wang, Wendao Yao, Guangwen Shi
(Zhongyuan Univ. of Tech., China)

In this paper, a new control system of electric vehicle (EV) based on CAN bus, as well as its task, network figure and partial information streams of the subsystems is developed. That is, to solve the conflict between the real time control of the whole vehicle and the transmission of a huge amount of data in network control system of vehicle body, both high and low speed CAN buses are used in the work system. Some information that needed to be exchanged in the network was exchanged by an information exchange module.

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