LSMS & ICSEE 2017

2017 International Conference on Life System Modeling and Simulation
2017 International Conference on Intelligent Computing for Sustainable Energy and Environment

UK-China Workshop on Smart Grid and Electric Vehicles
Workshop on Intelligent System and Networked Control

September 22-24, 2017, Nanjing, China

Final Program

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Welcome Address

The 2017 International Conference on Life System Modeling and Simulation (LSMS 2017) and 2017 International Conference on Intelligent Computing for Sustainable Energy and Environment (ICSEE 2017), which are held between September 22-24, Nanjing, China, aim to bring together researchers and practitioners in the field of life system modeling and simulation as well as intelligent computing theory and methodology with applications to sustainable energy and environment from across the world. These events are built upon the success of previous LSMS conferences held in Shanghai and Wuxi in 2004, 2007, 2010 and 2014 and ICSEE conferences held in Wuxi and Shanghai in 2010 and 2012 respectively, These events have been based on several large-scale UK-China collaboration projects on sustainable energy and environment funded by the Research Councils UK (RCUK) and China NSFC. The LSMS 2017 and ICSEE 2017 are particually supported by the most recently established UK-China University Conosrtium on Engineering Education and Research funded by the UK Department of Business, Energy & Industrial Strategy and facilitated by the British Council.

At LSMS 2017 and ICSEE 2017, technical exchanges within the research community take in the form of plenary speeches, panel discussions, as well as oral and poster presentations. In particular, two workshops, namely UK-China Workshop on Smart Grid and Electric Vehicles, and Workshop on Intelligent System and Networked Control are held in parallel within the LSMS 2017 and ICSEE 2017, focusing on the two recent hot topics on smart grid and electric vehicles, and distributed networked systems for internet of things.

The LSMS 2017 and ICSEE 2017 received over 625 submissions from 14 countries and regions. All papers went through rigorous peer review procedure and each paper received at least three review reports. Based on the review reports, the Program Committee finally selected 220 high-quality papers for presentation at LSMS 2017 and ICSEE 2017. These papers cover 24 topics, and are included into three volumes of CCIS proceedings published by the Springer. More than 50 selected papers will be expected to be published in SCI journals. The LSMS 2017 and ICSEE 2017 organizers will provide presenters with necessary facilities for those high-quality papers.

Nanjing is one of the most populous, vibrant and dynamic cities in the world, and has contributed significantly towards the progress in technology, education, finance, commerce, fashion, and culture. Participants are treated with a series of social functions, receptions and networking sessions, which will serve to build new connections, foster friendships, and forge collaborations.

The organizers of LSMS 2017 and ICSEE 2017 would like to acknowledge the enormous contributions made by the following: the Consultant Committee for their guidance and advice, the Program Committee and the numerous referees for their efforts in reviewing and soliciting the papers, and the Publication Committee for their editorial work. We would also like to thank editorial team from Springer for their support and guidance. Particular thanks are of course due to all the authors as without their high-quality submissions and presentations, the LSMS 2017 and ICSEE 2017 conferences would not have been successful.

September 2017

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Plenary Speeches

Plenary Speech 1

Saturday, September 23 (10:00-10:45)

Room 1 (Diamond Hall), XinDi Hotel, Nanjing

CPS driven optimal control system for energy-intensive equipment

Prof. Tianyou Chai

Northeastern University, China

Abstract: China has abundance of mineral resources such as magnesite, hematite and bauxite, which constitute a key component of its economy. The relatively low grade, and the widely varying and complex compositions of the raw extracts, however, pose difficult processing challenges including specialized equipment with excessive energy demands. The energy intensive furnaces together with widely uncertain features of the extracts form hybrid complexities of the system, where the existing modeling, optimization and control methods have met only limited success. Currently, the mineral processing plants generally employ manual control and are known to impose greater demands on the energy, while yielding unreasonable waste and poor operational efficiency. The recently developed Cyber-Physical System (CPS) provides a new key for us to address these challenges. The idea is to make the control system of energy intensive equipment into a CPS, which will lead to a CPS driven optimal control system.

This talk presents the syntheses and implementation of a CPS driven optimal control system for energy-intensive equipment under the framework of CPS. The proposed CPS driven optimal control system consists of three main functions: (i) setpoint control; (ii) tracking control; and (iii) self-optimized tuning. The key in realizing the above functions is the integrated optimal operational control methods to implement setpoint control, tracking control and self-optimized tuning together seamlessly. This talk introduces the integrated optimal operational control methods we proposed.

Hardware and software platform of CPS driven optimal control system for energy-intensive equipment is then briefly introduced, which adopts embedded control system, wireless network and industrial cloud. It not only realizes the functions of computer control system using DCS (PLS), optimization computer and computer for abnormal condition identification and self-optimized tuning, but also achieves the functions of mobile and remote monitoring for industrial process.

Then, using fused magnesium furnace as an example, a hybrid simulation system for CPS driven optimal control system for energy-intensive equipment developed by our team is introduced. The results of simulation experiments show the effectiveness of the proposed method that integrates the setpoint control, tracking control and self-optimized tuning in the framework of CPS.

The industrial application of the proposed CPS driven optimal control system is also discussed. It has been successfully applied to the largest magnesia production enterprise in China, resulting in great returns. Finally, future research on the CPS driven optimal control system is outlined.

Bio-sketch: Tianyou Chai received the Ph.D. degree in control theory and engineering in 1985 from Northeastern University, Shenyang, China, where he became a Professor in 1988. He is the founder and Director of the Center of Automation, which became a National Engineering and Technology Research Center and a State Key Laboratory. He is a member of Chinese Academy of Engineering, IFAC Fellow and IEEE Fellow, director of Department of Information Science of National Natural Science Foundation of China.

His current research interests include modeling, control, optimization and integrated automation of complex industrial processes.

He has published 180 peer reviewed international journal papers. His paper titled Hybrid intelligent control for optimal operation of shaft furnace roasting process was selected as one of three best papers for the Control Engineering Practice Paper Prize for 2011-2013. He has developed control technologies with applications to various industrial processes. For his contributions, he has won 4 prestigious awards of National Science and Technology Progress and National Technological Innovation, the 2007 Industry Award for Excellence in Transitional Control Research from IEEE Multiple-conference on Systems and Control.

Plenary Speech 2

Saturday, September 23(11:00-11:45)

Room 1 (Diamond Hall), XinDi Hotel, Nanjing

On Discontinuous Observers: From Basic Properties to a Robust Fault Detection and Condition Monitoring Tool

Prof. Sarah Spurgeon

University College London, UK

Abstract: Sliding mode observers have generated a ground swell of interest in recent years. These observers have unique properties. Their ability to force the error between the measured plant output and the output of the observer to be identically zero produces a set of state estimates that are precisely commensurate with the actual output of the plant. It is also the case that analysis of the applied observer injection signal, the so-called equivalent injection signal, contains useful information about the mismatch between the model used to define the observer and the actual plant. This lecture presents an overview of both linear and non-linear sliding mode observer paradigms. The use of the equivalent injection signal in problems relating to fault detection and condition monitoring is demonstrated. A number of applications specific results are also described.

Bio-sketch: Sarah Spurgeon OBE, FREng, FInstMC, FIET, FIMA is Professor of Control Engineering and Head of the Department of Electronic and Electrical Engineering at University College London and President of the Institute of Measurement and Control in the UK. Sarah Spurgeon's research interests are in the area of systems modelling and analysis, robust control and estimation in which areas she has published over 270 refereed research papers. She was awarded the Honeywell International Medal for 'distinguished contribution as a control and measurement technologist to developing the theory of control' in 2010 and an IEEE Millenium Medal in 2000. She is currently a member of the Council of the International Federation of Automatic Control (IFAC) and a member of the General Assembly of the European Control Association. Within the UK she is an independent member of the Defence Scientific Advisory Council (DSAC) which provides independent advice to the Secretary of State for Defence on science, technology, engineering, analysis and mathematics matters and is also a Board Member of Engineering.

Plenary Speech 3

Saturday, September 23 (11:45-12:30)

Room 1 (Diamond Hall), XinDi Hotel, Nanjing

What is medical innovation?

~ From biomedical engineering point of view ~

Prof. Mitsuo Umezu

Waseda University, Japan

Abstract: The Japanese Government has a special policy to promote medical innovation for overall happiness of nations. One of the epoch-making actions is related to a revision of "The pharmaceutical affairs act". It was originally established in 1943, and fully revised in fall, 2014, suitable for advanced medical technologies. Then, the name of the act was changed to "The act to ensure a quality, efficacy and safety of medical products and equipment". Another great action was an establishment of the "Japan Agency for Medical Research and Development (AMED)" in spring, 2015. AMED engages in research and development (R&D) in the field of medicine, establishing and maintaining an environment for this R&D, providing a mixture budgets, funding from the Ministry of Education(30%), the Ministry of Health(55%), and the Ministry of Economy(15%).

Biomedical engineering faculty members at Waseda University have conducted several trials to get on a "medical innovation" policy, including a development of human resources: (1) Practical bioengineers, having a valuable experience on true collaboration between Medicine and Engineering towards clinical application, and (2) Medical regulatory science specialists (PhD), having a professional skill to propose future medical policies.

Bio-sketch: Mitsuo Umezu is a biomedical engineer in the research field of modeling and simulation for cardiovascular system to evaluate advanced medical technologies and treatments. He received two PhDs; Doctor of Engineering from Waseda University and Doctor of Medical Science from Tokyo Women's Medical University. He was appointed as a research associate and laboratory head of a department of Artificial Organ at the National Cardiovascular Center Research Institute, Osaka between 1979 and 1988. Then, he worked as the first project leader of Australian Artificial Heart Program at St.Vincent's Hospital, Sydney, Australia. He has been a professor of the department of Mechanical Engineering, Waseda University since 1992. He is one of the founders of "Center for Advanced Biomedical Sciences, (TWIns)", and also a department head of Joint Graduate School with Tokyo Women's Medical University. His recent research interest includes development and evaluation of artificial organs and medical regulatory science.

Plenary Speech 4

Sunday, September 24 (09:00-9:45)

Room 1 (Diamond Hall), XinDi Hotel, Nanjing

Information Granularity in Data Science and Intelligent Systems:

Conceptual and Development Environment

Prof. Witold Pedrycz

The University of Alberta, Canada

Abstract: Information granules play a pivotal role in acquiring, representing, processing, and communicating knowledge at a suitable level of abstraction especially in the context of modelling and analysis of complex systems. There are challenging objectives of conceptual and algorithmic nature. Designing information granules is paramount importance to all pursuits of Granular Computing.

The talk offers a comprehensive and systematically structured overview of methodologies and algorithms of designing information granules along with a suite of representative applications in data analysis, system modelling, and decision-making. The taxonomy embraces two main categories of data-driven and knowledge-oriented approaches. We introduce and discuss a principle of justifiable granularity, which serves as a key design vehicle facilitating a formation of information granules completed on a basis of available experimental evidence. Recent advances of the principle are discussed including a collaborative version of the principle supporting data analysis carried out in the presence of distributed data, context-based version of the principle incorporating auxiliary sources of knowledge, and its hierarchical version facilitating handling experimental evidence being available at several levels of specificity (abstraction). A collection of design scenarios supporting a formation of hierarchies of information granules of higher type and higher order is presented.

In the realm of applied investigations, we discuss a number of representative constructs including collaborative mode of discovery of relationships through constructing granular bi-directional and multi-directional associative memories and stacked granular auto-encoders being regarded as building modules of deep learning architectures.

Bio-sketch: Witold Pedrycz (IEEE Fellow, 1998) is Professor and Canada Research Chair (CRC) in Computational Intelligence in the Department of Electrical and Computer Engineering, University of Alberta, Edmonton, Canada. He is also with the Systems Research Institute of the Polish Academy of Sciences, Warsaw, Poland. In 2009 Dr. Pedrycz was elected a foreign member of the Polish Academy of Sciences. In 2012 he was elected a Fellow of the Royal Society of Canada. Witold Pedrycz has been a member of numerous program committees of IEEE conferences in the area of fuzzy sets and neurocomputing. In 2007 he received a prestigious Norbert Wiener award from the IEEE Systems, Man, and Cybernetics Society. He is a recipient of the IEEE Canada Computer Engineering Medal, a Cajastur Prize for Soft Computing from the European Centre for Soft Computing, a Killam Prize, and a Fuzzy Pioneer Award from the IEEE Computational Intelligence Society.

His main research directions involve Computational Intelligence, fuzzy modeling and Granular Computing, knowledge discovery and data science, fuzzy control, pattern recognition, knowledge-based neural networks, relational computing, and Software Engineering. He has published numerous papers in this area. He is also an author of 16 research monographs and edited volumes covering various aspects of Computational Intelligence, data mining, and Software Engineering.

Dr. Pedrycz is vigorously involved in editorial activities. He is an Editor-in-Chief of Information Sciences, Editor-in-Chief of WIREs Data Mining and Knowledge Discovery (Wiley), and Int. J. of Granular Computing (Springer). He serves on an Advisory Board of IEEE Transactions on Fuzzy Systems and is a member of a number of editorial boards of international journals.

Plenary Speech 5

Sunday, September 24 (09:45-10:30)

Room 1 (Diamond Hall), XinDi Hotel, Nanjing

Towards cognitively-inspired Data Science based on context-aware, multi-modal Big Data Analytics: Selected real-world Case Studies

Prof. Amir Hussain

University of Stirling, UK

Abstract: Cognitive Data Science is a rapidly developing discipline, bringing together neurobiology, cognitive psychology, Big Data and artificial intelligence. Ongoing pioneering work at Stirling University is exploring the development of cognitively-inspired Data Science approaches based on context-aware, multi-modal Big Data Analytics, for solving challenging real world applications. Two case studies are introduced in this talk. Firstly, on-going research into cognitively-inspired multi-modal speech perception has led to the development of a novel context-aware, audio-visual speech processing system. The proposed framework exploits cognitively inspired use of both audio and visual (including lip-tracking) information, with potential applications in next-generation multimodal hearing aids and listening device technology. The second case study focusses on open-domain sentiment analysis of natural language text using sentic computing: a novel multi-disciplinary paradigm, exploiting the semantic, latent and implicit meaning of natural language concepts. Ongoing extensions of this work include a cognitively-inspired emotion recognition system based on contextual multimodal input, including natural language text, audio and facial information, which is shown to significantly outperform state-of-the-art systems. We present a brief summary of these exciting multi-disciplinary research areas, and outline some future research directions and challenges.

Bio-sketch: Amir Hussain is full Professor of Computing Science, founding Director of the Cognitive Big Data Informatics (CogBID) Research Laboratory, and Head of the Data Science and Security Research Group at the University of Stirling in Scotland, UK. He obtained his BEng in Electronic and Electrical Engineering (with the highest 1st Class Honours, with distinction) and PhD (in novel neural network architectures and algorithms for real-world applications), both from the University of Strathclyde in Glasgow, UK, in 1992 and 1997 respectively. Professor Hussain's research interests are cross-disciplinary and industry focused, aimed at pioneering next-generation brain-inspired multi-modal Big Data cognitive technology for solving complex real world problems. In 2016, he was ranked, in an independent survey published in Elsevier's leading Information Processing and Management Journal, as one of the world's top two most productive, highly cited researchers in the sentiment analytics field (since 2000). He has (co)authored more than 300 publications (with more than 100 journal papers, and a dozen Books, including the world's first research monographs in the multi-disciplinary areas of: cognitively-inspired audio-visual speech filtering, sentic computing, and cognitive agent based computing). He has led major multi-disciplinary research projects (worth over $3million, including over $0.5m of currently held grants), as Principal Investigator, funded by national and European research councils, local and international charities and industry, and has supervised more than 25 PhDs to-date. He is founding Editor-in-Chief of (Springer Nature's) Cognitive Computation journal and the (BioMed Central (BMC)/Springer Nature) journal: BMC Big Data Analytics. He also serves as Associate Editor of several other leading journals including, the IEEE Transactions on Neural Networks and Learning Systems and the IEEE Computational Intelligence Magazine. He is Vice-Chair of the Emergent Technologies Technical Committee of the IEEE Computa.

Plenary Speech 6

Sunday, September 24 (10:45-11:30)

Room 1 (Diamond Hall), XinDi Hotel, Nanjing

From smart grids to cyber-physical-social systems in energy

Prof. Yusheng Xue

Honorary President of State Grid Electric Power Research Institute, China

Abstract: Smart Grids (SGs) as cyber-physical systems in power (CPSP) in nature are electric networks that use innovative and intelligent monitoring, control, communication, and self-healing technologies to deliver better connections and operations for generators and distributors, flexible choices for prosumers, and reliability and security of electricity supply. However, in line with the global movement towards a sustainable renewable energy future to address Climate Change, SGs cannot fully reflect the requirements of dominating renewable energy generation, stringent economic and environmental constraints, market competition, social and regulatory requirements. On one hand, electric energy plays a central role in the whole energy supply chain since changing the energy from electric form to non-electric one may not be as effective as using electricity directly. On the other hand, any changes in primary energy and end-use energy significantly affect electric power reliability as well as economy. A more holistic (system-of-system) approach needs to be taken to deal with future energy, and a new concept of CPSSE (cyber-physical-social systems in energy) is proposed. Consideration should be given to coordination of environmental, economic, social factors and human behaviors, a hybrid research framework across various disciplines concerned with different time and space scales. This enables collaborative mining big data with hidden causal relationships in the complex cross social, technological, economical, and environmental dimensions. The driving force induced by interaction between them may be much more powerful than the internal driving force of information systems, energy systems, and human societies themselves.

Bio-sketch: Yusheng Xue is a Professor. He received MSc degree in Electrical Engineering from EPRI, China in 1981 and PhD degree from the University of Liege, Belgium in 1987. He was elected as an academician of Chinese Academy of Engineering in 1995. He is now the Honorary President of State Grid Electric Power Research Institute (SGEPRI or NARI), China. He holds the positions of Adjunct Professor in many universities in China and a conjoint professor of the University of Newcastle in Australia. He was also an honorary professor of the University of Queensland, Australia. He is the Editor-in-Chief of the Journal of "Automation of Electric Power System" (in Chinese) and that of the "Journal of Modern Power System and Clean energy" (in English), and a member of Editorial Board of IET Generation, Transmission & Distribution, and Chairman of Technical Committee of Chinese National Committee of CIGRE since 2005.

Plenary Speech 7

Sunday, September 24 (11:30-12:15)

Room 1 (Diamond Hall), XinDi Hotel, Nanjing

Decarbonizing the whole energy chain from top to tail – control challenges

Prof. Kang Li

Queen's University Belfast, UK

Abstract: No single solution currently exists to achieve the utopian desire of zero fossil fuel consumption in addressing the global challenge of sustainable energy and environment. It is evident that the energy mix will contain a large variation in stochastic, intermittent and distributed sources of renewable energy such as wind and solar power. The increasing prominence of renewable and cleaner energy resources in the pursuit of legally binding UK and European energy targets spurs all stakeholders and sectors on to plan for the unique challenges such promising sources present. This presentation will discuss various control challenges towards the de-carbonization of the whole energy chain from top to tail, including emission reductions from traditional thermal plants, integration of significant renewable power, electrification of transportation, and energy efficiency in building and manufacturing industry. The significant role of intelligent control techniques in transforming the energy system to a future energy network is highlighted and demonstrated.

Bio-sketch: Kang Li received Ph.D. degree in Control Theory and Applications from Shanghai Jiaotong University in 1995, and a DSc degree from Queen's University Belfast in 2015.

Between 1995 and 2012, he worked at Shanghai Jiaotong University, Delft University of Technology and Queen's University Belfast as a research fellow. Since 2002, he was a Lecturer, a Senior Lecturer (2007), and a Reader (2009) with the School of Electronics, Electrical Engineering and Computer Science, Queen's University Belfast, Belfast, U.K, and he became a Chair Professor of Intelligent Systems and Control in 2011. His research interests include nonlinear system modelling, identification, and control, and bio-inspired computational intelligence, with applications to the development of advanced control technologies for decarbonizing the whole energy systems, from integration of renewable energies, smart grid, to electric vehicles, and energy reduction in manufacturing.

Important Information

Conference

Conference duration: September 22-24, 2017

The Main Venue: XinDi Hotel, Nanjing

Agenda:

September 22, 2017	Registration
September 23-24 AM, 2017	Plenary Speeches
September 23-24 PM, 2017	Paper presentations and discussions

Registration

Registration Time: **September 22, 2017, 8:00 am-20:00 pm**

Registration Desk: **XinDi Hotel & XianLin Hotel**

Registration Time: **September 23, 2017, 8:00 am-9:00 am**

Registration Desk: **XinDi Hotel**

Contacts

Contact Persons: Naiyan Wang or Xiaohua Wu

Phone: +86-15951813961，+86-13162013910

E-mail: secretary@lsms-icsee.org

Address: XinDi Hotel at No. 6, Xue Dian Road, Qixia District, Nanjing, China

Website of LSMS & ICSEE 2017

http:// www.lsms-icsee.org

Transportation and XinDi Hotel Location

Information for Transportation

Subway: take the Metro Line 2 to the direction of Jingian road and get off at Xianlin Central Station, then exit from No.2 and walk to the Xuedian Road toward the north direction about 760 meters, you will reach the hotel;

By car A: on the Raocheng Highway to the direction of the second bridge to the Xianlin exports, along the Xianlin Avenue straight to the Xuedian Road toward the north direction about 500 meters, you will reach the hotel;

By car B: on the basaltic road to the direction of 312 State Road to Xianlin exports, along the Xianyin North Road, Wenyuan Road, driving 2 km, to the Xuedian Road toward the south direction about 200 meters, you will reach the hotel.

Transportation and Xianlin Hotel Location

Information for Transportation

Nanjing No. 4, Wenyuan Road, Qixia District, Nanjing Normal University on the 4th door (on the 4th door to go 50 meters), Nanjing Forest Police College is opposite, (Gate 4 opening time for the 7: 00-21: 30, Other time from the door 2)

The nearest bus station: Wen Lan Road (107,138,165,322,323,324 bus), from the Nanjing Normal University on the 4th door about 200 meters

The nearest subway station: Metro Line 2 (learn the road), the next subway can sit 138,165,322,323 bus directly to the "Wen Lan Road" platform to get off

Nanjing Railway Station ------Xianlin Hotel （11.0 km）

- Taxi: Taxi from Nanjing Railway Station, via Hongshan Road, Moxiang Road, Five Overpass, Basaltic Avenue, Ningzhen Highway, Xuelin Road. Wenlan Road, Shiyuan Road: about 21 minutes.
- Bus/Metro: You can take bus No.208, chang to bus No.107 in the Yan Ming Shan Zhuang station, finally get off at Wenlan Road: about 1 hours.
- You can also take Metro No.1 at Nanjing Station, change to take Merto No.4 at Gulou Station, then change to take Metro No.2 at Jinma Road and change to take Bus No.323 at Xueze Road, finally get off at Wenlan Road: about 1 hours 6 minutes.
- You can also take Metro No.1 at Nanjing Station, change to take Merto No.2 at Xin Jie Kou Station, get off at Xueze Road and walk to Yingtian Academy Road take Bus No.323 (or take Bue No.138 or Bus No.165), finally get off at Wenlan Road: about 1 hours 12 minutes.

Nanjing South Railway Station ------Xianlin Hotel（18.8 km）

- Taxi: Taxi from Nanjing South Railway Station, via Hurong Expressway, Ningluo Expressway, Ningzhen Highway, Xuelin Road. Wenlan Road, Shiyuan Road: about 31 minutes.
- Bus/Metro: You can take Metro No.3 at Nanjing South Railway Station (or take Metro No.1 at Nanjing South Station), change to take Merto No.2 at Da Xing Gong Station(take Merto No.2 at Xin Jie Kou Station), then get off at Xueze Road and walk to Yingtian Academy Road take Bus No.323 (or take Bue No.138 or Bus No.165), finally get off at Wenlan Road: about 1 hours 15 minutes.
- You can also take Metro No.3 at Nanjing South Railway Station, change to take Merto No.4 at Ji Ming Si Station, and change to take Bus No.165 at Xuzhuang Cultural Center, finally get off at Wenlan Road: about 1 hours 20 minutes.

Nanjing Lukou International Airport------Xianlin Hotel（42.1 km）

- Taxi: Taxi from Nanjing Lukou International Airport, via South Konggang Road, Konggang Road, Nanjing Airport Expressway, Flower Temple Hub, Hurong Expressway, Ningluo Expressway, Ningzhen Highway, Xuelin Road. Wenlan Road, Shiyuan Road: about 54 minutes.
- Bus/Metro: You can take Metro No.s1 at Lukou Airport Station, change to take Metro No.1 at Nanjing South Station, change to take Merto No.2 at Xin Jie Kou Station, then get off at Xueze Road and walk to Yingtian Academy Road take Bus No.323 (or take Bue No.138 or Bus No.165), finally get off at Wenlan Road: about 2 hours 6 minutes.
- You can also take Metro No.s1 at Lukou Airport Station, change to take Metro No.3 at Nanjing South Railway Station, change to take Merto No.2 at Da Xing Gong Station, then get off at Xueze Road and walk to Yingtian Academy Road take Bus No.323 (or take Bus No.138 or Bus No.165), finally get off at Wenlan Road: about 1 hours 15 minutes.

Instruction for Oral Presentations

Oral Presentation:

- Oral Presentation duration: 15minutes (including discussion).
- Each speaker is required to meet his/her session chairs in the corresponding session rooms 10 minutes before the session starts and copy the PPT file to the computer.
- Each session room is equipped with a projector and a PC (with Microsoft Windows and Microsoft PowerPoint). Please make sure that your files are compatible and readable with our operation system by using commonly used fonts and symbols.

Program at a Glance

<table>
<tr><td colspan="5">September 22ed, 2017
8:00-20:00 Registration</td></tr>
<tr><td colspan="5">September 23rd, 2017
08:00 - 09:00 Registration and Welcome</td></tr>
<tr><td colspan="5">09:00 - 09:40 Opening Ceremony (Room 1)</td></tr>
<tr><td colspan="5">09:40 - 09:55 Photograph</td></tr>
<tr><td colspan="5">10:00 - 10:45 (Room 1) Session 1
Plenary speech 1- Prof. Tianyou Chai</td></tr>
<tr><td colspan="5">10:45 - 11:00 Coffee Break</td></tr>
<tr><td colspan="5">11:00 - 11:45 (Room 1) Session 2
Plenary speech 2- Prof. Sarah Spurgeon</td></tr>
<tr><td colspan="5">11:45 - 12:30 (Room 1) Session 3
Plenary speech 3- Prof. Mitsuo Umezu</td></tr>
<tr><td colspan="5">12:30 - 14:00 Lunch Break</td></tr>
<tr><td rowspan="2">14:00 - 16:30
(Room 2)
UK-China Workshop on Smart Grid and Electric Vehicles
Session 5E
SaE1</td><td>14:00 - 15:15
(Room 3)
Session 5A
SaA1</td><td>14:00 - 15:15
(Room 4)
Session 5B
SaB1</td><td>14:00 - 15:15
(Room 5)
Session 5C
SaC1</td><td rowspan="2">14:00 -16:30
(Room 6)
Selected Papers' Speeches

Session 5D
SaD</td></tr>
<tr><td>15:15- 16:30
(Room 3)
Session 6A
SaA1</td><td>15:15- 16:30
(Room 4)
Session 6B
SaB1</td><td>15:15- 16:30
(Room 5)
Session 6C
SaC1</td></tr>
<tr><td colspan="5">16:30 - 16:45 Coffee Break</td></tr>
<tr><td>16:45 - 18:00
(Room 2)
UK-China Workshop on Smart Grid and Electric Vehicles
Session 7E
SaE1</td><td>16:45 - 18:00
(Room 3)
Session 7A
SaA2</td><td>16:45 - 18:00
(Room 4)
Session 7B
SaB2</td><td>16:45 - 18:00
(Room 5)
Session 7C
SaC2</td><td>16:45 - 18:00
(Room 6)
Session 7D
SaA3</td></tr>
<tr><td colspan="5">18:00 - 19:00 (Room 3) Session 8
Panel discussion on UK-China collaborations to tackle global challenges</td></tr>
<tr><td colspan="5">19:00 - 21:00 (Dinner room) Conference Banquet</td></tr>
</table>

<table>
<tr><td colspan="5">September 24th, 2017
09:00-09:45 (Room 1) Session 9 Plenary speech 4 - Prof. Witold Pedrycz</td></tr>
<tr><td colspan="5">09:45– 10:30 (Room 1) Session 10 Plenary speech 5 - Prof. Amir Hussain</td></tr>
<tr><td colspan="5">10:30 - 10:45 Coffee Break</td></tr>
<tr><td colspan="5">10:45– 11:30 (Room 1) Session 11 Plenary speech 6 - Prof. Yusheng Xue</td></tr>
<tr><td colspan="5">11:30 - 12:15 (Room 1) Session 12 Plenary speech 7 - Prof. Kang Li</td></tr>
<tr><td colspan="5">12:15 - 14:00 Lunch Break</td></tr>
<tr><td rowspan="2">14:00 - 16:30
(Room 2)
Workshop on Intelligent System and Networked Control

Session 14E
SuE2</td><td>14:00 - 15:15
(Room 3)
Session 14A
SuA4</td><td>14:00 - 15:15
(Room 4)
Session 14B
SuB4</td><td>14:00 - 15:15
(Room 5)
Session 14C
SuC3</td><td>14:00 - 15:15
(Room 6)
Session 14D
SuC5</td></tr>
<tr><td>15:15- 16:30

(Room 3)
Session 15A
SuA4</td><td>15:15- 16:30
(Room 4)
Session 15B
SuB4</td><td>15:15- 16:30
(Room 5)
Session 15C
SuC3</td><td>15:15- 16:30
(Room 6)
Session 15D
SuC5</td></tr>
<tr><td colspan="5">16:30 - 16:45 Coffee Break</td></tr>
<tr><td>16:45 - 18:00
(Room 2)
Workshop on Intelligent System and Networked Control Session 16E
SuE2</td><td>16:45 - 18:00
(Room 3)
Session 16A
SuB3</td><td>16:45 - 18:00
(Room 4)
Session 16B
SuB5</td><td>16:45 - 18:00
(Room 5)
Session 16C
SuC4</td><td>16:45 - 18:00
(Room 6)
Session 16D
SuB6</td></tr>
<tr><td colspan="5">19:00 - 21:00 (Dinner room) Closing Ceremony</td></tr>
</table>

Timetable for Technical Program

The Main Venue: Room 1 (Diamond Hall), XinDi Hotel, Nanjing

Time	September 23, Saturday	Time	September 24, Sunday
09:00-09:55	**Opening Ceremony** **Chairs: Prof. Minrui Fei, Prof. Kang Li, Prof. Dong Yue**	09:00-09:45	**Plenary speech 4** **Speaker: Prof. Witold Pedrycz** **Chair: Prof. Qing-Long Han**
10:00-10:45	**Plenary speech 1** **Speaker: Prof. Tianyou Chai** **Chair: Prof. Kang Li**	09:45-10:30	**Plenary speech 5** **Speaker: Prof. Amir Hussain** **Chair: Prof. Patrick Luk**
10:45-11:00	**Coffee Break**	10:30-10:45	**Coffee Break**
11:00-11:45	**Plenary speech 2** **Speaker: Prof. Sarah Spurgeon** **Chair: Prof. Sean McLoone**	10:45-11:30	**Plenary speech 6** **Speaker: Prof. Yusheng Xue** **Chair: Prof. Luonan Chen**
11:45-12:30	**Plenary speech 3** **Speaker: Prof. Mitsuo Umezu** **Chair: Prof. Dong Yue**	11:30-12:15	**Plenary speech 7** **Speaker: Prof. Kang Li** **Chair: Prof. Jianhua Zhang**

September 23 PM, Saturday

Room2-6: XinDi Hotel, Nanjing

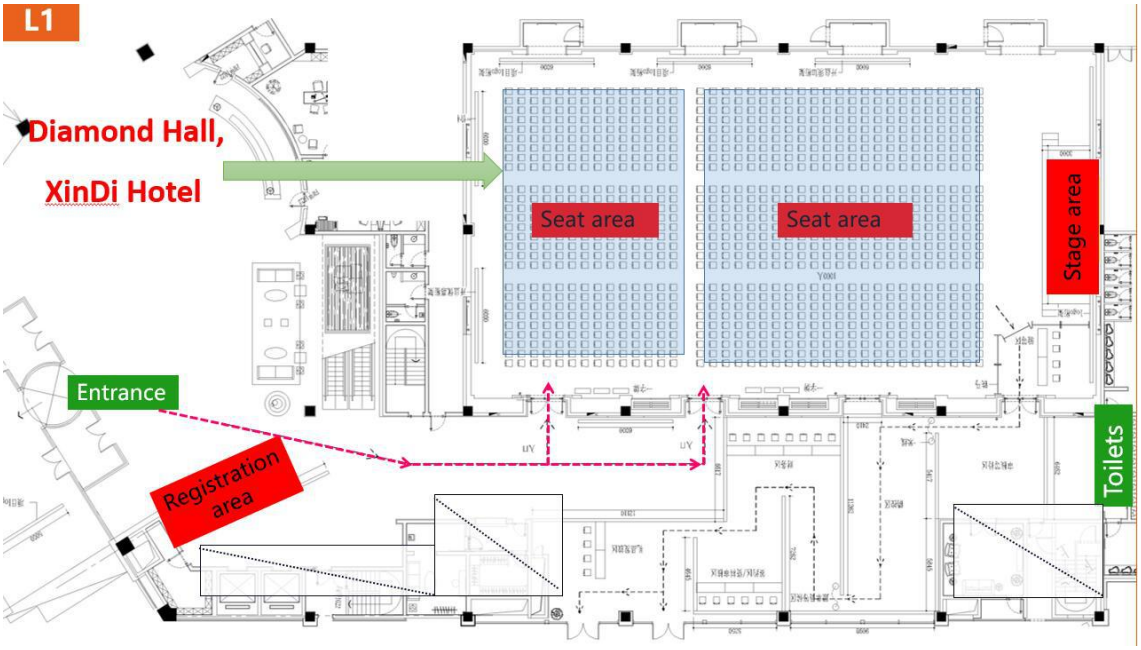
Time	Meeting Room 2	Meeting Room 3	Meeting Room 4	Meeting Room 5	Meeting Room 6
14:00-16:30	**SaE1** **Topic: UK-China Workshop on Smart Grid and Electric Vehicles (I)**	**SaA1** **Topic: Biomedical Signal Processing And Computational Methods in Organism Modeling**	**SaB1** **Topic: Advanced Fuzzy and Neural Network Theory and Algorithms**	**SaC1** **Topic: Computational Intelligence in Utilization of Clean and Renewable Energy Resources**	**SaD** **Topic: Selected Papers' Speeches**
Chairs	**Patrick Luk** **Jianhua Zhang**	**Erfu Yang** **Banghua Yang**	**Shiji Song** **Meixi Wang**	**Le Gao** **Xuejian Yang**	**Qinglong Han** **Luonan Chen**
16:30-16:45 Coffee Break					
Time	Meeting Room 2	Meeting Room 3	Meeting Room 4	Meeting Room 5	Meeting Room 6
16:45-18:00	**SaE1** **Topic: UK-China Workshop on Smart Grid and Electric Vehicles (II)**	**SaA2** **Topic: Bionics Control Methods, Algorithms and Apparatus**	**SaB2** **Topic: Advanced Evolutionary Methods and Applications**	**SaC2** **Topic: Intelligent Methods for Energy Saving and Pollution Reduction**	**SaA3** **Topic: Modeling and Simulation of Life Systems and Data Driven Analysis**
Chairs	**Sean McLoone** **Dajun Du**	**Minrui Meng** **Chuanjiang Li**	**Fazhi Song** **Ziqi Yang**	**Zhiyou Ouyang** **Hong Qian**	**Xiaojuan Huang** **Xiaoxing Ou**

September 24 PM, Sunday

Room2-6: XinDi Hotel, Nanjing

Time	Meeting Room 2	Meeting Room 3	Meeting Room 4	Meeting Room 5	Meeting Room 6
14:00-16:30	**SuE2 Topic: Workshop on Intelligent System and Networked Control (I)**	**SuA4 Topic: Image and video processing**	**SuB4 Topic: Intelligent Modeling, Monitoring, and Control of Complex Nonlinear Systems**	**SuC3 Topic: Advanced Computational Methods in Energy, Power, Electric Vehicles and Their Integration**	**SuC5 Topic: Optimization Methods and Computational Methods for Sustainable Environment**
Chairs	**Xingsheng Gu** **Sean McLoone**	**Kun Zhang** **Zhaoxia Wang**	**Yang Yang** **Lei Wang**	**Huwei Chen** **Qiwei Xu**	**Mohammed Alkhafaji** **Ruyun Wang**
16:30-16:45 Coffee Break					
Time	Meeting Room 2	Meeting Room 3	Meeting Room 4	Meeting Room 5	Meeting Room 6
16:45-18:00	**SuE2 Topic: Workshop on Intelligent System and Networked Control (II)**	**SuB3 Topic: Advanced Machine Learning Methods and Applications**	**SuB5 Topic: Advanced Methods for Networked Systems**	**SuC4 Topic: Modeling, Simulation and Control in Smart Grid and Microgrid**	**SuB6 Topic: Advanced Sliding Mode Control and Applications and Advanced Analysis of New Materials and Devices**
Chairs	**Weiyan Hou** **Qichun Zhang**	**Rongbao Chen** **Bing Bai**	**Xiaoan Zhang** **Shengnan Cao**	**Pengwei Su** **Jing Shi**	**Yanliang Cui** **Hongyu Sun**

The Main Venue (Diamond Hall) and the Session Rooms



- **Plenary speech Main Venue: Room 1 XinDi Hotel (Diamond Hall)**
- **Workshop Session Room2: Amethyst Hall, XinDi Hotel**
- **Oral Session Room3: Peony Hall A, XinDi Hotel**
- **Oral Session Room4: Peony Hall B, XinDi Hotel**
- **Oral Session Room5: Yulan Hall A, XinDi Hotel**
- **Oral Session Room6: Yulan Hall B, XinDi Hotel**
- **Author Registration: XinDi Hotel Hall**

UK-China Workshop on Smart Grid and Electric Vehicles

Chairs: Patrick Luk, Jianhua Zhang, Sean McLoone ,Dajun Du
Date: 14:00-18:00 PM, Sep. 23, 2017
Location: Room 2 (Amethyst Hall), XinDi Hotel

Agenda

Time	Title	Speaker	Affiliation
PART I			
14:00 - 16:30	Research on the Model and Method of Maturity Evaluation of Smart Grid Industry	Yue He, Junyong Wu and Yi Ge	State Grid Jiangsu Economic Research Institute
	A Green Dispatch Model of Power System with Wind Energy Considering Energy-environmental Efficiency	Daojun Chen, Liqing Liang,Lei Zhang, Jian Zuo, Keren Zhang, Chenkun Li, Hu Guo	State Grid Hunan Electric Power Corporation Research Institute
	A Novel RBF Neural Model for Single Flow Zinc Nickel Batteries	Xiang Li, Kang Li, Zhile Yang and Chikong Wong	Queen's University Belfast
	Model Predictive Control Based on the Dynamic PLS Approach to Waste Heat Recovery System	Jianhua Zhang, Haopeng Hu, Jinzhu Pu and Guolian Hou	North China Electric Power University
	Optimization Allocation of Aerospace Ground Support Vehicles for Multiple Types of Military Aircraft	Fuqin Yang, Jinhua Li and Mingzhu Zhu	Military Transportation University
	Experimental Research on Power Battery Fast Charging Performance	Jinlei Sun, Lei Li and Qiang Li	Nanjing University of Science and Technology
	Small-Signal Refinement of Power System Static Load Modelling Techniques	Gareth McLorn and Sean McLoone	Queen's University Belfast
	System Frequency Control of Variable Speed Wind Turbines with Variable Controller Parameters	Guoyi Xu and Chen Zhu	North China Electric Power University
Coffee Break PART II			

16:45 - 18:00	Research on Parameters matching of Hybrid Electric Vehicle with Compound-Structure Induction Machine	Qiwei Xu, Xiaobiao Jiang, Meng Zhao, Xiaoxiao Luo, Weidong Chen, Yunqi Mao and Shumei Cui	Chonqing University
	Research on Global Energy Internet Oriented Power Big Data Reference Architecture	Wei Rao, Jing Jiang and Aihua Zhou	Global Energy Internet Research Institute
	A Discrete Fourier Transform based Compensation Task Sharing Method for Power Quality Improvement	Jianbo Chen, Dong Yue, Chunxia Dou and Chongxin Huang	Nanjing University of Posts and Telecommunications
	A Combinational Clustering Approach to Household Electricity Load Curves	Qiang Zheng and Chen Peng	Shanghai University

Workshop on Intelligent System and Networked Control

Chairs: Xingsheng Gu, Sean McLoone, Weiyan Hou, Qichun Zhang
Date: 14:00-18:00 PM, Sep. 24, 2017
Location: Room 2 (Amethyst Hall), XinDi Hotel

Agenda

Time	Title	Speaker	Affiliation
PART I			
14:00 - 16:30	**Keynote speech1：Necessary Communication Schemes in Networked Measurement and Control Systems**	**Chen Peng**	Shanghai University
	Keynote speech2：Edge Computing for the Next Generation Vehicular Networks	**Zhou Su**	Shanghai University
	Neural-network-based tracking control of offshore steel jacket platforms	Zhi-Hui Cai, Bao-Lin Zhang and Xian-Hu Yu	China Jiliang University
	Temperature and Humidity Compensation for MOS Gas Sensor Based on Random Forests	Peng Xu, Kai Song, Yinsheng Chen, Qi Wang and Guo Wei	Harbin Institute of Technology
	Mean Squared Error vs. Frame Potential for Unsupervised Variable Selection	Federico Zocco and Sean McLoone	Queen's University Belfast
	Data reconciliation based on an improved robust estimator and NT-MT for gross error detection	Shengxi Wu, Jinmeng Xu, Wei Liu, Xiaoying Wu and Xingsheng Gu	East China University of Science and Technology
	Improved Artificial Weed Colonization Based Multi-objective Optimization Algorithm	Ruochen Liu, Ruinan Wang, Guan Xia and Xiao Wang	Xidian University
Coffee Break PART II			
16:45	Modelling and Control Design for Membrane Potential Conduction along Nerve Fibre using B-spline Neural Network	Qichun Zhang	University of Essex

- 18:00	Design of Output Feedback Controller for Networked Control Systems with Delay and Packet Dropout	Jun Xiang Dai, Ying Zhou and Chao Sun	Nanjing University of Posts and Telecommunications
	Orthogonal Matching Pursuit for Multilayer Perceptions Neural Networks Model Reduction	Xiaoquan Tang, Xiaolin Wang and Long Zhang	Shanghai Jiaotong University
	Compressed Binary Discernibility Matrix Based Incremental Attribute Reduction Algorithm for Group Dynamic Data	Fumin Ma, Mianwei Ding, Tengfei Zhang	Nanjing University of Finance and Economics
	Study of Perfusion Kinetics in Human Brain Tumor using Leaky Tracer Kinetic Model of DCE-MRI Data and CFD	Ajay Bhandari, Ankit Bansal, Anup Singh and Niraj Sinha	Indian Institute of Technology Kanpur

Selected Papers' Speeches

Chairs: Qinglong Han, Luonan Chen
Date: 14:00-16:30 PM, Sep. 23, 2017
Location: Room 6 (Yulan Hall B), XinDi Hotel

Agenda

NO.	Title	Speaker	Affiliation
SaD-1	Automated Detection of Targets via a Focus of Attention for SAR Images	Fei Gao, Fei Ma, Jun Wang, Jinping Sun, Erfu Yangand Amir Hussain	Beihang University
SaD-2	Passing Control between Driver and Highly Automated Driving Functions	Niko Maas, Mira Schüller, Weiyan Hou and Dieter Schramm	University Duisburg-Essen
SaD-3	Integration of the Demand Side Management with Security-Constrained Optimal Unified Active and Reactive Dynamic Economic Dispatch of Microgrids	Mohammed Al-Saadi, Patrick Luk and John Economou	Cranfield University
SaD-4	A Novel Data Injection Cyber-Attack against Dynamic State Estimation in Smart Grid	Dajun Du, Rui Chen and Minrui Fei	Shanghai University
SaD-5	Analysis of cyber physical systems security issue via uncertainty approaches	Hui Ge, Dong Yue, Xiangpeng Xie, Song Deng and Songlin Hu	Nanjing University of Posts and Telecommunications
SaD-6	Hybrid discrete estimation of distribution algorithm for the no-wait flow shop scheduling problem	Zewen Sun and Xingsheng Gu	East China University of Science and Technology
SaD-7	Compact Real-valued Teaching-Learning Based Optimization for Continuous Optimization Problems	Zhile Yang, Kang Li, Haiping Ma, Qun Niu, Min Zheng and Chenyang Ding	Queen's University Belfast
SaD-8	Surgical Timing Prediction of Patient-specific Congenital Tracheal Stenosis with Bridging Bronchus by Using Computational Aerodynamics	Juanya Shen, Limin Zhu, Zhirong Tong, Jinfen Liu, Mitsuo Umezu, Zhuomin Xu and Jinlong Liu	School of Medicine, Shanghai Jiao Tong University
SaD-9	A Composite Controller for Piezoelectric Actuators with Model Predictive Control and Hysteresis Compensation	Ang Wang and Long Cheng	Institute of Automation, Chinese Academy of Sciences

SaD-10	Intelligent Decentralized Multivariable PID Controller Design of Interacting Multivariable Processes using the Human Learning Optimizer	Muhammad Ilyas Menhas, Ling Wang and Minrui Fei	Mirpur University of Science and Technology
SaD-11	Technology of Cortical Bone Trajectory on The Influence of Stability in Fixation of Burst Fracture of Thoracolumbar Spine: A Finite Element Analysis	Jianping Wang, Juping Gu, Jian Zhao, Xinsong Zhang, Liang Hua and Chunfeng Zhou	Nantong University
SaD-12	Dynamical characteristics of anterior cruciate ligament deficiency combined meniscus injury knees	Wei Yin, Shuang Ren, Hongshi Huang, Yuanyuan Yu, Zixuan Liang, Yingfang Ao and Qiguo Rong	Peking University

Technical Program
September 23, PM, 2017
Saturday

SaE1
14:00-18:00
Room 2 (Amethyst Hall)
Topic: UK-China Workshop on Smart Grid and Electric Vehicles

SaE1-1

Research on the Model and Method of Maturity Evaluation of Smart Grid Industry

Yue He1, Junyong Wu1,2, Yi Ge2,3, Dezhi Li3, Huaguang Yan3,
1 School of Electrical Engineering, Beijing Jiao Tong University, Haidian District, Beijing, China
2 State Grid Jiangsu Economic Research Institute, China
3 China Electric Power Research Institute, Beijing, China

SaE1-2

A Green Dispatch Model of Power System with Wind Energy Considering Energy-environmental Efficiency

Daojun Chen1, Liqing Liang1,Lei Zhang2, Jian Zuo1, Keren Zhang1, Chenkun Li1, Hu Guo1
1 State Grid Hunan Electric Power Corporation Research Institute, Changsha, China
2 Hunan Xiangdian Test and Research Institute Company Limited, Changsha, China

SaE1-3

A Novel RBF Neural Model for Single Flow Zinc Nickel Batteries

Xiang LI1, Kang LI1, Zhile YANG1 and Chikong WONG2
1 Queen's University Belfast, School of Electronics, Electrical Engineering and Computer Science, Belfast, UK
2 The University of Macau, Department of Electrical and Computer Engineering, Macau, China

SaE1-4

Model Predictive Control Based on the Dynamic PLS Approach to Waste Heat Recovery System

Jianhua Zhang1*, Haopeng Hu1, Jinzhu Pu1 and Guolian Hou1
1 School of Control and Computer Engineering, North China Electric Power University, Beijing, China

SaE1-5

Optimization Allocation of Aerospace Ground Support Vehicles for Multiple Types of Military Aircraft

Fuqin YANG1 and Jinhua LI2-3 and Mingzhu ZHU4
1 Department of Military Logistics, Military Transportation University, Tianjin, China
2 Department of Automation, TNList, Tsinghua University, Beijing, P. R. China
3 The Logistics Information Center of PLA, Beijing, P. R. China
4 Innovation and Enterpreneurship Development Center, Tianjin Sino-German University of Applied Sciences, Tianjin, China

SaE1-6

Experimental Research on Power Battery Fast Charging Performance

Sun Jinlei , Li lei, Yang Fei, Li Qiang
School of Automation, Nanjing University of Science & Technology, Nanjing, China

SaE1-7

Small-Signal Refinement of Power System Static Load Modelling Techniques

Gareth McLorn and Seán McLoone
School of Electronics, Electrical Engineering and Computer Science, Queen's University Belfast, Belfast, Northern Ireland, U.K.

SaE1-8

System Frequency Control of Variable Speed Wind Turbines with Variable Controller Parameters

Guoyi Xu1, Chen Zhu1, Libin Yang2, Chunlai Li2, Jun Yang2, Tianshu Bi1
1 State Key Laboratory of Alternate Electrical Power System with Renewable Energy Sources, North China Electric Power University, Beijing, China
2 QingHai Province Key Laboratory of Photovoltaic Gird Connected Power Generation Technology, Xining, China

SaE1-9

Research on Parameters matching of Hybrid Electric Vehicle with Compound-Structure Induction Machine

Qiwei Xu1, Xiaobiao Jiang1, Meng Zhao1, Xiaoxiao Luo1, Weidong Chen1, Yunqi Mao1 and Shumei Cui2,
1 The State Key Laboratory of Power Transmission Equipment & System Security and New Technology Chongqing University, Chongqing, China
2 School of Electrical Engineering and Automation Harbin Institute of Technology, Harbin, China

SaE1-10

Research on Energy Interconnection Oriented Big Data Sharing Platform Reference Architecture

Wei Rao1, Jing Jiang1, Ming Yang2, Wei Peng2, Aihua Zhou1
1 Advanced Computing and Big Data Laboratory, Global Energy Interconnection Research Institute, State Grid Corporation of China, Beijing, China
2 Shanghai Electric Power Corporation Information Communications Branch, Shanghai,

China

SaE1-11

A Discrete Fourier Transform based Compensation Task Sharing Method for Power Quality Improvement

Jianbo Chen, Dong Yue, Chunxia Dou, and Chongxin Huang
Institute of Advanced Technology and the Jiangsu Engineering Laboratory of Big Data Analysis and Control for active distribution network, Nanjing University of Posts and Telecommunications, Nanjing, China

SaE1-12

A Combinational Clustering Approach to Household Electricity Load Curves

Qiang Zheng1,2 and Chen Peng1
1 Shanghai University, Shanghai, China
2 Shandong University of Technology, Zibo, China

September 23, PM, 2017 Saturday

SaA1
14:00-16:30
Room3 (Peony Hall A)
Topic: Biomedical Signal Processing And Computational Methods in Organism Modeling

SaA1-1

Research of Rectal Pressure Signal Preprocessing Based on Improved FastICA Algorithm

Peng Zan1, Yankai Liu1, Suqin Zhang2, Chundong Zhang1, Hua Wang1 and Zhiyuan Gao1
1 School of Mechatronics Engineering and Automation, Shanghai University;
Shanghai Key Laboratory of Power Station Automation Technology, Shanghai, China
2 Naval Aeronautical University Qingdao Campus, Qingdao, China

SaA1-2

Classification of MMG Signal Based On EMD

Lulu Cheng1, Jiejing Wang1, Chuanjiang Li1, Xiaojie Zhan1,
Chongming Zhang1, Ziming Qi2, Ziqiang Zhang1,
1 College ofinformation, Mechanical and ElectricalEngineering of Shanghai Normal University, Shanghai, China
2 Tago Polytechnic, Dunedin, Otago, New Zealand

SaA1-3

Adaptive KF-SVM Classification for Single Trial EEG in BCI

Banghua Yang1 *, Chengcheng Fan 1, Jie Jia 2*, Shugeng Chen 2, Jianguo Wang 1
1 Department of Automation, College of Mechatronics Engineering and Automation, Key Laboratory of Power Station Automation Technology,Shanghai University, Shanghai, China
2 Department of rehabilitation medicine, Huashan hospital, Fudan University, Shanghai, China

SaA1-4

Research on non-frontal face detection method based on skin color and region segmentation

Haonan Wang 1, Tianfei Shen 2
1 Department of Automation, School of Mechatronic Engineering and Automation, Shanghai University, Shanghai, China

SaA1-5

Modelling and Analysis of the Cerebrospinal Fluid Flow in the Spinal Cord

Xiaode Liu1, Danmei Luo1, Panpan Hu2, Miao Yu2, Qiguo Rong1
1 Department of Mechanics and Engineering Science, College of Engineering,Peking University
2 Orthopaedic Department, Peking University Third Hospital, Beijing, P. R. China

SaA1-6

Fracture prediction for a customized mandibular reconstruction plate with finite element method

Danmei Luo1, Xiangliang Xu2, Chuanbin Guo2, and Qiguo Rong1*
1 Department of Mechanics and Engineering Science, College of Engineering, Peking University, Beijing, China
2 Department of Oral and Maxillofacial Surgery, Peking University School and Hospital of Stomatology, Beijing, China

SaA1-7

Three-dimensional Pathological Analysis of Cerebral Aneurysm Initiation

Xinning Wang1, Kenta Suto1, Takanobu Yagi1,2, Koichi Kawamura1 and Mitsuo Umezu1
1 Center for Advanced Biomedical Science (TWIns), Waseda University, Wakamatsu-cho, Shinjuku-ku, Tokyo, 162-8480, Japan
2 EBM Corporation, 4-16-15-508, Ohmoriminami, Ohta-ku, Tokyo, 143-0013, Japan

SaA1-8

Research on Active and Passive Monitoring Fusion for Integrated Lamb Wave Structural Health Monitoring

Qiang Wang1, Jie Hua1, Dong-chen Ji1
1 College of Automation, Nanjing University of Posts and Telecommunications, Nanjing, China

SaA1-9

Current Solutions for the Heat-sink Effect of Blood Vessels with Radiofrequency Ablation: A Review and Future Work

Zheng Fang1, Bing Zhang1, 2, Wenjun Zhang1,2,3
1 Tumor ablation group, CISR Lab, East China University of Science and Technology, Shanghai, China
2 Division of Biomedical Engineering, University of Saskatchewan, Saskatoon, Canada
3 Department of Mechanical Engineering, University of Saskatchewan, Saskatoon, Canada

SaA1-10

Extraction Technique of Spicules-Based Features for the Classification of Pulmonary Nodules on Computed Tomography

Xingyi He, Jing Gong, Lijia Wang, Shengdong Nie
Institute of Medical Imaging Engineering, University of Shanghai for Science and Technology, Shanghai, P. R. China

SaA1-11

An Embedded Driver Fatigue Detect System based on Vision

Huaming Shen1, Meihua Xu1, Feng Ran2
1 Department of Automation, College of Mechatronics Engineering and Automation, Shanghai University, Shanghai, China
2 Microelectronic R&D Center, Shanghai University, Shanghai, China

SaA1-12

A Noncontact Measurement of Cardiac Pulse based on PhotoPlethysmoGraphy

Xiaohua Wu , Xin Li, Yulin Xu, Lang Zhang
School of Mechatronics Engineering and Automation, Shanghai University, Shanghai, China

SaA1-13

A Survey of the State-of-the-Art Techniques for Cognitive Impairment Detection in the Elderly

Zixiang Fei1, Erfu Yang1, David Li2, Stephen Butler3, Winifred Ijomah1, Neil Mackin4
1 Department of Design, Manufacture and Engineering Management University of Strathclyde, Glasgow G1 1XJ, UK
2 Strathclyde Institute of Pharmacy & Biomedical Sciences University of Strathclyde, Glasgow G4 0RE, UK
3 School of Psychological Sciences and Health University of Strathclyde, Glasgow G1 1QE, UK
4 Capita plc, London SW1H 0XA, UK

SaA1-14

Identification Approach of Hammerstein-Wiener Model Corrupted by Colored Process Noise

Feng Li1, Li Jia1 and Qi Xiong1
1. Department of Automation, College of Mechatronics Engineering and Automation, Shanghai University, Shanghai, China

SaA1-15

A Novel Segmentation Framework Using Sparse Random Feature in Histology images of Colon Cancer

Kun Zhang1, Huiyu Zhou 2, Li Chen3, Minrui Fei4, Jianguo Wu1, Peijian Zhang1
1 School of Electrical Engineering, Nantong University, Nantong, China
2 School of Electronics, Electrical Engineering and Computer Science Queen's University Belfast
3 Department of Pathology, Medical College, Nantong University, Nantong, China
4 School of Mechatronic Engineering and Automaton, Shanghai University, China

SaA1-16

Skin Disease Recognition Method Based on Vertical Image Segmentation

Li-sheng Wei1, Quan Gan1, Tao Ji1
1 School of Electrical Engineering, Anhui Polytechnic University,
Wuhu City, Anhui Province, P. R. China

SaA1-17

Finite Element Analysis and Application of a Flexure Hinge based Fully Compliant Prosthetic Finger

Suqin Liu1, Hongbo Zhang1, Ruixue Yin1, Ang Chen2, Wenjun Zhang1,2
1 Complex and Intelligent Research Center, East China University of Science and Technology Shanghai, P. R. China
2 Department of Mechanical Engineering, University of Saskatchewan, Canada

SaA1-18

Automatic Measurement of Blood Vessel Angles in Immunohistochemical Images of Liver Cancer

Hongbin Zhang1, Kun Zhang1, Li Chen2, Jianguo Wu1, Peijian Zhang1, Huiyu Zhou 3
1 School of Electrical Engineering, Nantong University, Nantong, China
2 Department of Pathology, Medical College, Nantong University, Nantong, China
3 School of Electronics, Electrical Engineering and Computer Science Queen's University Belfast

SaA2
16:45-18:00
Room3 (Peony Hall A)
Topic: Bionics control methods, algorithms and apparatus

SaA2-1

Improvement of Acoustic Trapping Capabilityby Punching Specific Holes on Acoustic Tweezers

Haojie Yuan, Yanyan Liu
School of Mechatronic Engineering and Automation, Shanghai University, ShangHai, China

SaA2-2

Motion Planning and Object Grasping of Baxter Robot with Bionic Hand

Xinyi Fei1, Ling Chen1, Yulin Xu1, Yanbo Liu2
1 School of Mechatronics Engineering and Automation, Shanghai University, China
2 Shanghai Industrial Technology Institute, China

SaA2-3

Grasping Force Control of Prosthetic Hand Based on PCA and SVM

Jian Ren1, Chuanjiang Li1, 2, Huaiqi Huang3, Peng Wang1, Yanfei Zhu1, Bin Wang1 and Kang An1
1 The College of Information, Mechenical and Electrical Engineering, Shanghai Normal University, Shanghai, China
3 EPFL, Neuchâtel, 2002, Switzerland; BFH, Biel, 2502, Switzerland

SaA2-4

Adaptive SNN Torque Control for Tendon-Driven Fingers

Minrui Meng1,2, Xingbo Wang1,2, Xiaotao Wang2,3
1 College of Automation, Nanjing Unversity of Posts and Telecommunications, Nanjing, China
2 Shanghai Aerospace Systems Engineering Research Institute, Shanghai, China
3 College of Astronautics, Nanjing University of Aeronautics and Astronautics, Nanjing, China

SaA2-5

Application of human learning optimization algorithmfor production scheduling optimization

Xiaoyu Li, Jun Yao, Ling Wang1 and Muhammad Ilyas Menhas2
1 School of Mechatronic Engineering and Automation, Shanghai University, Shanghai, China
2 Department of Electrical (Power) Engineering, Mirpur University of Science and Technology, MUST, Mirpur AJ&K, Pakistan

SaA2-6

An Improved WKNN Indoor Fingerprinting Positioning Algorithm Based on Adaptive Hierarchical Clustering

Jian Li1 , Jingqi Fu1, Ang Li 1, Weihua Bao2, Zhengming Gao2
1 School of Mechatronic Engineering and Automation, Shanghai University, 200072, Shanghai, China
2 Shanghai Automation Instrumentation Co.

SaA2-7

Short-term Load Forecasting Model based on Multi-label and BPNN

Xiaokui Sun, Zhiyou Ouyang, Dong Yue
Institute of Advanced Technology, Nanjing University of Posts and Telecommunications, Nanjing, China

SaA2-8

Hybrid Fx-NLMS Algorithm for Active Vibration Control of Flexible Beam with Piezoelectric Stack Actuator

Yubin Fang, Xiaojin Zhu, Haotian Liu, Zhiyuan Gao
School of Mechatronic Engineering and Automation, Shanghai University Shanghai, P. R. China

SaB1
14:00-16:30
Room4 (Peony Hall B)
Topic: Advanced Fuzzy and Neural Network Theory and Algorithms

SaB1-1

A robust fuzzy c-means clustering algorithm for incomplete data

Jinhua Li1, Shiji Song1, Yuli Zhang1,2, and Kang Li3
1 Department of Automation, TNList, Tsinghua University, Beijing, P. R. China
2 Department of Industrial Engineering, Tsinghua University, Beijing, P. R. China
3 School of Electronics, Electrical Engineering & Computer Science, Queens University Belfast, United Kingdom

SaB1-2

Multi-objective optimization improved GA algorithm and fuzzy PID control of ATO system for train operation

Longda Wang, Xingcheng Wang, Dawei Sun and Hua Hao
School of Information Science and Technology, University of Dalian Maritime

SaB1-3

Research on AGV Trajectory Tracker Based on Fuzzy Control

Tongqing Feng1 and Bin Jiao2
1 Electrical Engineering College, Shanghai Dian Ji University, Shanghai
2 Shanghai Dian Ji University, Shanghai

SaB1-4

Stability Determination Method of Flame Combustion Based on Improved BP Model with Hierarchical Rate

Rongbao Chen, Zipei Cao, and Benxian Xiao
Hefei University of Technology, Hefei, China

SaB1-5

A genetic neural network approach for production prediction of trailing suction dredge

Zhen Su 1,2, Jingqi Fu1, Jian Sun 2
1 Department of Automation, College of Mechatronic Engineering and Automation, Shanghai University, Shanghai, China
2 Marine equipment and technology institute, Jiangsu University of Science and Technology, Zhenjiang, China

SaB1-6

A fault diagnosis method of gear based on SVD and improved EEMD

Mengmeng Song 1,Shungen Xiao1,2
1 Department of Physics and Electrical Engineering, Ningde Normal University, Ningde, China
2 School of Mechatronical Engineering and Automation, Shanghai University, Shanghai, China

SaB1-7

Research on fault data wavelet threshold denoising method based on CEEMDAN

Zhouqun Liu, Guochu Chen
Electric Engineering School, Shanghai DianJi University, Shanghai, China

SaB1-8

Evaluation of K-SVD Embedded with Modified l_1 -norm Sparse Representation Algorithm

Meixi Wang1, Jingjing Liu1, Shiwei Ma1 and Wanquan Liu2
1 School of Mechatronic Engineering and Automation, Shanghai University, 200072 Shanghai, China
2 Department of Computer Science, Curtin University, Perth, Australia

SaB1-9

Study on Path Planning of Unmanned Vehicle Based on Kinematic and Dynamic Contraints

Li Li, Benshan Zhong, Ziyan Geng
School of Mechatronics Engineering and Automation, Shanghai University, Shanghai, China

SaB1-10

A Novel Immune-Endocrine-based Intelligent Algorithm for Information Diffusion on Social Network

Yanjun Liu, Yongsheng Ding, Kuangrong Hao, Lei Chen
Engineering Research Center of Digitized Textile & Apparel Technology, Ministry of Education, College of Information Science and Technology, Donghua University, Shanghai, China

SaB1-11

Design and Optimization of Compliant Revolute Joint Based on Finite Element Method

Li Li, Ziyan Geng, Benshan Zhong
School of Mechatronics Engineering and Automation of Shanghai University, Shanghai, China

SaB1-12

Optimal sensor placement based on relaxation sequential algorithm

Hong Yin1, Kangli Dong1, An Pan1, Zhenrui Peng1, Zhaoyuan Jiang1, Shaoyuan Li2
1 School of Mechatronics Engineering, Lanzhou Jiaotong University, China
2 School of Electronic Information and Electrical Engineering, Shanghai Jiao Tong University, China

SaB1-13

Study on the Magnetic Coupling and Decoupling Algorithm of Electrical Variable Transmission

Qiwei Xu1, Jing Sun1, Yiming Su1, Weidong Chen1, Jianshu Huang1 and Shumei Cui2
1 Chongqing University, Chongqing, China
2 Harbin Institute of Technology, Harbin, China

SaB1-14

An Improved Dual Grey Wolf Optimization Algorithm for Unit Commitment Problem

Jian Liu 1 and Sanming Liu 2
1 Department of Electrical Engineering, Shanghai Dianji University, Shanghai, China
2 Department of Mathematics and Physics, Shanghai Dianji University, Shanghai, China

SaB1-15

A New Quantum-Behaved Particle Swarm Optimization with a Chaotic Operator

Zhenghua Wu1, Dongmei Wu1, Haidong Hu2, Chuangye Wang3, Hao Gao1
1 The College of Automation, Nanjing University of Posts and Telecommunications,Nanjing, China
2 Beijing Institute of Control Engineering,Beijing, China
3 State Grid Guzhen Electric Power Company, Bengbu, China

SaB1-16

A Method of Ridge-NNG-based Multivariate Fault Isolation in Presentence of Collinearity

Yimin Guo1, Jianguo Wang1, Banghua Yang1, Shiwei Ma1, Minrui Fei1, Yao Yuan2, Chen Tao3,
1 School of Mechatronical Engineering and Automation, Shanghai University, Shanghai Key Lab of Power Station Automation Technology, Shanghai, China
2 Department of Chemical Engineering, National Tsing-Hua University, Taiwan
3 Department of Chemical and Process Engineering, University of Surrey, Guildford, UK

SaB1-17

Noise-Removal Method for Manifold Learning

Zhonghua Hao1, Jingjing Liu2 , ShiWei Ma2 , Xin Jin1,4 , Xin Lian3
1 College of Automation and Electrical Engineering，Qingdao University，China
2 School of Mechatronical Engineering and Automation，Shanghai University，China
3 University of Western Australia, Australia
4 Stage Grid Shandong Electric Power Company, China

SaB2
16:30-18:00
Room4 (Peony Hall B)
Topic: Advanced Evolutionary Methods and Applications

SaB2-1

Dynamic Process Fault Isolation and Diagnosis Using Improved Fisher Discriminant Analysis and Relative Error of Variance

Huifeng Tian1,2, Li Jia1
1 Shanghai Key Laboratory of Power Station Automation Technology, Department of Automation, College of Mechatronics Engineering and Automation, Shanghai University, Shanghai, China

2 College of Electric and Information Engineering, Jiangsu University of Science and Technology, Zhangjiagang Jiangsu, China

SaB2-2

An LMI approach to iterative learning control based on JITL for batch processes

Liuming Zhou, Li Jia
Shanghai Key Laboratory of Power Station Automation Technology, Department of Automation, College of Mechatronics Engineering and Automation, Shanghai University, Shanghai, China

SaB2-3

Theme-based Spider for Academic Paper

Peifeng Yin1, Qiyu Shao2, Xingfu Wang1, Weihua Wang1,Fuyou Miao1, Chenxi Shao1,3
1 College of Computer Science and Technology, Unviersity of Science and Technology of China, Hefei,China
2 Department of Computer Science, Dayananda Sagar Institutions, Bangluer University, India
3 Anhui Province Key Laboratory of Software in Computing and Communication, Hefei, China

SaB2-4

Iterative Learning Identi_cation with BiasCompensation for Stochastic LinearTime-Varying Systems

Fazhi Song1, Yang Liu1, Zhile Yang2, Xiaofeng Yang2, and Ping He1
1 Department of Control Science and Engineering, Harbin Institute of Technology, Harbin, China
2 School of Microelectronics, Fudan University, Shanghai, China

SaB2-5

A Skylight Opening Prediction Method Based on Parallel Dirichlet Process Mixture Model Clustering

Yue Yu1,2, Li Deng1,2, Lili Wang1,2 and Honglin Pang1,2
1 School of Mechatronics Engineering and Automation, Shanghai University, Shanghai, China
2 Shanghai Key Laboratory of Power Station Automation Technology, Shanghai, China

SaB2-6

Two-layer harmony search algorithm for a robust flow shop scheduling problem

Bo Wu, Bing Wang and Xingbao Han
School of Mechatronic Engineering and Automation, Shanghai University, Shanghai, China

SaB2-7

Heuristic based terminal iterative learningcontrol of ISBM reheating processes

Ziqi Yang, Zhile Yang, Kang Li, Wasif Naeem, Kailong Liu
School of Electronics, Electrical Engineering and Computer Science,Queen's University Belfast, Belfast, BT9 5AH, UK

SaB2-8

Application of LSSVM in Performance Test of Pneumatic Valves

Jiayuan Li1, Wei Sun2
School of Mechatronic Engineering and Automation, Shanghai University, Shanghai, China

SaC1
14:00-16:30
Room5 (Yulan Hall A)
Topic: Computational Intelligence in Utilization of Clean and Renewable Energy Resources

SaC1-1

Research on Wind Speed Vertical Extrapolation Based on Extreme Learning Machine

Hui Lv1, Guochu Chen2
Electric Engineering School, Shanghai DianJi University, Shanghai, China

SaC1-2

Optimal scheduling of wind turbine generator units based on the amount of damage of impeller

Kai Lin and Guochu Chen
Department of Electrical Engineering, Shanghai Dianji University, Shanghai, China

SaC1-3

A short term wind speed forecasting method using signal decomposition and extreme learning machine

Sizhou Sun 1, 2, Jingqi Fu1, Feng Zhu1
1 School of Mechatronics Engineering and Automation, Shanghai University, Shanghai, China;
2 School of Electrical Engineering, Anhui Polytechnic University, Wuhu, China;

SaC1-4

A novel method for short-term wind speed forecasting based on UPQPSO-LSSVM

Wangxue Nie1 , Jingqi Fu1, Sizhou Sun 1,2
1 School of Mechatronic Engineering and Automation, Shanghai University, Shanghai, China
2 School of Electrical Engineering, Anhui Polytechnic University, Wuhu, China

SaC1-5

Structure Design and Parameter Computation of a Seawater Desalination System with Vertical Axis Wind Turbine

Yihuai Hu, Kai Li and Hao Jin
Marine Engineering Department, Shanghai Maritime University, Shanghai, China

SaC1-6

Inertial response control strategy of wind turbine based on variable universe fuzzy control

Le Gao, Guoxing Yu, LanLiu, and Huihui Song
School of Information and Electrical Engineering, Harbin Institute of Technology at Weihai, Weihai , China

SaC1-7

Base-load Cycling Capacity Adequacy Evaluation in Power Systems with Wind Power

Jingjie Ma, Shaohua Zhang, Liuhui Wang
Key Laboratory of Power Station Automation Technology, Department of Automation Shanghai University, Shanghai, China

SaC1-8

MFAC-PID Control for Variable-Speed Constant Frequency Wind Turbine

Qingye Meng1, Shuangxin Wang1, Jianhua Zhang2, and Tingting Guo1
1 School of Mechanical, Electronic and Control Engineering, Beijing Jiaotong University, Beijing, China
2 State Key Laboratory of Alternate Electrical Power System with Renewable Energy Sources, North China Electric Power University, Beijing, China

SaC1-9

A Multivariate Wind Power Fitting Model Based on Cluster Wavelet Neural Network

Ruiwen Zheng1, Qing Fang2, Zhiyuan Liu3, Binghong Li1 and Xiao-Yu Zhang1
1 Department of Mathematics, Beijing Forestry University, Beijing, P. R. China
2 Faculty of Science, Yamagata University, Yamagata 990-8560, Japan
3 Posts and Telecommunications, Chongqing University, Chongqing, P. R. China

SaC1-10

Control Strategy for Isolated Wind-Solar-Diesel Micro Grid System Considering Constant Load

Xuejian Yang, dong Yue, Tengfei Zhang
Institude of Advanced Technolgy, Automatic College, Nanjing University of Posts and Telecommunications, China

SaC1-11

Equilibrium Analysis of Electricity Market with Wind Power Bidding and Demand Response Bidding

Kai Zhang, Xian Wang, Shaohua Zhang
Key Laboratory of Power Station Automation Technology School of Mechatronic Engineering and Automation Shanghai University Shanghai, China

SaC1-12

Stability Analysis of Wind Turbines Combined with Rechargeable Batteries based on Markov Jump Linear Systems

Xiao-kun Dai1, Yang Song1,2 Mira Schüller3, Dieter Schramm3,
1 School of Mechatronic Engineering and Automation, Shanghai University, Shanghai
2 Shanghai Key Laboratory of Power Station Automation Technology, Shanghai China
3 Department Mechanical Engineering, University of Duisburg-Essen, Duisburg, Germany

SaC1-13

Modeling and Simulation Study of Photovoltaic DC Arc Faults

Zhihua Li, Zhiqun Ye, Chunhua Wu, and Wenxin Xu
Shanghai Key Laboratory of Power Automation Technology, Shanghai University, Shanghai, China

SaC1-14

Data Management of Water Flow Standard Device Based on LabVIEW

Shaoshao Qin, Bin Li, Chao Cheng
School of Mechatronic Engineering and Automation, Shanghai University, Shanghai, China;

SaC1-15

Design and Research of Water Flow Standard Facilities Based on Field Service

Chao Cheng, Bin Li, Shaoshao Qin
School of Mechatronical Engineering and Automation, Shanghai University, Shanghai, China;

SaC1-16

Fault Diagnosis Method of Ningxia Photovoltaic Inverter Based on Wavelet Neural Network

Guohua Yang 1,2, Pengzhen Wang 1, Bingxuan Li 1, Bo Lei 1, Hao Tang 1, Rui Li 1
1 Department of Electrical Engineering and Automation Ningxia University, Yinchuan, China
2 Ningxia Key Laboratory of Intelligent Sensing & Intelligent Desert, Yinchuan, China

SaC1-17

Research on Expert Knowledge Base of Intelligent Diagnosis Based on Tubing Leakage of High-pressure Heater in Nuclear Power Plant

Miao Zheng1,2,Hong Qian1,2, Siyun Lin1,Bole Xiao3, Xiaoping Chu1
1 School of Automation Engineering, Shanghai University of Electric Power, Shanghai, China
2 Shanghai Power Station automation technology key laboratory, Shanghai, China
3 Shanghai Power Equipment Research Institute, China

SaC2
16:30-18:00
Room5 (Yulan Hall A)
Topic: Intelligent Methods for Energy

Saving and Pollution Reduction

SaC2-1

Research on Intelligent Early-warning System of Main Pipeline in Nuclear Power Plants Based on Hierarchical and Multidimensional Fault Identification Method

Hong Qian 1,2 , Siyun Lin1,2 , Miao Zheng1,2 , Qiang Zhang3
1 School of Automation Engineering, Shanghai University of Electric Power, Shanghai, China;
2 Shanghai Power Station automation technology key laboratory, Shanghai, China
3 Shanghai Power Equipment Research Institute, Shanghai, China

SaC2-2

The Early Warning System of Nuclear Power Station Oriented to Human Reliability

Ren Shuai1, Qian Hong1,2
1 Shanghai University of Electric Power, Shanghai, China
2 Shanghai Key Laboratory of Power Station Automation Technology, Shanghai, China

SaC2-3

Study on Lightweight Design and Connection of Dissimilar Metals of Titanium Alloy TC4 /T2 Copper/304 Stainless Steel

Shun Guo1, Qi Zhou1, Peng Xu2, Qiong Gao1, Tianyuan Luo1, Yong Peng1, Jian Kong1, KeHong Wang1, Jun Zhu3
1 School of Materials Science and Engineering, Nanjing University of Science and Technology, Nanjing, China
2 School of Mechanical Engineering and Automation, Shanghai University, Shanghai, China
3 School of Materials Science and Engineering, Nanjing Institute of Technology, Nanjing, China

SaC2-4

Research on warehouse scheduling optimization problem for broiler breeding

Wenqiang Yang, Yongfeng Li
Henan Institute of Science and Technology, Xinxiang, China

SaC2-5

A Comprehensive Optimization of PD^{μ} Controller Design for Trade-off of Energy and System Performance

Ke Zhang1, Min Zheng1,2, and Kang Li3 and Yijie Zhang1
1 School of Mechatronic Engineering and Automation,Shanghai University
2 Shanghai Key Laboratory of Power Station Automation Technology, Shanghai, China
3 School of Electronics,Electrical Engineering and Computer Science, Queens University Belfast, Belfast, UK

SaC2-6

Hierarchical Time Series Feature Extraction for Power Consumption Anomaly Detection

Zhiyou Ouyang1,2,3, Xiaokui Sun1,2,3, and Dong Yue1,2,3,4
1 School of Automation, Nanjing University of Posts and Telecommunications, Nanjing, P. R. China
2 Hubei Province Collaborative Innovation Center for New Energy Microgrid, China Three Gorges University, China.
3 Institute of Advanced Technology, Nanjing University of Posts and Telecommunications, Nanjing, P. R. China
4 Jiangsu Engineering Laboratory of Big Data Analysis and Control for Active Distribution Network, Nanjing University of Posts and Telecommunications, Nanjing, China

SaC2-7

Prospect Theory based Electricity Allocation for GenCos Considering Uncertainty of Emission Price

Yue Zhang, Shaohua Zhang
Shanghai Key Laboratory of Power Station Automation Technology, Department of Automation Shanghai University, Shanghai, China

SaC2-8

Dispatching Analysis of Ordered Charging Considering the Randomness Factor of Electric Vehicles Charging

Ling Mao and Enyu Jiang
College of Electrical Engineering, Shanghai University of Electric Power, China

SaD
14:00-16:30
Room6 (Yulan Hall B)
Topic: Selected Papers' Speeches

SaD-1

Automated Detection of Targets via a Focus of Attention for SAR Images

Fei Gao1, Fei Ma1, Jun Wang1, Jinping Sun1, Erfu Yang2, Amir Hussain3
1 School of Electronic and Information Engineering, Beihang University, Beijing, China
2 Strathclyde Space Institute, Department of Design, Manufacture and Engineering Management, University of Strathclyde, Glasgow G1 1XJ, UK
3 Cognitive Signal-Image and Control Processing Research Laboratory, School of Natural Sciences, University of Stirling, Stirling FK9 4LA, UK

SaD-2

Passing Control between Driver and Highly Automated Driving Functions

Niko Maas1, Frederic Etienne Kracht1, Mira Schuller1, Weiyan Hou2, and Dieter Schramm1
1 University at Duisburg-Essen, Lotharstr. 1,

47057 Duisburg, Germany
2 School of Information Engineering, Zhengzhou University, Zhengzhou, Henan, China

SaD-3

Integration of the Demand Side Management with Active and Reactive Power Economic Dispatch of Microgrids

Mohammed K. Al-Saadi1, 2, Patrick C. K. Luk1, John Economou3
1 Cranfield University, Bedford, UK
2 University of Technology, Baghdad, Iraq
3 Cranfield University, Swindon, UK

SaD-4

A Novel Data Injection Cyber-Attack against Dynamic State Estimation in Smart Grid

Rui Chen, Dajun Du, and Minrui Fei
School of Mechatronical Engineering and Automation, Shanghai University, Shanghai, China

SaD-5

Analysis of cyber physical systems security issue viauncertainty approaches

Hui Ge1,2, Dong Yue1,2,3, Xiang-peng Xie2, Song Deng2, and Song-lin Hu2
1 School of Automation, Nanjing University of Posts and Telecommunications, Nanjing, P. R. China
2 Institute of Advanced Technology, Nanjing University of Posts and Telecommunications, Nanjing, P. R. China
3 Hubei Province Collaborative Innovation Center for New Energy Microgrid, China

SaD-6

Hybrid discrete EDA for the no-wait flow shop scheduling problem

Zewen Sun, Xingsheng Gu
Key Laboratory of Advanced Control and Optimization for Chemical Process, Ministry of Education, East China University of Science and Technology, Shanghai, China

SaD-7

Compact Real-valued Teaching-Learning Based Optimization for Continuous Optimization Problems

Zhile Yang1, Kang Li1, Haiping Ma2, Qun Niu3, Min Zheng3, Chenyang Ding4
1 School of Electronics, Electrical Engineering and Computer Science, Queen's University Belfast, Belfast, BT9 5AH, UK
2 Department of Electrical Engineering, Shaoxing University, Shaoxing, China
3 Shanghai Key Laboratory of Power Station Automation Technology, School of Mechatronic Engineering and Automation, Shanghai University, Shanghai, China
4 Extreme Motion Technologies, Eindhoven, Netherlands

SaD-8

Surgical Timing Prediction of Patient-specific Congenital Tracheal Stenosis with Bridging Bronchus by Using Computational Aerodynamics

Juanya Shen1, Limin Zhu1, Zhirong Tong1, Jinfen Liu1, Mitsuo Umezu2, Zhuomin Xu1 and Jinlong Liu1, 3
1 Department of Cardiothoracic Surgery, Shanghai Children's Medical Center, Shanghai Jiao Tong University School of Medicine, Shanghai, China
2 Center for Advanced Biomedical Sciences, TWIns, Waseda University, TWIns 03C-301, ASMeW Lab, 2-2 Wakamatsucho, Shinjuku 162-8480, Tokyo, Japan
3 Institute of Pediatric Translational Medicine, Shanghai Children's Medical Center, Shanghai Jiao Tong University School of Medicine, Shanghai, China

SaD-9

A Composite Controller for Piezoelectric Actuators with Model Predictive Control and Hysteresis Compensation

Ang Wang and Long Cheng
State Key Laboratory of Management and Control for Complex Systems, Institute of Automation, Chinese Academy of Sciences, Beijing, China.

SaD-10

Intelligent Decentralized Multivariable PID Controller Design of Interacting Multivariable Processes using the Human Learning Optimizer

Muhammad Ilyas Menhas1, 2, Ling Wang2, Ji Pei2, JiaoJie Du2, MinRui Fei2
1 Department of Electrical (Power) Engineering Mirpur University of Science and Technology, MUST, Mirpur AJ&K, Pakistan
2 Shanghai Key Laboratory of Power Station Automation Technology School of Mechatronics and Automation, Shanghai University, Shanghai, China

SaD-11

Technology of Cortical Bone Trajectory on The Influence of Stability in Fixation of Burst Fracture of Thoracolumbar Spine: A Finite Element Analysis

Jianping Wang1, Juping Gu1, Jian Zhao2, Xinsong Zhang1, Liang Hua1, Chunfeng Zhou3
1 College of Electrical Engineering, Nantong University, Nantong, China
2 Department of Orthopaedics, Changzheng Hospital, Second Military Medical University, Shanghai, China
3 Department of Orthopaedics, Rich Hospital of Nantong, Nantong, China

SaD-12

Dynamical characteristics of anterior cruciate ligament deficiency combined meniscus injury knees

Wei Yin1, Shuang Ren2, Hongshi Huang2,

Yuanyuan Yu2, Zixuan Liang2, Yingfang Ao2, and Qiguo Rong1
1 Department of Mechanics and Engineering Science, College of Engineering, Peking University, Beijing, China
2 Beijing Key Laboratory of Sports Injuries, Institute of Sports Medicine, Peking University Third Hospital, Beijing, China

SaA3
16:45-18:00
Room6 (Yulan Hall B)
Topic: Modeling and simulation of life systems and Data Driven Analysis

SaA3-1

Research of Model Identification for Control System Based on Improved Differential Evolution Algorithm

Li Zheng 1, Daogang Peng 1, Yuzhen Sun 1, Sheng Gao 2
1. College of Automation Engineering, Shanghai University of Electric Power, Shanghai, China;
2. Shanghai Power Equipment Research Institute, Shanghai, China

SaA3-2

Multi-variety fresh agricultural products distribution optimization based on an improved cuckoo search algorithm

Wenqiang Yang, Junpeng Xu, Yongfeng Li
Henan Institute of Science and Technology, Xinxiang, China

SaA3-3

Research on Indoor Fingerprint Localization System Based on Voronoi Segmentation

Ang Li1, Jingqi Fu1, Huaming Shen1
1Department of Automation, College of Mechatronics Engineering and Automation, Shanghai University, Shanghai, China

SaA3-4

Co-Simulation Using ADAMS and MATLAB for Active Vibration Control of Flexible Beam with Piezoelectric Stack Actuator

Haotian Liu, Yubin Fang, Bing Bai, Xiaojin Zhu
School of Mechatronic Engineering and Automation, Shanghai University, Shanghai, P. R. China

SaA3-5

Review of research on simulation platform based on the crowd evacuation

Pei-juan Xu1 and Ke-cai Cao1,2
1 Nanjing University of Posts and Telecommunications, Nanjing, China
2 Nanjing University of Aeronautics and Astronautics, Nanjing, China

SaA3-6

A TopicRank based Document Priors Model for Expert Finding

Jian Liu1,2 Bei Jia1, Hao Xu1, Baohong Liu2, Donghuai Gao1 and Baojuan Li4,
1 Network Center, Fourth Military Medical University, Xi'an, Shaanxi, China
2 College of Information System and Management, National University of Defense Technology, Changsha, Hunan, China.
3 Xi'an Communication Institute, Xi'an, Shaanxi, China
4 School of Biomedical Engineering, Fourth Military Medical University, Xi'an, Shaanxi, China

SaA3-7

Algorithm Design for Automatic Modeling of the First and the Second Level of Airway Tree

Yue Lou， Xin Sun
School of Mechatronic Engineering and Automation, Shanghai University, Shanghai, China

SaA3-8

Light-weight Mg/Al dissimilar structures welded by CW laser for weight saving applications

Qiong Gao1, Sonia Meco2, Kehong Wang1, Shun Guo1
1 School of Material Science and Engineering, Nanjing University of Science and Technology, Nanjing, P. R. China
2 Welding Engineering and Laser Processing Centre, Cranfield University, University Way, building 46, Cranfield, Bedfordshire MK43 0AL, UK

SaA3-9

Modeling and simulation of intelligent substation network under intrusion attack

Xiaojuan Huang1 , Rong Fu1, Yi Tang2, Mengya Li2, Dong Yue1
1 College of Automation, Nanjing University of Posts and Telecommunications, Nanjing, China
2 College of Electrical Engineering Southeast University, Nanjing, China

SaA3-10

Analysis of Temperature and Gas Flow Distribution inside Safety Helmet Based on Numerical Simulation

Heng Ma, Rui Li, Ke Qian, Yibo Gao, Ling Chen
Zhejiang Huadian Equipment Testing Institute (Zhejiang Key Laboratory for Protection Technology of High - Rise Operation), Hangzhou, Zhejiang, China

SaA3-11

Analysis of Influence of Moving Axial Load on Elevated Box Bridge of Slab Track

Xiaoyun ZHANG1, Guangtian SHI1, Xiaoan ZHANG1 and Yanliang CUI1
1 School of Mechanical Engineering, Lanzhou Jiaotong University, Lanzhou, China

SaA3-12

Low-Carbon Architectural Design and Data Analysis Based on BIM

Xiaoxing Ou1,1, Qiming Li1 and Dezhi Li1
1 Department of Construction and Real Estate, Southeast University, Nanjing, P. R. China

SaA3-13

Survey of 3D Map in SLAM: Localization and Navigation

Aolei Yang, Yu Luo, Ling Chen, Yulin Xu
Shanghai Key Laboratory of Power Station Automation Technology, School of Mechatronic Engineering and Automation, Shanghai University, Shanghai, China.

SaA3-14

An Adaptive Immune-Endocrine Algorithm for Service-Oriented Agricultural Internet of Things

Zhen Yang1,2, Yongsheng Ding1, Kuangrong Hao1, Xin Cai1
1 Engineering Research Center of Digitized Textile & Apparel Technology, Ministry of Education, College of Information Science and Technology, Donghua University, Shanghai, China
2 College of Information Engineering,Huzhou University, Huzhou, China

September 24, PM, 2017 Sunday

SuE2
14:00-18:00
Room 2 (Amethyst Hall)
Topic: Workshop on Intelligent System and Control

SuE2-1

Necessary Communication Schemes in Networked Measurement and Control Systems

Cheng Peng
Shanghai University, China

SuE2-2

Edge Computing for the Next Generation Vehicular Networks

Zhou Su
Shanghai University, China

SuE2-3

Neural-network-based tracking control of offshore steel jacket platforms

Zhi-Hui Cai1, Bao-Lin Zhang1, and Xian-Hu Yu2
1 China Jiliang University, Hangzhou, China
2 Ningbo Radio and TV University, Ningbo, China

SuE2-4

Temperature and Humidity Compensation for MOS Gas Sensor Based on Random Forests

Peng Xu1, Kai Song1, Xiaodong Xia2,Yinsheng Chen3, Qi Wang1 , Guo Wei1
1 Department of Automatic Testing and Control, Harbin Institute of Technology, Harbin, P. R. China
2 Institute of Aerospace System Engineering Shanghai, Shanghai, P, R. China
3 Department of Measurement and Control Technology and Instrument, Harbin University of Science and Technology, Harbin, P. R. China

SuE2-5

Mean Squared Error vs. Frame Potential forUnsupervised Variable Selection

Federico Zocco and Sean McLoone
School of Electronics, Electrical Engineering and Computer Science, Queen's University Belfast, Northern Ireland

SuE2-6

Data reconciliation based on an improved robust estimator and NT - MT for gross error detection

Shengxi Wu, Jinmeng Xu, Wei Liu, Xiaoying Wu and Xingsheng Gu
Key Laboratory of Advanced Control and Optimization for Chemical Processes (East China University of Science and Technology), Ministry of Education, Shanghai, China

SuE2-7

Improved Artificial Weed Colonization Based Multi-objective Optimization Algorithm

Ruochen Liu1, Ruinan Wang1, Manman He2 and Xiao Wang1
1 Key Laboratory of Intelligent Perception and Image Understanding of Ministry of Education, Xidian University, Xi'an, China.
2School of Computer, Xi`an Shi you University, Xi'an, China

SuE2-8

Modelling and Control Design for Membrane Potential Conduction along Nerve Fibre using B-spline Neural Network

Qichun Zhang, Francisco Sepulveda
University of Essex, Colchester, CO45FT, UK

SuE2-9

Design of Output Feedback Controller for Networked Control Systems with Delay and Packet Dropout

Jun Xiang Dai, Ying Zhou, Chao Sun, Jin Xing Lin
College of Automation, Nanjing University of Posts and Telecommunications, Nanjing, China

SuE2-10

Orthogonal Matching Pursuit for MultilayerPerceptions Neural Networks Model Reduction

Xiaoquan Tang1, Xiaolin Wang2 and Long Zhang3
1 School of Automation, Huazhong University of Science and Technology Wuhan, China
2 School of Electronic Information and Electrical Engineering, Shanghai Jiaotong University, China
3 School of Electrical and Electronic Engineering, University of Manchester Manchester, M13 9PL, UK

SuE2-11

Compressed Binary Discernibility Matrix Based Incremental Attribute Reduction Algorithm for Group Dynamic Data

Fumin Ma1, Mianwei Ding2, Tengfei Zhang2
1 College of Information Engineering, Nanjing University of Finance and Economics, Nanjing, China
2 College of Automation, Nanjing University of Posts and Telecommunications, Nanjing, China

SuE2-12

Study of Perfusion Kinetics in Human Brain Tumor using Leaky Tracer Kinetic Model of DCE-MRI Data and CFD [MSTT]

A.Bhandari1, A. Bansal2, A. Singh3, 4 and N. Sinha1
1 Department of Mechanical Engineering, Indian Institute of Technology, Kanpur-208016, India
2 Department of Mechanical and Industrial Engineering, Indian Institute of Technology, Roorkee-247677, India
3 Centre for Biomedical Engineering, Indian

Institute of Technology, Delhi-110016, India 4 Department of Biomedical Engineering, All India Institute of Medical Sciences, Delhi-110016, India

September 24, PM, 2017 Sunday

SuA4
14:00-16:30
Room 3 (Peony Hall A)
Topic: Image and video processing

SuA4-1

A Hybrid Generative-Discriminative Learning Algorithm for Image Recognition

Bin Wang1 , Chuanjiang Li1, Xiong Li2 , Hongwei Mao1,
1 College of Information, Mechanical and Electrical Engineering, Shanghai Normal University, Shanghai, China
2 National Computer Network Emergency Response Technical Team, Beijing, China

SuA4-2

Multi-channel Feature for Pedestrian Detection

Zhixiang He, Meihua Xu, Aiying Guo
School of Mechatronics Engineering and Automation, Shanghai University, Shanghai, China

SuA4-3

Detection Method of Laser Level Line Based on Machine Vision

Xiaozhen Wang1, Haikuan Wang1, Aolei Yang1, Minrui Fei1, and Chunfeng Shen2
1 Shanghai Key Laboratory of Power Station Automation Technology, School of Mechatronic Engineering and Automation, Shanghai University, Shanghai, China
2 Shanghai Baosight Software Co., Ltd. Shanghai, China

SuA4-4

An Accurate Calibration Method of a Multi Camera System

Song Han, Xiaojing Gu, Xingsheng Gu
Key Laboratory of Advanced Control and Optimization for Chemical Process, Ministry of Education, East China University of Science and Technology, Shanghai, China

SuA4-5

A Novel Memory Gradient based for Efficient Image Segmentation

Kun Zhang1,2, Jianguo Wu1, Peijian Zhang1,
1 School of Electrical Engineering, Nantong University, Nantong, China
2 Nantong Research Institute for Advanced Communication Technologies, China

SuA4-6

Research on cigarette filter rod counting system based on machine vision

Hongjun Qu1, Peijian Zhang1,Kun Zhang1,2, Jianguo Wu1,
1 School of Electrical Engineering, Nantong University, Nantong, China
2 Nantong Research Institute for Advanced Communication Technologies

SuA4-7

Circular Mask and Harris Corner Detection on Rotated Images

Le Wang1, Minrui Fei1 ,Taicheng Yang2
Shanghai Key Laboratory of Power Station Automation Technology School of Mechatronic Engineering and Automation Shanghai University,Shanghai, China

SuA4-8

MEG Source Imaging Algorithm for Finding Deeper Epileptogenic Zone

Yegang Hu1,2, Yicong Lin3, Baoshan Yang1,2, Guangrui Tang1,2, Yuping Wang3, Jicong Zhang1,2
1 School of Biological Science and Medical Engineering, Beihang University, Beijing, China
2 Beijing Advanced Innovation Center for Big Data-Based Precision Medicine, Beihang University, Beijing, China
3 Department of Neurology, Xuanwu Hospital, Capital Medical University, Beijing, China

SuA4-9

A New Meanshift Target Tracking Algorithm by Combining Feature Points from Gray and Depth Images

Lu Lu1, Minrui Fei1, 2, Haikuan Wang1, Huosheng Hu3.
1 School of Mechatronics Engineering and Automation, Shanghai University, China
2 Shanghai Key Laboratory of Power Station Automation Technology, Shanghai University, China
3 School of Computer Science & Electronic Engineering, University of Essex, U.K.

SuA4-10

A Novel 3D Expansion and Corrosion Method for Human Detection based on Depth Information

Xiexin Qi1, Minrui Fei1,2, Huosheng Hu3, Haikuan Wang1
1 School of Mechatronics Engineering and Automation, Shanghai University
2 Shanghai Key Laboratory of Power Station Automation Technology, Shanghai University
3 School of Computer Science & Electronic Engineering, University of Essex

SuA4-11

An Adaptive Edge Detection Algorithm Based On Improved Canny

Aolei Yang1, Weiwei Jiang1, Ling Chen
Shanghai Key Laboratory of Power Station Automation Technology, School of Mechatronic Engineering and Automation, Shanghai University, Shanghai, China.

SuA4-12

Design of the Traffic Sign Recognition System Based on Android Platform
Jie Qiang, Shujing Wang and Zhenhua Shan
Shanghai University, Shanghai, China

SuA4-13
Apical growing points Segmentation by using RGB-D data
Pengwei Liu1 , Xin Li12, Qiang Zhou2
1 School of Mechatronics Engineering and Automation, Shanghai University, Shanghai, China
2 Shanghai Dushi Green Co., Ltd. China

SuA4-14
Towards Visual Human Tracking of Quadcopter: A Survey
Ling Chen, Xinxing Pan, Aolei Yang, Yulin Xu
Shanghai Key Laboratory of Power Station Automation Technology, School of Mechatronic Engineering and Automation, Shanghai University, Shanghai, China.

SuA4-15
Consensus of Multi-agent Systems with Diverse Time-varying Communication Delays and Self-delays
Zhaoxia Wang2, Dajun Du1, Minrui Fei1, and Yuchu Tian3,
1 Shanghai Key Laboratory of Power Station Automation Technology, School of Mechatronic Engineering and Automation, Shanghai University, Shanghai, China
2 School of Electrical Engineering and Automation, Qilu University of Technology, Jinan, China
3 School of Electrical Engineering and Computer Science, Queensland University of Technology, GPO Box 2434, Brisbane QLD 4001, Australia

SuA4-16
A Remote Control System with Dual Mode in Multi-channel Designed for Pigeon's Nerve Stimulation
Yunguo Chang 1, Xinlin Liu 1,2 Weiyan Hou1,3
1 School of Information Engineering, Zhengzhou University, Zhengzhou, Henan, China

SuB3
16:45-18:00
Room 3 (Peony Hall A)
Topic: Advanced Machine Learning Methods and Applications

SuB3-1
A Two-Stage Optimal Detection Algorithm Research for Pedestrians in front of the Vehicles
Yunlian Shao1,2 and Mei-hua Xu1 and Feng Ran3 and Dong-yang Shen1
1 Department of Automation, College of Mechatronics Engineering and Automation, Shanghai University, Shanghai, China
2 School of Physics and Electronic Electrical Engineering, Huaiyin Normal University Huai' an, China
3 Microelectronic R&D Center, Shanghai University, Shanghai, China

SuB3-2
Collision Free Path Planning for Welding Robot Based on CG-MOPSO
Xuewu Wang and Yixin Yan and Xingsheng Gu
Key Laboratory of Advanced Control and Optimization for Chemical Processes of Ministry of Education, East China University of Science and Technology, Shanghai, China

SuB3-3
Taxi Driving Anomalous Route Detection Using GPS Sampling Data
Zhiguo Ding
College of Mathematics, Physics and Information Engineering, Zhejiang Normal University, Jinhua, Zhejiang, 321004, China

SuB3-4
Study on Flame Combustion Stability Based on Particle Swarm Optimization Feature-weighted SVM
Rongbao Chen1, Honghui Jiang2 YangLiu3
1,2,3 Hefei University of Technology, Hefei 230009, China

SuB3-5
Study on Lamb Wave Dispersion Curves for the Testing of Metal Plates
Jinggang Xu1,2, Jingshan Deng1,3
1 Shanghai University, Shanghai, China
2 Changzhou Vocational Institute of Engineering, Changzhou, China
3 State Nuclear Power Plant Service Company, Shanghai, China

SuB3-6
Automatic Character Detection System for IC Test Handler Based on Active Learning SVM
Tianshan Wang, Fan Jiang, Xiaojin Zhu, Hesheng Zhang, Zhiyuan Gao
School of Mechatronic Engineering and Automation, Shanghai University Shanghai, China

SuB3-7
Active RFID Tags for Smart Shelf Based on LF Assistant Devices
Bing Bai, Xiaojin Zhu, Hesheng Zhang, Zhaoxun Zhang,
School of Mechatronic Engineering and Automation, Shanghai University Shanghai, P. R. China

SuB4
14:00-16:30
Room 4 (Peony Hall B)
Topic: Intelligent Modeling, Monitoring, and Control of Complex Nonlinear

Systems

SuB4-1

Zero-Shot Image Classification via Coupled Discriminative Dictionary Learning

Lehui Liu, Songsong Wu, Runqing Chen and Mengquan Zhou
Nanjing University of Post and Telecommunication, China

SuB4-2

Multivariate Fault Isolation in Presence of Outliers Based on Robust Nonnegative Garrote

Jianguo Wang1, Zhifu Deng1, Banghua Yang1, Shiwei Ma1, Minrui Fei1, Yuan Yao 2, Tao Chen 3
1 School of Mechatronical Engineering and Automation, Shanghai University, Shanghai Key Lab of Power Station Automation Technology, Shanghai, China
2 Department of Chemical Engineering, National Tsing-Hua University, Taiwan
3 Department of Chemical and Process Engineering, University of Surrey, Guildford GU2 7XH, UK

SuB4-3

Secant Method Based U-model Identification and Generalized Predictive Controller for Nonlinear Dynamic Systems

Ting Zhou, Jie Ding, Hui Deng
School of Automation, Nanjing University of Posts and Telecommunications, Nanjing, China

SuB4-4

Research on nonlinear Lamb wave based structural damage monitoring

Wang Qiang, Ji Dongchen, Zhou Chen
College of Automation, Nanjing University of Posts and Telecommunications, Nanjing, China

SuB4-5

Second-order Average Consensus with Buffer Design in Multi-agent System with Time-varying Delay

Junxian Yang1,2 Li Hui1,2 Peidong Wang3 and Yang Li4,5
1 Shandong Provincial Key Laboratory of Ocean Environment Monitoring Technology, Qingdao, China.
2 Shandong Academy of Sciences Institute of Oceanographic Instrumentation, Qingdao, China.
3 Qingdao Institute of product quality supervision and inspection, Qingdao, China
4 College of Mechanical & Electronic Engineering, Shandong Agricultural University, Tai'an, China
5 Shandong Provincial Key Laboratory of Horticultural Machinery and Equipment, Tai'an, China

SuB4-6

Adaptive consensus-based distributed targettracking in sensor networks

Xue Zhou1, Hao Zhang2, and Huaicheng Yan3
1 the Department of Control Science and Engineering, Tongji University, Shanghai, P. R. China
2 the Department of Control Science and Engineering, Tongji University, Shanghai, P. R. China
3 the Key Laboratory of Advanced Control and Optimization for Chemical Processes of Ministry of Education, School of Information Science and Engineering, East China University of Science and Technology, Shanghai, China

SuB4-7

Event-Triggered Consensus Tracking Control ofMulti-Agent Systems With Lipschitz-TypeDynamics

Yang Yang1 and Dong Yue1,2
1 College of Automation, Nanjing University of Posts and Telecommunications,Nanjing, China
2 The Jiangsu Engineering Laboratory of Big Data Analysis and Control for ActiveDistribution Network, Nanjing University of Posts and Telecommunications, Nanjing, China

SuB4-8

Formation Problem of Second-order Multi-agent Systems with Input Delay and Communication Delay

Yun Chai1 and Ke-cai Cao1,2
1 Nanjing University of Posts and Telecommunications, Nanjing, China
2 Nanjing University of Aeronautics and Astronautics, Nanjing, China

SuB4-9

Fault Estimation Observer Design of Nonlinear Systems with Actuator Faults

Xiangpeng Xie1,3 and Yanan Liu2
1 Institute of Advanced Technology, Nanjing University of Posts and Telecommunications, Nanjing, P. R. China
2 School of Automation, Nanjing University of Posts and Telecommunications, Nanjing, P. R. China
3 Hubei Province Collaborative Innovation Center for New Energy Microgrid, China Three Gorges University, China

SuB4-10

Stability Analysis of Event-Triggered Networked Control Systems with Time-Varying Sampling

Huaibin Xie1, Songlin Hu2
1 College of Automation, Nanjing University of Posts and Telecommunications, Nanjing,China
2 Hubei Provincial Collaborative Innovation Center for New Energy Microgrid, CTGU, China
2 Institute of Advanced Technology, Nanjing University of Posts and Telecommunications, Nanjing, China

SuB4-11

State Estimation-based Security Control forNetworked Systems under Hybrid Attacks

Hao Zhang1, Chen Peng1 and Hongtao Sun1
Shanghai Key Laboratory of power Station Automation Technology, School of Mechatronic Engineering and Automatic, Shanghai University, Shanghai, China

SuB4-12

Hopf bifurcation in a delayed two-neuronfractional network with incommensurate-order

Lingzhi Zhao1 , Beibei Shi1, Min Xiao2
1 School of Information Engineering, Nanjing Xiaozhuang University, Nanjing, China
2 College of Automation, Nanjing University of Posts and Telecommunications, Nanjing, China

SuB4-13

Networked control system based on LQ tracking and response strategy under data injection attack

Xinchun Jie,2, Minrui Fei1, Dajun Du1, T C Yang3
1 School of Mechanical Engineering and Automation,Shanghai University, Shanghai, China
2 School of Information and Engineering, Inner Mongolia University of Science and Technology, Baotou, China
3 Department of Engineering and Design University of Sussex, Brighton BN1 9QJ, UK

SuB4-14

Filtering for Stochastic Systems withTransmission Delays and Out-of-Order Packets

Li Liu1, Aolei Yang2, Wenju Zhou1, Qiang Tao3, Xiaowei Tu2, and Jun Yue1
1 School of Information Science and Electrical Engineering, Ludong University, Yantai, China
2 Shanghai Key Laboratory of Power Station Automation Technology, School of Mechatronic Engineering and Automation, Shanghai University, Shanghai, China
3 Department of Student Affairs, Shandong Commerce Vocational College, Yantai, Shangdong, China

SuB4-15

Local Bifurcation Analysis of a Fractional-Order Dynamic Model of Genetic Regulatory Networks with Delays

Qingshan Sun1, Min Xiao1, Lingzhi Zhao2, Binbin Tao1
1 College of Automation, Nanjing University of Posts and Telecommunications, Nanjing, China
2 College of Information Engineering, Nanjing Xiaozhuang University, Nanjing, China

SuB4-16

l_2/l_∞ Filtering for Wireless Networked Control Systems with Communication Constraints and Packet Losses

Li-sheng Wei, Yun-qiang Ma
School of Electrical Engineering, Anhui Polytechnic University, Wuhu City, Anhui Province, China

SuB4-17

Observer-based H_∞ Output Feedback Control for Switched Systems with Sojourn Probability Method

Lei Wang, Juan Li, Engang Tian, Yinghui Hu
School of Electrical Engineering and Automation Engineering, Nanjing Normal University, Nanjing, China

SuB5
16:45-18:00
Room 4 (Peony Hall B)
Topic: Advanced Methods for Networked Systems

SuB5-1

Event-triggered Communication and H_∞ Filtering Co-design for Networked Control Systems

Weili Shen1, Jingqi Fu1 , Jie Wu1, Weihua Bao2, Zhengming Gao
1 Department of Automation, College of Mechatronics Engineering and Automation, Shanghai University, China
2 Shanghai Automation Instrumentation Co. Ltd., China

SuB5-2

State Estimation for Discrete-time Complex Dynamical Networks with Markovian Packet Losses

Shengnan Cao, Youhong Wan
College of Automation, Nanjing University of Posts and Telecommunications, Nanjing, China

SuB5-3

Coverage and Control of Diffusion Process in Cyber-Physical Systems

Ke-cai Cao1,2 and Fujiao Zhou1 and Minglou Qian1
1 Nanjing University of Posts and Telecommunications, Nanjing, P. R. China;
2 College of Automation Engineering, Nanjing University of Aeronautics and Astronautics, Nanjing, P. R. China;

SuB5-4

Jamming Attacks against Control Systems: A Survey

Yanbo Dong1, Peng Zhou1
1 School of Mechatronic Engineering and Automation, Shanghai University, Shanghai, China.

SuB5-5

State Estimation For Complex Network With One Step Induced Delay Based On Structural Controllability and Pinning Control

Wei Wang, Youhong Wan, Xinyuan Liang
College of Automation, Nanjing University of Posts and Telecommunications,Nanjing, China

SuB5-6

Distributed economic dispatch based on consensus algorithm under event-triggered mechanism

Shengxuan Weng1, Dong Yue1, Chongxin Huang1
Institute of Advanced Technology, Nanjing University of Posts and Telecommunications, Nanjing, China.

SuB5-7

MTMDs-based Noise Control for Box-girder Bridge of High Speed Railway

Xiaoan ZHANG1,2, Guangtian SHI1, Jianjin YANG2 and Xiaoyun ZHANG1
1 School of Mechanical Engineering, Lanzhou Jiaotong University, Lanzhou, China
2 Train and Track Research Institute, State Key Laboratory of Traction Power, Southwest Jiaotong University, Chengdu, China

SuB5-8

The re-optimization strategy of multi-layer hybrid building's cooling and heating load soft sensing technology research based on temperature interval and hierarchical modeling techniques

Kai Liu, 1,2 Ting-Zhang Liu, 1,2 Ping Fang, 1,2 Zhan-Pei Li1,2
1 Department of Automation, College of Mechatronics Engineering and Automation, Shanghai University
2 Shanghai Key Laboratory of Power Station Automation Technology, Shanghai, China

SuC3
14:00-16:30
Room 5 (Yulan Hall A)
Topic: Advanced Computational Methods in Energy, Power, Electric Vehicles and Their Integration

SuC3-1

A Contract Based Approach for Electric Vehicles Charging in Heterogeneous Networks

Huwei Chen1, Zhou Su1, Yilong Hui1, Hui Hui1, and Dongfeng Fang2
1 School of Mechatronic Engineering and Automation, Shanghai University, P. R. China.
2 Department of Electrical and Computer Engineering, University of Nebraska-Lincoln (UNL), USA.

SuC3-2

Review of the Four Ports Electromechanical Converter used for Hybrid Electric Vehicle

Qiwei Xu1, Jing Sun1, Meng Zhao1, Xiaobiao Jiang1, Yunqi Mao1, and Shumei Cui2
1 Chongqing University, Chongqing, China
2 Harbin Institute of Technology, Harbin, China

SuC3-3

Location Model Research of Charging Station for Electric Vehicle Based on Users' Benefit

Fei Xia1,2, Zhicheng Wang1,2, Daogang Peng1,2, Zihao Li1, Zhijiang Luo1, Bo Yuan1,2
1 Faculty of automation engineering, Shanghai Universiy of Electric Power, Shanghai, P. R. China
2 Shanghai Engineering Research Center of Intelligent Management and Control for Power Process, Shanghai, China

SuC3-4

Research on Double Fuzzy Control Strategy for Parallel Hybrid Electric Bus

Qiwei Xu, Xiaoxiao Luo, Xiaobiao Jiang, Meng Zhao
State Key Laboratory of Power Transmission Equipment & System Security and New Technology, Chongqing University, Chongqing, China

SuC3-5

Optimal Battery Charging Strategy Based on Complex System Optimization

Haiping Ma1, 2, Pengcheng You1, Kailong Liu3, Zhile Yang3, and Minrui Fei4
1 State Key Laboratory of Industrial Control Technology, Department of Control, Zhejiang University, Hangzhou, China
2 Department of Electrical Engineering, Shaoxing University, Shaoxing, Zhejiang, China
3 School of Electronics, Electrical Engineering and Computer Science, Queen's University Belfast, Belfast, UK
4 Shanghai Key Laboratory of Power Station Automation Technology, School of Mechatronic Engineering and Automation, Shanghai University, Shanghai, China

SuC3-6

Design of Adaptive Predictive Controller for Superheated Steam Temperature Control in Thermal Power Plant

Hong Qian1,2 Yu-qing Feng1 Zi-bin Zheng1
1 Shanghai University Of Electric Power, Shanghai, China
2 Shanghai Key Laboratory of Power Station Automation Technology

SuC3-7

Extended State Space Predictive Control of Gas Turbine System in Combined Cycle Power Plant

Guolian Hou1, Tian Wang1, Huan Du1, Jianhua Zhang1 and Xiaobin Zheng2
1 School of Control and Computer Engineering, North China Electric Power University, Beijing, China
2 Beijing Hualian Electric Power Engineering Supervision Company, Beijing, China

SuC3-8

Decentralized H∞ load frequency control for multi-area power systems with communication uncertainties

Yanliang Cui1, Guangtian Shi1, Lanlan Xu2, Xiaoan Zhang1 and Xue Li1
1 School of Mechanical Engineering, Lanzhou Jiaotong University, Lanzhou, Gansu, China
2 School of Civil Engineering, Lanzhou Jiaotong University, Lanzhou, Gansu, China

SuC3-9

Cyber Security Against Denial of Service of Attacks on Load Frequency Control of Multi-Area Power Systems

Yubin Shen1, Minrui Fei1, Dajun Du1, Wenjun Zhang2, Srdjan Stankovi ′ c3 and Aleksandar Rakic3
1 Shanghai Key Laboratory of Power Station Automation Technology, Department of Automation, School of Mechatronical Engineering and Automation, Shanghai University, Shanghai, China
2 School of Communication and Information Engineering, Shanghai University, Shanghai, China
3 School of Electrical Engineering, University of Belgrade,Belgrade, Serbia

SuC3-10

Detecting Replay Attacks in Power Systems:A Data-Driven Approach

Mingliang May1, Peng Zhou1, Dajun Du1, Chen Peng1, Minrui Fei1 and Hanan Mubarak AlBuasax2
1 Shanghai University, China
2 University of Bahrain, Bahrain

SuC3-11

A Novel Dynamic State Estimation Algorithm in Power Systems under Denial of Service Attacks

Mengzhuo Yang, Xue Li, and Dajun Du
School of Mechatronical Engineering and Automation,Shanghai University, Shanghai, China

SuC3-12

H_∞ prediction triggering control of multi-area power systems load frequency control under DoS attacks

Zihao Cheng1, Dong Yue2, Xinli Lan3, Chongxin Huang2, Songlin Hu2
1 School of Computer Science, Nanjing University of Posts and Telecommunications, Nanjing, China
2 Institute of Advanced Technology, Nanjing University of Posts and Telecommunications, Nanjing, China
3 School of Automation, Nanjing University of Science and Technology, Nanjing, China

SuC3-13

New Framework Mining Algorithm Based Main Operation Parameters Optimization in Power Plant

Wencheng Huang 1, Li Jia 1 and Daogang Peng 2
1 School of Mechatronics Engineering and Automation, Shanghai University, Shanghai Key Laboratory of Power Station Automation Technology, Shanghai, China;
2 College of Automation Engineering, Shanghai University of Electric Power, Shanghai Key Laboratory of Power Station Automation Technology, Shanghai, China

SuC3-14

A Consensus-based Distributed Primal-dual Perturbed Subgradient Algorithm for DC OPF

Zhongyuan Yang, Bin Zou, Junmeng Zhang
School of Mechatronical Engineering and Automation, Shanghai University, Shanghai, China.

SuC3-15

Optimized Control of Ship DC Electric Propulsion System with Energy Storage Unit

Feng Ding1, Shuofeng Wang2 and Shaohua Zhang1
1 Key Laboratory of Power Station Automation Technology, Department of Automation, Shanghai University, Shanghai, China
2 Shanghai Marine Equipment Research Institute, Shanghai, China

SuC3-16

The Application of the Particle Swarm Algorithm to Optimize PID Controller in the Automatic Voltage Regulation System

Jing Wang1, Naichao Song2, Enyu Jiang3, Da Xu3, Weihua Deng3, Ling Mao3
1 College of Information Technology, Shanghai Ocean University, Shanghai, P. R. China
2 Xu Chang electric power supply company, Xu Chang City, Henan Province, P. R. China
3 College of Electrical Engineering, Shanghai University of Electric Power, Shanghai, P. R. China

SuC3-17

Research on the Bio-electromagnetic Compatibility of Artificial Anal Sphincter Based on Transcutaneous Energy Transfer

Peng Zan1, Chundong Zhang1, Suqin Zhang2, Yankai Liu1 and Yong Shao1
1 School of Mechatronics Engineering and Automation, Shanghai University;
Shanghai Key Laboratory of Power Station Automation Technology, Shanghai, China
2 Naval Aeronautical University Qingdao Campus, Qingdao, China

SuC4
16:45-18:00
Room 5 (Yulan Hall A)
Topic: Modeling, Simulation and Control in

Smart Grid and Microgrid

SuC4-1

The Role of Intelligent Computing in Load Forecasting for Distributed Energy System

Pengwei Su, Yan Wang1, Jun Zhao 1, Shuai Deng1, Ligai Kang1, Zelin Li1,Yu Jin1
1 Key Laboratory of Efficient Utilization of Low and Medium Grade Energy, Tianjin University, Tianjin, China

SuC4-2

Intelligent Control Methods of Demand Side Management in Integrated Energy System: Literature Review and Case Study

Yan Wang, Pengwei Su, Jun Zhao, Shuai Deng, Hao Li, Yu Jin
Key Laboratory of Efficient Utilization of Low and Medium Grade Energy, Tianjin University, Tianjin, China

SuC4-3

Optimal Design and Operation of Integrated Energy System Based on Supply-demand Coupling Analysis

Qiong Wu and Hongbo Ren
College of Energy and Mechanical Engineering, Shanghai University of Electric Power, Shanghai, China,

SuC4-4

Control strategies for the microgrid control system with communication delays

Weihua Deng1, Pengfei Chen1, Kang Li2, Chuanfeng Li3
1 College of Electrical Engineering, Shanghai University of Electric Power, Shanghai,China
2 School of Electronics, Electrical Engineering and Computer Science, Queen's University Belfast, UK
3 School of Computer and Information, Luoyang Institute of Science and Technology, Luoyang, China

SuC4-5

Secondary voltage control of microgrids with distributed event-triggered mechanism

Jing Shi, Dong Yue, and Shengxuan Weng
School of Automation and the Institute of Advanced Technology, Nanjing University of Posts and Telecommunications, Nanjing, China

SuC4-6

Frequent Deviation-Free Control for Micro-Grid Operation Modes Switching Based on Virtual Synchronous Generator

Yan Xu1 , Tengfei Zhang1, Dong Yue2
1 College of Automation, Nanjing University of Posts and Telecommunications, Nanjing, China
2 Jiangsu Engineering Laboratory of Big Data Analysis and Control for active distribution network, Nanjing, China

SuC4-7

Research on Field Service Scheduling Problem Based on Hybrid Fruit Fly Optimization Algorithm

Bin Wu , Min Dong
School of Economics& Management, Nanjing Tech University, Nanjing, China

SuC5
14:00-16:30
Room 6 (Yulan Hall B)
Topic: Optimization Methods and Computational Methods for Sustainable Environment

SuC5-1

A Novel Combination of Forecasting Model Based on ACCQPSO-LSSVM and Its Application

Nan Xiong1, Minrui Fei1, Sizhou Sun1;2, and Taicheng Yang3
1 School of Mechatronics Engineering and Automation, Shanghai University, Shanghai, China
2 School of Electrical Engineering, Anhui Polytechnic University, Wuhu, China
3 Department of Engineering and Design, University of Sussex, Brighton BN1 9QT, UK.

SuC5-2

Research on Power Terminal Access Control Technology Supporting Internet Interactive Service in Smart Grid

Song Deng, Liping Zhang, Dong Yue
Institute of Advanced Technology, Nanjing University of Posts and Telecommunications, Nanjing 210003, China

SuC5-3

An Improved Multi-objective Differential Evolution Algorithm for Active Power Dispatch in Power System with Wind Farms

Shu Xia1, Yingcheng Xu1, Xiaolin Ge2
1 Shibei Electricity Supply Company of State Grid Shanghai Municipal Electric Power Company, Shanghai, China
2 College of Electrical Engineering, Shanghai University of Electric Power, Shanghai, China

SuC5-4

Multi-level Maintenance Economic Optimization Model of Electric Multiple Unit Component Based on Shock Damage Interaction

Hong Wang 1, Yong He1, Lv Xiong1, Zuhua Jiang2
1 School of Mechatronic Engineering, Lanzhou Jiao Tong University, Lanzhou, P. R. China
2 School of Mechanical Engineering, Shanghai Jiao Tong University, Shanghai, P. R. China

SuC5-5

Numerical Investigation of the

Environment Capacity of COD, Inorganic Nitrogen and Phosphate in the Bohai Bay
Hao Liu and Zhi-kang Zhang
Shanghai Ocean University, Shanghai, China

SuC5-6
An Artificial Neural Network Model for Predicting Typhoon Intensity and Its application
Ruyun Wang1, Tian Wang2, Xiaoyu Zhang3, Qing fang4, Chumin Wu1, Bin Zhang1
1 College of Oceanography, Hohai University , Nanjing, China
2 College of Harbour, Coastal and Offshore Engineering, Hohai University, Nanjing, China
3 Department of Mathematics, College of Science, Beijing Forestry University , Beijing, China
4 Faculty of Science, Yamagata University, Yamagata 990-8560, Japan

SuC5-7
Analysis of Power Spectrum Feature Based on Slurry Noise in Electromagnetic Flowmeter
Jie Chen, Qiong Fei, Bin Li, Xiaojie Zheng
School of Mechatronic Engineering and Automation, Shanghai University, Shanghai, China

SuC5-8
A Two-stage Agriculture Environmental Anomaly Detection Method
Lili Wang1,2,Yue Yu1,2, Li Deng1,2, Honglin Pang1,2
1 School of Mechatronics Engineering and Automation, Shanghai University, Shanghai, China
2 Shanghai Key Laboratory of Power Station Automation Technology, Shanghai, China

SuC5-9
Building a Virtual Reality System for Intelligent Agriculture Greenhouse based on Web3D
Qun Huang 1,2, Li Deng1,2, Minrui Fei 1,2, Huosheng Hu3
1 School of Mechatronics Engineering and Automation, Shanghai University, China
2 Shanghai Key Laboratory of Power Station Automation Technology, Shanghai University, China
3. School of Computer Science & Electronic Engineering, University of Essex, UK

SuC5-10
Short-term Optimal Scheduling with the Consideration of Electric Vehicle Driving Rules
Xiaolin Ge, Chenhao Pei
College of Electrical Engineering, Shanghai University of Electric Power, 200090 Shanghai, China

SuC5-11
Unit Commitment Dynamic Unified Active and Reactive Power Dispatch of Microgrids with Integration of Electric Vehicles
Mohammed K. Al-Saadi1, 2, Patrick C. K. Luk1, John Economou 3
1 Cranfield University, Bedfordshire, UK
2 University of Technology, Baghdad, Iraq
3 Cranfield University, Swindon, UK

SuC5-12
Security-Constrained Two-Stage Stochastic Unified Active and Reactive Power Management System of the Microgrids
Mohammed K. Al-Saadi1, 2, Patrick C. K. Luk1
1 Cranfield University, Bedfordshire, UK
2 University of Technology, Baghdad, Iraq

SuC5-13
Optimal design and planning of electric vehicles within microgrid
Mohammed Alkhafaji1, Prof. Patrick Luk2, Dr John Economou3
1 Cranfield University, Bedford, UK
2 Cranfield University, Bedford, UK
3 Cranfield University, Shrivenham, Swindon, UK

SuC5-14
Charging and discharging strategy of electric vehicles within a hierarchical energy management framework
Mohammed Alkhafaji1, Prof. Patrick Luk2, Dr John Economou3
1 Cranfield University, Bedford, UK
2 Cranfield University, Bedford, UK
3 Cranfield University, Shrivenham, Swindon, UK

SuC5-15
State-of-Charge Estimation of Lithium Batteries Using Compact RBF Networks and AUKF
Li ZHANG1, Kang LI2, Dajun DU1, Minrui Fei1, Xiang LI2
1 School of Mechatronics and Automation, Shanghai University, Shanghai, China
2 School of Electronics, Electrical Engineering and Computer Science, Queen's University Belfast

SuC5-16
An improved multi-objective bare-bones PSO for optimal design of solar dish Stirling engine systems
Qun Niu, Ziyuan Sun and Dandan Hua
Shanghai Key Laboratory of Power Station Automation Technology, School of Mechatronic Engineering and Automation, Shanghai University, Shanghai, China

SuB6
16:45-18:00
Room 6 (Yulan Hall B)
Topic: Advanced Sliding Mode Control and Applications and Advanced Analysis of New Materials and Devices

SuB6-1

Influences of Stiffness of rail pads on system dynamic performances of heavy haul railway

Guangtian Shi1, Kaiyun Wang2, Qianxing Huang1 ,and Xiaoyun Zhang1,2
1 Lanzhou Jiaotong University, Lanzhou, China
2 Southwest Jiaotong University, Chengdu, China

SuB6-2

Noise observer based sliding mode control for time-varying delay systems

Yanliang Cui1, Guangtian Shi1, Lanlan Xu2, Xiaoan Zhang1 and Xue Li1
1 School of Mechanical Engineering, Lanzhou Jiaotong University, Lanzhou, Gansu, China
2 School of Civil Engineering, Lanzhou Jiaotong University, Lanzhou, Gansu, China

SuB6-3

Research on Speed Identification of Induction Motor Based on Sliding Mode Observer

Qiwei Xu, Meng Zhao, Xiaoxiao Luo, Xiaobiao Jiang, Yunqi Mao, Weidong Chen and Yiming Su
Chongqing University, Chongqing, China

SuB6-4

Magnetic Field Measurement Instrument Based on Asymmetric Giant Magneto-impedance Effect

Feng Jiang1, 2, Shulin Liu1
1 School of Mechatronics Engineering and Automation, Shanghai University, Shanghai, China
2 School of Mechatronics Engineering, Jiangsu College of Information Technology, Wuxi, China

SuB6-5

Analysis of Effective Transmission Distance of Double Transmitters in Magnetic Coupled Resonant WPT System

Nenghong Xia, Menglin Tian, Haisheng Lian, Yimin Zhu
Shanghai University of Electric Power, Shanghai, China

SuB6-6

Analysis on Al-Cu Dissimilar Materials Friction Stir Welding Butt Joint based on J Integral Model

Hongyu Sun1, Jun Zhu2, Shun Guo1, Yong Peng1, Qi Zhou1, Jun Huang1, Yushan Chen1
1 School of Materials Science and Engineering, Nanjing University of Science and Technology, Nanjing, China
2 Nanjing Institute of Technology, Nanjing, China

SuB6-7

Pinched hysteresis loop characteristics of a fractional-order HP TiO2 memristor

Min Shi1,2 and Songlin Hu1,2
1 Institute of Advanced Technology, Nanjing University of Posts and Telecommunications, Nanjing, P. R. China
2 Hubei Province Collaborative Innovation Center for New Energy Microgrid, China Three Gorges University, Yichang, P. R. China

SuB6-8

Integral Sliding Mode Based Precision Motion Control for PMLM

Yang Liu 1,2, Hao Luo 1, Zhile Yang 2, Zhenxian Fu 1, Xiaofeng Yang 2
1 Department of control science and engineering, Harbin Institute of Technology, Harbin, China
2 School of Microelectronics, Fudan University, China

BOOK OF ABSTRACTS

September 23, PM, 2017 Saturday

SaE1
14:00-18:00
Room 2 (Amethyst Hall)
Topic: UK-China Workshop on Smart Grid and Electric Vehicles

SaE1-1

Research on Model and Method of Maturity Evaluation of Smart Grid Industry

Yue He1, Junyong Wu1,2, Yi Ge2,3, Dezhi Li3,4, Huaguang Yan3,5
1 School of Electrical Engineering, Beijing Jiao Tong University, Haidian District, Beijing, China
2 State Grid Jiangsu Economic Research Institute, Nanjing, China
3 China Electric Power Research Institute, Beijing, China

Abstract. Smart grid has become the inevitable development trend of the modern power grid. The vigorous development of the smart grid led to the rise and development of the smart grid industry, seize the smart grid industry development opportunities, also has become one of the important choice of regional planning and construction. Scientifically reflecting the effect of regional development of smart grid industry of the conditions and the development of the industries to the region will guide regional smart grid industry planning, and encourage regional investment in the development of smart grid industry. This paper established smart grid industry maturity comprehensive evaluation index system from five aspects, the technical performance, industrial facilities, market environment, policy environment and social influence, to put forward to smart grid industry maturity evaluation algorithm, thus smart grid industry maturity assessment model is established, in order to provide reference for regional planning and smart grid industry.

SaE1-2

A Green Dispatch Model of Power System with Wind Energy Considering Energy-environmental Efficiency

Daojun Chen1, Liqing Liang1,Lei Zhang2, Jian Zuo1, Keren Zhang1, Chenkun Li1, Hu Guo1
1 State Grid Hunan Electric Power Corporation Research Institute, Changsha, China
2 Hunan Xiangdian Test and Research Institute Company Limited, Changsha, China

Abstract. With rising pressure caused by decreasing natural resources, there emerges stronger call for environmental protection and sustainable development. As a kind of environmental-friendly energy, wind power has been increasing in capacity around the world in recent years. As more and more wind power gets connected with the grid, its impact on power dispatch should also be considered. Based on traditional power system optimized dispatch, this paper introduces the energy-environmental efficiency concept into construction of a green dispatch model for wind incorporated power systems. The strategy takes both minimum resource consumption and best energy-environmental efficiency as indexes to assess the optimization of wind power incorporated systems from an environmental-friendly point of view. Fuzzy technology is adopted along with the tabu search-based PSO algorithm to solve the problem. It is proven that the proposed model is reasonable and of good practicality.

SaE1-3

A Novel RBF Neural Model for Single Flow Zinc Nickel Batteries

Xiang LI1, Kang LI1, Zhile YANG1 and Chikong WONG2
1 Queen's University Belfast, School of Electronics, Electrical Engineering and Computer Science, Belfast, UK,
2 The University of Macau, Department of Electrical and Computer Engineering, Macau, China,

Abstract. As a popular type of Redox Flow Batteries (RFBs), single ow Zinc Nickel Battery (ZNB) was proposed in the last decade without requiring an expensive and complex ionic membrane in the battery. In this paper, a Radial Basis Function (RBF) neural model is proposed for modelling the behaviours of ZNBs. Both the linear and non-linear parameters in the model are tuned through a new feedback-learning phase assisted Teaching-Learning-Based Optimization (TLBO) method. Besides, the fast recursive algorithm (FRA) is applied to select the proper inputs and network structure to reduce the modelling error and computational efforts. The experimental results confirm that the proposed methods are capable of producing ZNB models with desirable performance over both training and test data.

SaE1-4

Model Predictive Control Based on the Dynamic PLS Approach to Waste Heat Recovery System

Jianhua Zhang, Haopeng Hu, Jinzhu Pu and Guolian Hou

School of Control and Computer Engineering, North China Electric Power University, Beijing, China

Abstract. This paper investigates model predictive control scheme based on PLS latent space for CO_2 transcritical power cycle based waste heat recovery system. First, a control-oriented model is developed for the transcritical CO_2 power cycle system. For the sake of solving multi-variable and strong coupling problems of the transcritical CO_2 cycle system, model predictive control scheme based on the dynamic PLS approach is adopted and applied to this waste heat recovery system. The experimental results show that the adopted control method shows better performance in disturbance rejection and set-point tracking than PLS-PID control scheme for the CO_2 transcritical power cycle system.

SaE1-5

Optimization Allocation of Aerospace Ground Support Vehicles for Multiple Types of Military Aircraft

Fuqin YANG1 and Jinhua LI2,3 and Mingzhu ZHU4
1 Department of Military Logistics, Military Transportation University, Tianjin, China
2 Department of Automation, TNList, Tsinghua University, Beijing, P. R. China
3 The Logistics Information Center of PLA, Beijing, P. R. China
4 Innovation and Enterpreneurship Development Center, Tianjin Sino-German University of Applied Sciences, Tianjin, China

Abstract. As an important class of support resources, the allocation of aerospace ground support vehicles (AGSV) has important impact on the sortie generation rate of multiple types of military aircraft (MTMA). In this paper, a general queueing model of AGSV has been built to describe the features of the support process of MTMA using the multi-class closed queueing networks. To satisfy constraints on each sortie generation rate(SGR) of MTMA and get good economic benefits, an optimization allocation model of AGSV has been developed to minimize the total value of AGSV. Based on mean value analysis and marginal analysis, a solving algorithm determines the numbers of AGSV at each station. The results of a case study show applicability of the optimization model.

SaE1-6

Experimental Research on Power Battery Fast Charging Performance

Sun Jinlei , Li lei, Yang Fei, Li Qiang
School of Automation, Nanjing University of Science & Technology, Nanjing, China

Abstract. Lithium-ion battery fast charging issues have become a crucial factor for the promotion of consumer interest in commercialization, such as mobile devices and electric vehicles (EVs). This paper focuses on the experimental research on fast charging. A battery thermal model is introduced to investigate the temperature variation at high charging current rates 1C,3C,4C,5C. And charging experiments are taken at current rates respectively. The results show that high charging current rates could effectively reduce charging time. Besides, batteries can be charged to 77.5%,76.2%,72.5% of the capacity at 3C, 4C, 5C current rates respectively. The maximum temperature rises during charging are 4.5 ℃ , 5.5 ℃ , 6.6 ℃ respectively.

SaE1-7

Small-Signal Refinement of Power System Static Load Modelling Techniques

Gareth McLorn and Seán McLoone
School of Electronics, Electrical Engineering and Computer Science, Queen's University Belfast, Belfast, Northern Ireland, UK

Abstract. Loads are often represented as a weighted combination of constant impedance (Z), current (I) and power (P) components, so called ZIP models, by various power systems network simulation tools. However, with the growing need to model nonlinear load types, such as LED lighting, ZIP models are increasingly rendered inadequate in fully representing the voltage dependency of power consumption traits. In this paper we propose the use of small-signal ZIP models, derived from a neural network model of appliance level consumption profiles, to enable better characterizations of voltage dependent load behavior. Direct and indirect approaches to small-signal ZIP model parameter estimation are presented, with the latter method shown to be the most robust to neural network approximation errors. The proposed methodology is demonstrated using both simulation and experimentally collected load data.

SaE1-8

System Frequency Control of Variable Speed Wind Turbines with Variable Controller Parameters

Guoyi Xu1, Chen Zhu1, Libin Yang2, Chunlai Li2, Jun Yang2, Tianshu Bi1
1 State Key Laboratory of Alternate Electrical Power System with Renewable Energy Sources,

North China Electric Power University, Beijing, China
2 QingHai Province Key Laboratory of Photovoltaic Gird Connected Power Generation Technology, Xining, China

Abstract. System operators are require wind power plants to provide system frequency control to secure safe operation of power systems. This paper first discussed the available amount of kinetic energy from wind turbines which could be released to provide extra power, minimum rotor speed of wind turbines operate at different condition to provide system frequency control is defined. The strategy to determine the wind turbine frequency controller parameter values is proposed, which will release all the available kinetic energy to provide system frequency support, this strategy also make sure the wind turbine rotor speed drop during frequency support is within the limited range, which ensure the stable operation of the turbine. The proposed strategy is tested by simulations carried out with Matlab/Simulink., which demonstrated the improvements on wind turbine operation and system frequency control effect.

SaE1-9

Research on Parameters matching of Hybrid Electric Vehicle with Compound-Structure Induction Machine

Qiwei Xu1, Xiaobiao Jiang1, Meng Zhao1, Xiaoxiao Luo1, Weidong Chen1, Yunqi Mao1 and Shumei Cui2,
1 The State Key Laboratory of Power Transmission Equipment & System Security and New Technology Chongqing University, Chongqing, China
2 School of Electrical Engineering and Automation Harbin Institute of Technology, Harbin, China

Abstract. This paper analyzes the parameters matching problem of hybrid electric vehicle with compound-structure induction machine. According to vehicle dynamics model, the dynamic coupling of compound-structure induction machine can be studied. After the analysis of optimization for degree of hybridization, the research of parameters matching can be carried out. Furthermore, the design requirements of hybrid electric vehicle based on compound-structure induction machine are analyzed. As a result of above analysis, the requirements of three aspects: peak power, continuous power and energy are obtained. Finally, aid from the simulation of Cruise, it is verified that the parameters matching of optimization for degree of hybridization can be feasible.

SaE1-10

Research on Energy Interconnection Oriented Big Data Sharing Platform Reference Architecture

Wei Rao1, Jing Jiang1, Ming Yang2, Wei Peng2, Aihua Zhou1
1 Advanced Computing and Big Data Laboratory, Global Energy Interconnection Research Institute, State Grid Corporation of China, Beijing, China
2 Shanghai Electric Power Corporation Information Communications Branch, Shanghai, China

Abstract. In order to provide a unified data sharing service support for energy interconnection business, big data application development and operation, the large power data sharing platform for energy interconnection will integrate data storage, data calculation, data analysis and data service functions. This platform will not only invigorate the power data assets, bringing enormous economic benefits, but also promote economic restructuring and energy saving and emission reduction. This paper analyzes the development requirements of energy interconnection, and then designs the general framework, functional framework, technical framework and deployment framework of the power big data platform which is suitable for the energy interconnection. Finally, this paper lists the application flow and strategy of the big data platform, which is under the typical scenarios of transmission monitoring and status assessment real-time analysis and distribution network planning off-line analysis.

SaE1-11

A Discrete Fourier Transform based Compensation Task Sharing Method for Power Quality Improvement

Jianbo Chen, Dong Yue, Chunxia Dou, and Chongxin Huang
Institute of Advanced Technology and the Jiangsu Engineering Laboratory of Big Data Analysis and Control for active distribution network, Nanjing University of Posts and Telecommunications, Nanjing, China

Abstract. In this paper, a discrete Fourier transform (DFT) based compensation task sharing method is proposed for the improvement of power quality of main grid. Power quality problem induced by typical nonlinear loads is tackled by the cooperation of multi-functional grid-tied inverters (MFGTIs) with the compensation instruction as part of its reference. Unlink the ordinary method where communication is avoided, Low-bandwidth channel is used to transmit the

compensation reference after the current data are calculated by DFT. Simulation results are presented to demonstrate the effectiveness of the proposed method.

SaE1-12

A Combinational Clustering Approach to Household Electricity Load Curves

Qiang Zheng1,2 and Chen Peng1
1 Shanghai University, Shanghai, China
2 Shandong University of Technology, Zibo, China

Abstract. As one of the fundamental data mining tools, clustering technique has been applied in power system for a period of time. However traditional clustering methods have difficulties in finding representative load curves, and classifying the increasing load curves into groups. This paper proposes an ensemble load curve clustering method combining dimension reduction, partitioning clustering and hierarchical clustering. The proposed method can identify similar consumption patterns, and classify load curves into different groups in an efficient and accurate way. Using real consumer 24-hour load curves from power company, we investigated k-means, hierarchical clustering, and the combinational clustering algorithm. Result shows that the proposed method performs better in classifying customers into stable representative groups accurately according to silhouette coefficient value, and cuts down cluster building time greatly by dimension reduction.

September 23, PM, 2017 Saturday

SaA1
14:00-16:30
Room3 (Peony Hall A)
Topic: Biomedical Signal Processing And Computational Methods in Organism Modeling

SaA1-1

Research of Rectal Pressure Signal Preprocessing Based on Improved FastICA Algorithm

Peng Zan1, Yankai Liu1, Suqin Zhang2, Chundong Zhang1, Hua Wang1 and Zhiyuan Gao1
1 School of Mechatronics Engineering and Automation, Shanghai University;
Shanghai Key Laboratory of Power Station Automation Technology, Shanghai, China
2 Naval Aeronautical University Qingdao Campus, Qingdao, China

Abstract. In view of some shortcomings of the existing rectal function diagnosis method, we propose that use the artificial anal sphincter system to collect the human rectal pressure signal, and then achieve the diagnosis of human rectal status through the rectal function diagnosis model. Since the collected signal is not pure rectal pressure signal, the single-dimensional pressure signal is extended to a multidimensional time series by phase space reconstruction. And then preprocessing of the reconstructed signal is carried out by the improved fifteenth order Newton iteration Fast ICA algorithm. The improved algorithm is simulated and the better separation effect is realized, proving the feasibility of the algorithm.

SaA1-2

Classification of MMG Signal Based On EMD

Lulu Cheng1, Jiejing Wang1, Chuanjiang Li1, Xiaojie Zhan1,
Chongming Zhang1, Ziming Qi2, Ziqiang Zhang1,
1 College of information, Mechanical and Electrical Engineering of Shanghai Normal University, Shanghai, China
2 Tago Polytechnic, Dunedin, Otago, New Zealand

Abstract. Mechanomyography(MMG) signal is the sound from the surface of a muscle when the muscle is contracted. The traditional filtering algorithms for the processing of MMG signal would make most useful signal filtered when they are used to remove noise. According to MMG signal's characteristics, a new signal filtering method is presented in this paper based on combining empirical mode decomposition with digital filter, which has a better performance on MMG signal filtering processing in experimental analysis. With extracting the energy feature of wavelet packet coefficient as the feature of classifier, the BP neural network classifier gets a better classification results. The average classification results showed that the best performance for recognizing hand gestures with the energy feature of wavelet packet coefficient features was achieved by BP neural network with the accuracy of 86.41%. This work was accomplished by introducing the new signal filtering method for the recognition of different hand gestures; And suggesting basing on combining empirical mode decomposition with digital filter as a new filtering method in MG-based hand gesture classification.

SaA1-3

Adaptive KF-SVM Classification for Single Trial EEG in BCI

Banghua Yang1, Chengcheng Fan 1, Jie Jia 2*, Shugeng Chen 2, Jianguo Wang 1
1 Department of Automation, College of Mechatronics Engineering and Automation, Key Laboratory of Power Station Automation Technology, Shanghai University, Shanghai, China
2 Department of rehabilitation medicine, Huashan hospital,Fudan University, Shanghai, China

Abstract. Single trial electroencephalogram classification is indispensable in online brain–computer interfaces (BCIs). A classification method called adaptive Kernel Fisher Support Vector Machine (KF-SVM) is designed and applied to single trial EEG classification in BCIs. The adaptive KF-SVM algorithm combines adaptive idea, SVM and within-class scatter inspired from kernel fisher. Firstly, the within-class scatter matrix of a feature vector is calculated. And to construct a new kernel, this scatter is incorporated into the kernel function of SVM. Ultimately, the recognition result is calculated by the SVM whose kernel has been changed. The proposed algorithm simultaneously maximizes the discrimination between classes and also considers the within-class dissimilarities, which avoids some disadvantages of traditional SVM. In addition, the within-class scatter matrix of adaptive KF-SVM is updated trial by trail, which enhances the online adaptation of BCIs. Based on the EEG data recorded from seven subjects, the new approach achieved higher classification accuracies than the standard SVM, KF-SVM

and adaptive linear classifier. The proposed scheme achieves the average performance improvement of 5.8%, 5.2% and 3.7% respectively compared to other three schemes.

SaA1-4

Research on non-frontal face detection method based on skin color and region segmentation

Haonan Wang 1, Tianfei Shen 2
1 Department of Automation, School of Mechatronic Engineering and Automation, Shanghai University, Shanghai, China

Abstract. The detection of face region can be divided into two kinds: frontal and non-frontal faces. This thesis focuses on the detection of human face region in non-frontal cases. A method of separating face and neck region is presented to extract the non-frontal face in the image. Facial features are usually used in frontal face detection, such as eyes, mouth and etc. With complete facial features, the frontal face can be easier to detected with high accuracy now. However, the research on non-frontal face detection is just beginning. Since the non frontal face image can not provide complete facial features information, it is necessary to develop a new method. Skin color is the most prominent facial feature in the non-frontal cases. It is found that the skin color has better clustering capability in YCbCr color space. According to the skin color characteristics and illumination conditions in the YCbCr color space, the Gaussian model and the Otsu method are used to segment the skin color to extract the non-frontal face region in the images. But the segmented skin color area often contains the neck region. In this paper, the contour line of the chin is fitted by illumination intensity and position information, remove the neck area and get a face region without the neck. Simulation results show the effectiveness of the proposed method for the detection of non-frontal face region.

SaA1-5

Modelling and Analysis of the Cerebrospinal Fluid Flow in the Spinal Cord

Xiaode Liu1, Danmei Luo1, Panpan Hu2, Miao Yu2, Qiguo Rong1
1 Department of Mechanics and Engineering Science, College of Engineering, Peking University
2 Orthopaedic Department, Peking University Third Hospital, Beijing, P. R. China

Abstract. The cerebrospinal fluid (CSF) flow in the spinal cord is important in maintaining the stability of the central nervous system. However, the interaction between CSF and spinal cord is not well understood. A three-dimensional (3D) simplified finite element model (FEM) of a sheep CSF and spinal cord segment was developed, verified using clinical experimental data, and used to investigate the effect of deformations and stress distributions on spinal cord in normal physiological conditions. The commercial software ANSYS Workbench was adopted to simulate the unidirectional CSF flow along the coaxial tube, which considered the bi-directional fluid-solid coupling. It was demonstrated that CSF had a slight impact on the spinal cord, which was transmitted to the white and gray matter through the pia mater. The pia mater protected the normal physiological function of the white and gray matter while the spinal dura mater ensured the regular rate and pressure of CSF. It was also showed that the CSF flow in the spinal cord was laminar. This model might help us to better understand the mechanism of interaction between CSF and spinal cord and provide a baseline for mechanical comparisons in spinal cord injury.

SaA1-6

Fracture prediction for a customized mandibular reconstruction plate with finite element method

Danmei Luo1, Xiangliang Xu2, Chuanbin Guo2, and Qiguo Rong1
1 Department of Mechanics and Engineering Science, College of Engineering, Peking University, Beijing, China
2 Department of Oral and Maxillofacial Surgery, Peking University School and Hospital of Stomatology, Beijing, China

Abstract. The use of customized reconstruction plate is an effective method for reconstruction of mandibular continuity defects. Plate fracture is one of the most common postoperative complications. The aim of this study was to investigate the biomechanical behavior of the customized reconstruction plate by finite element method. The geometry model was created from computed tomography (CT) data of a patient. The muscle forces for the defected mandible under two common static biting tasks were estimated by a numerical optimization strategy with the objective function of minimization of overall muscle force. The simulation results revealed that changing bite from molar region to incisor region increased the maximum stress in the plate. The position of stress concentration, the upper-inner edge of the plate near ramus-end, was in agreement with that of fracture, which indicated that stress concentration regions were critical regions for fracture failure.

SaA1-7

Three-dimensional Pathological Analysis of Cerebral Aneurysm Initiation

Xinning Wang1, Kenta Suto1, Takanobu Yagi1,2, Koichi Kawamura1 and Mitsuo Umezu1
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Abstract. Cerebral aneurysm is known to initiate at the cerebral artery bifurcation. The pathological mechanism of cerebral aneurysm awaits further understanding especially on its initiation. This study sought to elucidate the three-dimensional structure of cerebral vascular bifurcations with and without aneurysms using human cadavers. The two cases had aneurysmal initiations out of total 7 cases. The studied structure was intimal hyperplasia, tunica media and internal elastic lamina, which were recognized by elastica masson staining. The results showed that the non-existence of tunica media and internal elastic lamina was found in the lesion without aneurysm. The non-existence of intimal hyperplasia was only found in the lesion with aneurysm. These data suggest that the formation of intimal hyperplasia may be related with the initiation of aneurysm. We regarded the boundary of existence arteriosclerosis as the position for new arteriosclerosis occurs and thought the direction of new arteriosclerosis grows would influence whether the cerebral aneurysm initiates or not.

SaA1-8

Research on Active and Passive Monitoring Fusion for Integrated Lamb Wave Structural Health Monitoring

Qiang Wang, Jie Hua, Dong-chen Ji
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Abstract. Lamb wave based active and passive monitoring technologies are both hot points in structural health monitoring (SHM). However, active and passive monitoring methods were usually worked independently. The interaction and complementarity between Lamb wave active and passive monitoring techniques was analyzed. According to the advantages and disadvantages of active and passive monitoring methods, the active and passive cooperative working mechanism was proposed which combined the active and passive monitoring approaches. In the new method, active scanning and monitoring was set to be trigged by passive acoustic emission event, and the scanning interval could be greatly extended to save the energy consumption and improving monitoring efficiency as the evolution of damages caused by service and external erosion were usually very long. Meanwhile, the results and diagnosis information of active and passive monitoring method could be fused to improve the monitoring accuracy. In addition, the hardware implementation and software frame of the new integrated system were given. The experimental validation showed that the new approach combined the advantages of active and passive monitoring methods, and improved the damage monitoring efficiency and accuracy.

SaA1-9

Current Solutions for the Heat-sink Effect of Blood Vessels with Radiofrequency Ablation: A Review and Future Work

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2 Division of Biomedical Engineering, University of Saskatchewan, Saskatoon, Canada
3 Department of Mechanical Engineering, University of Saskatchewan, Saskatoon, Canada

Abstract. Radio frequency ablation (RFA) as an alternative treatment to the conventional open surgery is the most popular minimally invasive thermal therapy, and it is widely used in clinic today. One of the most important limits for the RFA in clinic is the difficulty to deal with the heat-sink effect of blood vessels, as it causes the difficulty of control the RFA process and consequently the coagulation size of RFA is decreased considerably (empirically, the coagulation size is less than 3 cm with a single RFA electrode). This paper reviews the literature of the current solution for the heat-sink effect due to large blood vessels and suggests future work for finding more effective solutions.

SaA1-10

Extraction Technique of Spicules-Based Features for the Classification of Pulmonary Nodules on Computed Tomography

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Abstract. To avoid the deformation of spicules surrounding pulmonary nodules caused by the classic rubber band straightening transform (RBST), we propose a novel RBST technique to extract

spicules-based features. In this paper, the run-length statistics (RLS) features are extracted from the RBST image, in which a smooth circumference with a suitable radius inside the nodule is proposed as the border of transformed object. An experimental sample set of 814 images of pulmonary nodules was used to verify the proposed feature extraction technique. The best accuracy, sensitivity and specificity achieved based on the proposed features were 79.4%, 66.5%, 89.2%, respectively, and the area under the receiver operating characteristic curve was 87.0%. These results indicate that the proposed method of feature extraction is promising for classifying benign and malignant pulmonary nodules.

SaA1-11

An Embedded Driver Fatigue Detect System based on Vision

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Abstract. The embedded driver fatigue detect system is a real-time system can detect driver fatigue. In order to improve the performance of embedded driver fatigue monitor system, we propose a new system on chip (SOC) structure for accelerating the fatigue estimate. The new SOC consists two parts including the main processor and support vector machine IP core. An embedded Linux was transplanted and run the main algorithm which consists Haar-Adaboost classifier to locate the face and eyes. The SVM IP core accomplished the task of classifying the eyes' statues. At last the system will estimate the state with PERCLOS standard. The results show that the system can content the need of real-world.

SaA1-12

A Noncontact Measurement of Cardiac Pulse based on PhotoPlethysmoGraphy

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Abstract. Heart rate measurement is important for monitoring people's physiological and body state. In this paper, a heart rate measurement methodology based on PhotoPlethysmoGraphy(PPG) signal is proposed. Human face positions are detected and tracked in real time by using facial color videos taken from cameras by non-contact shooting. Signals containing pulse components are extracted from images of the forehead skin area for the purpose of calculating blood volume pulse waves via wavelet filtering. Hence, heart rates are calculated after energy spectrum analysis using Fourier transform. The method realizes non-contact measurement, which avoids potential discomfort caused by direct skin contact, and has the advantages of simple operation and low costs. The result indicates that it is sensible to apply this method to daily family heart rate monitoring and remote medical monitoring equipment.

SaA1-13

A Survey of the State-of-the-Art Techniques for Cognitive Impairment Detection in the Elderly

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2 Strathclyde Institute of Pharmacy & Biomedical Sciences University of Strathclyde, Glasgow G4 0RE, UK
3 School of Psychological Sciences and Health University of Strathclyde, Glasgow G1 1QE, UK
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Abstract. With a growing number of elderly people in the UK, more and more of them suffer from various kinds of cognitive impairment. Cognitive impairment can be divided into different stages such as mild cognitive impairment (MCI) and severe cognitive impairment like dementia. Its early detection can be of great importance. However, it is challenging to detect cognitive impairment in the early stage with high accuracy and low cost, when most of the symptoms may not be fully expressed. This survey paper mainly reviews the state of the art techniques for the early detection of cognitive impairment and compares their advantages and weaknesses. In order to build an effective and low-cost automatic system for detecting and monitoring the cognitive impairment for a wide range of elderly people, the applications of computer vision techniques for the early detection of cognitive impairment by monitoring facial expressions, body movements and eye movements are highlighted in this paper. In additional to technique review, the main research challenges for the early detection of cognitive impairment with high accuracy and low cost

are analysed in depth. Through carefully comparing and contrasting the currently popular techniques for their advantages and weaknesses, some important research directions are particularly pointed out and highlighted from the viewpoints of the authors alone.

SaA1-14

Identification Approach of Hammerstein-Wiener Model Corrupted by Colored Process Noise

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Abstract. For Hammerstein-Wiener model with colored process noise, this paper derives an identification approach. The correlation function between input and output data points is derived by using separable signal to realize that the unmeasurable internal variable is replaced by the correlation function of input, and then correlation analysis method is used to estimate the parameters of the output nonlinear part and linear part. Furthermore, a correction term is added to least square estimation to compensate error caused by process noise, and then to derive an error compensation recursive least square method for the observed data from Hammerstein-Wiener model. Therefore, the parameters of the input nonlinear part can be estimated by error compensation method. Finally, the advantages of proposed algorithm are shown by simulation example.

SaA1-15

A Novel Segmentation Framework Using Sparse Random Feature in Histology images of Colon Cancer

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Abstract. In this paper, we present a novel segmentation framework for glandular structures in Hematoxylin and Eosin stained histology images, choosing poorly differentiated colon tissue as an example. The proposed framework' target is to identify precise epithelial nuclei objects. We start with staining separate to detect all nuclei objects, and deploy multi-resolution morphology operation to map the initial epithelial nuclei positions. We proposed a new bag of words scheme using sparse random feature to classify epithelial nuclei and stroma nuclei objects to adjust the rest nuclei positions. Finally, we can use the boundary of optimized epithelial nuclei objects to segment the glandular structure.

SaA1-16

Skin Disease Recognition Method Based on Vertical Image Segmentation

Li-sheng Wei1, Quan Gan1, Tao Ji1
School of Electrical Engineering, Anhui Polytechnic University, Wuhu City, Anhui Province, P. R. China

Abstract. The skin diseases have a serious impact on people's life and health. The issue of using Image Processing technique can be very important to identify Herpes, dermatitis, psoriasis disease. Firstly, the diseases are needed to use image preprocessing, and the image is grouped into ten vertical images and the information of GLCM feature is extracted for identifying three different tissues; Secondly, the ten vertical image is segmented by using Markercontrolled watershed and Clustering Algorithm. Lesion area feature of the ten vertical images are extracted by using area pixel method. Based on this, the skin diseases are investigated with segmentation by using support vector machine (SVM) method. Finally, the examples are used to verify the effectiveness and feasibility of localized-automated image processing approach.

SaA1-17

Finite Element Analysis and Application of a Flexure Hinge based Fully Compliant Prosthetic Finger

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1 Complex and Intelligent Research Center, East China University of Science and Technology Shanghai, P. R. China
2 Department of Mechanical Engineering, University of Saskatchewan, Canada

Abstract. Prosthetic hand is usually made by rigid body mechanism with ropes and pulleys. Such a hand is not "soft" to patients or to objects to be manipulated by the hand. In this paper, the concept of compliant mechanism is applied to prosthetic finger. The main challenge in designing and constructing such a finger lies in the design of flexure hinge. First, a fully compliant finger with a monolithic structure and flexure hinge was built. Then, finite element analysis for the compliant finger

was implemented, and the results were compared with the experimental result to verify the design. Finally, the complaint finger was applied in a prosthetic hand design and worked excellent with the hand.

SaA1-18

Automatic Measurement of Blood Vessel Angles in Immunohistochemical Images of Liver Cancer

Hongbin Zhang1, Kun Zhang1, Li Chen2, Jianguo Wu1, Peijian Zhang1, Huiyu Zhou 3
1 School of Electrical Engineering, Nantong University, Nantong, China
2 Department of Pathology, Medical College, Nantong University, Nantong, China
3 School of Electronics, Electrical Engineering and Computer Science Queen's University Belfast

Abstract. This paper presents a method for automated measurement of vascular angle in immunohistochemical images of liver cancer. Firstly, Colour Deconvolution is used to conduct staining separation on a H&E-stained immunohistochemical image, and then blood vessels are segmented using an improved Otsu algorithm. Then the standard SURF algorithm is used to select feature points of the image, and then these feature points are divided into two equal groups according to the distance between individual feature points and the far left (or right) feature point. Finally, a standard least squares method is used to fit two lines using the two groups of points. When the linear deviation of the fitting result based on the two groups of feature points is significant, it is necessary to adjust the belonging of the points of the two groups, and then the two sets are fitted again respectively till the correlation coefficients of the two fitted lines are greater than the predefined threshold, meaning that the measurement of the blood vessel angle in the immunohistochemical map is completed. Compared with the experts' results, our proposed technique results in better accuracy. It is worthy to point out that, to our knowledge, our system is the first one that conducts automated measurement of blood vessel angle of immunohistochemistry.

SaA2
16:45-18:00
Room3 (Peony Hall A)
Topic: Bionics control methods, algorithms and apparatus

SaA2-1

Improvement of Acoustic Trapping Capabilityby Punching Specific Holes on Acoustic Tweezers

Haojie Yuan, Yanyan Liu
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Abstract. It is found that small particles can be successfully manipulated by the acoustic tweezers. This paper presents a method to improve the acoustic trapping capability by punching specific round holes on two vibrating V-shaped metal strips of the acoustic tweezers. A particle is trapped under the sharp edges of metal strips with some specific round holes. Its trapping capability is improved under certain conditions compared with the original acoustic tweezers. A finite element model is developed to calculate the acoustic radiation force. The effects of the radius, the number and the arrangement of the round holes on the acoustic radiation force on the top surface of the particle are discussed. It is found that the acoustic radiation force increases obviously when the radius of the hole is more than a certain magnitude by changing the vibrational mode of the acoustic tweezers. With the increase of number and the row in vertical direction of the round holes, the acoustic radiation force acting on the particle increases correspondingly.

SaA2-2

Motion Planning and Object Grasping of Baxter Robot with Bionic Hand

Xinyi Fei1, Ling Chen1,Yulin Xu 1, Yanbo Liu 2
1 School of Mechatronics Engineering and Automation, Shanghai University, China
2 Shanghai Industrial Technology Institute, China

Abstract: Grasping and moving objects is a natural behavior in human daily life, whereas it turns into an enormous challenge with robots. To analyze the difficulty of grasping and moving target objects, a arm-hand system is performed with 7-DOF dual arms robot and bionic hand in this paper. A numerical method is proposed to solve the problem of arm motion planning. And a novel grasping strategy is proposed for enabling bionic hand to grasp efficiently. Finally, the effectiveness of the proposed methodology is demonstrated using both computer simulation and physical experiment.

SaA2-3

Grasping Force Control of Prosthetic Hand Based on PCA and SVM

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3 EPFL, Neuchâtel, 2002, Switzerland; BFH, Biel, 2502, Switzerland

Abstract. This paper presents a control method of grasping force of prosthetic hand. Firstly, the correlated features of surface electromyogram (sEMG) signal that collected by MYO are calculated, and then principal component analysis (PCA) dimension reduction is processed. According to pattern classification model and sEMG-force regression model which based on support vector machine (SVM) to gain the force prediction value. In this approach, force is divided into different grades. The predicted force value is used as the given signal, and grasping force of prosthetic hand is controlled by a fuzzy controller, and combined with vibration feedback device to feedback grasping force value to patient's arm. The test results show that the method of prosthetic hand grasping force control is effective.

SaA2-4

Adaptive SNN Torque Control for Tendon-Driven Fingers

Minrui Meng1,2 , Xingbo Wang1,2 , Xiaotao Wang2,3
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2 Shanghai Aerospace Systems Engineering Research Institute, Shanghai, China
3 College of Astronautics, Nanjing University of Aeronautics and Astronautics, Nanjing, China

Abstract: Tendon-driven robot manipulators are often used to actuate distal joints. The tendons allow the actuators to be located outside the fingers. Conventionally, the use of the tendons of the fingers allows for the significant reduction to the size and weight, in this case, which approximately similar to that of the human. To achieve the interaction with unstructured environments, a torque control system is presented based on the single neuron networks (SNN) in this paper. The torque control allows the system maintain proper torques on the joints. Meanwhile, this controller calculates actuator positions based on the error measured by the actual joint torques and desired joint torques. Simulations have been conducted on a tendon-driven finger model to demonstrate that the proposed controller can achieve the faster response, and then decrease overshoot comparing to a PI controller.

SaA2-5

Application of human learning optimization algorithm for production scheduling optimization

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1 School of Mechatronic Engineering and Automation, Shanghai University, Shanghai, China
2 Department of Electrical (Power) Engineering, Mirpur University of Science and Technology, MUST, Mirpur AJ&K, Pakistan

Abstract. In this paper, Human Learning Optimal (HLO) algorithm is presented to solve the scheduling problem. HLO is a meta-heuristic search algorithm which is inspired by the process of human learning. Three learning operators are developed to generate new solutions and search for the optima by mimicking the learning behaviors of human. This new algorithm has been proved to be very effective in solving optimization problems. HLO is applied to solve an actual production scheduling problems in a dairy factory and the performance of HLO is compared with that of two other meta-heuristics algorithms, BSO-PSO and HGA. Comparison results demonstrate that HLO is a promising optimization algorithm.

SaA2-6

An Improved WKNN Indoor Fingerprinting Positioning Algorithm Based on Adaptive Hierarchical Clustering

Jian Li1 , Jingqi Fu2, Ang Li 1, Weihua Bao2, Zhengming Gao2
1 School of Mechatronic Engineering and Automation, Shanghai University, Shanghai, China
2 Shanghai Automation Instrumentation Co. Ltd., China

Abstract. Aiming at the dependence of the traditional indoor clustering positioning accuracy on the initial center and clustering number selection, an improved WKNN indoor fingerprint localization algorithm based on adaptive H clustering algorithm is proposed in this thesis. Specifically, an adaptive hierarchical clustering combined with positioning environment and fingerprint information without initial clustering center is introduced. At the same time, a RSSI information compensation method based on cosine similarity is proposed aiming at the problem of RSSI information packet loss for test nodes in complicated indoor location environment, with the result of positioning error decrease at test node by using cosine similarity between test nodes and fingerprint points to approximately compensate the missing RSSI information. The experimental

results indicate that the proposed adaptive hierarchical clustering algorithm can divide the experimental area adaptively according to fingerprint information, meanwhile the proposed fingerprint information compensation method can decrease the positioning error of the test node with incomplete information，by which the average positioning error in the experimental environment is decreased to 0.78 m compared with other indoor positioning algorithms.

SaA2-7

Short-term Load Forecasting Model based on Multi-label and BPNN

Xiaokui Sun, Zhiyou Ouyang, Dong Yue
Institute of Advanced Technology, Nanjing University of Posts and Telecommunications, Nanjing, China

Abstract. With the rapid development of smart grid, the importance of power load forecast is more and more important. Short-term load forecasting (STLF) is important for ensuring efficient and reliable operations of smart grid. In order to improve the accuracy and reduce training time of STLF, this paper proposes a combined model, which is back-propagation neural network (BPNN) with multi-label algorithm based on K-nearest neighbor (K-NN) and K-means. Specific steps are as follows. Firstly, historical data set is clustered into K clusters with the K-means clustering algorithm; Secondly, we get N historical data points which are nearest to the forecasting data than others by the K-NN algorithm, and obtain the probability of the forecasting data points belonging to each cluster by the lazy multi-label algorithm; Thirdly, the BPNN model is built with clusters including one of N historical data points and the respective forecasting load are given by the built models; Finally, the forecasted load of each cluster multiply the probability of each, and then sum them up as the final forecasting load value. In this paper, the test data which include daily temperature and power load of every half hour from a community compared with the results only using BPNN to forecast power load, it is concluded that the combined model can achieve high accuracy and reduce the running time.

SaA2-8

Hybrid Fx-NLMS Algorithm for Active Vibration Control of Flexible Beam with Piezoelectric Stack Actuator

Yubin Fang, Xiaojin Zhu, Haotian Liu, Zhiyuan Gao
School of Mechatronic Engineering and Automation, Shanghai University Shanghai, P. R. China

Abstract. Filtered-x Least Mean Square (FxLMS) algorithm is a meaningful adaptation algorithm used in the field of Active Vibration Control (AVC). Hybrid FxLMS algorithm, which is the combination of the feedforward structure and the feedback structure of FxLMS, has a better stability and could get the same performance with a lower filter order. In order to get a faster convergence speed, this paper adopts Normalized LMS (NLMS) algorithm to replace of LMS algorithm in the hybrid AVC system. To verify the Hybrid Fx-NLMS algorithm, this paper developed a simulation platform for active vibration control of a flexible beam with piezoelectric stack actuator using ADAMS and MATLAB SIMULINK. Simulation results show that the convergence speed and vibration suppression performance of the Hybrid Fx-NLMS algorithm are better than other traditional algorithms.

SaB1
14:00-16:30
Room4 (Peony Hall B)
Topic: Advanced Fuzzy and Neural Network Theory and Algorithms

SaB1-1

A robust fuzzy c-means clustering algorithm for incomplete data

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2 Department of Industrial Engineering, Tsinghua University, Beijing, P.R.China
3 School of Electronics, Electrical Engineering & Computer Science, Queens University Belfast, UK

Abstract. Date sets with missing feature values are prevalent in clustering analysis. Most existing clustering methods for incomplete data rely on imputations of missing feature values. However, accurate imputations are usually hard to obtain especially for small-size or highly corrupted data sets. To address this issue, this paper proposes a robust fuzzy c-means (RFCM) clustering algorithm, which does not require imputations. The proposed RFCM represents the missing feature values by intervals, which can be easily constructed using the K-nearest neighbors method, and adopts a min-max optimization model to reduce the impact of noises on clustering performance. We give an equivalent tractable reformulation of the min-max optimization problem and propose

an efficient solution method based on smoothing and gradient projection techniques. Experiments on UCI data sets validate the effectiveness of the proposed RFCM algorithm by comparison with existing clustering methods for incomplete data.

SaB1-2

Multi-objective optimization improved GA algorithm and fuzzy PID control of ATO system for train operation

Longda Wang, Xingcheng Wang, Dawei Sun and Hua Hao
School of Information Science and Technology, University of Dalian Maritime, China

Abstract. In order to solve the problem that automatic train operation control system considering the single factor and control is not easy to be accurate, a multi-objective optimization (MO) based on improved genetic algorithm (GA) and fuzzy PID control method is proposed in this paper. Firstly, based on train operation characteristics, a multi-objective model of train operation process is established. Secondly, in order to improve the performance of the algorithm, the train operation process is optimized by using linear weight method and multi-objective genetic algorithm. Third, in order to suppress the local convergence of GA, a dual population genetic mechanism is adopted in the iterative process. Finally, a fuzzy PID controller is embedded into the control designer after target curve and control train operation in real time according to the real time running state. The results show that the proposed algorithm can get a reasonable MO result and accurate real-time control.

SaB1-3

Research on AGV Trajectory Tracker Based on Fuzzy Control

Tongqing Feng1 and Bin Jiao2
1 Electrical Engineering College, Shanghai Dian Ji University, Shanghai, China
2 Shanghai Dian Ji University, Shanghai, China

Abstract. Aiming at the problem of Automated Guided Vehicles (AGV) trajectory tracking, a fuzzy controller is designed by the fuzzy control principle. The distance deviation and the angle deviation of the car are taken as the input variables of the fuzzy variable, and the voltage analog quantity can be used as the output variable. The traditional PID controller and the designed fuzzy controller are simulated by Matlab software. And the simulation results show that the AGV trajectory tracker based on fuzzy control can effectively solve the problem of unsatisfactory control in the case of large deviation.

SaB1-4

Stability Determination Method of Flame Combustion Based on Improved BP Model with Hierarchical Rate

Rongbao Chen, Zipei Cao, and Benxian Xiao
Hefei University of Technology, Hefei, China

Abstract. For the purpose of automatic monitoring of the boiler combustion stability and quantifying the degree of combustion stability, a determination model for the combustion stability based on BP neural network is proposed. This model, according to the digital image processing technology, captures flame combustion state images, then extracts combustion states. Aimed at shortcomings of BP algorithm -- anti-jamming ability, slow learning rate, easy to fall into local minimum, etc., this paper proposes a BP algorithm based on hierarchical dynamic adjustment of different learning rates. The samples are divided into training samples and test samples for training and testing the established model. Experience has shown that the improved model not only has better fault-tolerance and mapping ability but also improves recognition rates and computing speed, which can meet the real-time requirement of stability determination.

SaB1-5

A genetic neural network approach for production prediction of trailing suction dredge

Zhen Su 1,2, Jingqi Fu1, Jian Sun 2
1 Department of Automation, College of Mechatronic Engineering and Automation, Shanghai University, Shanghai, China
2 Marine equipment and technology institute, Jiangsu University of Science and Technology, Zhenjiang, China

Abstract. The working efficiency and economic benefit of trailing suction dredge are directly dependent on the earth production, so prediction of earth production is of great significance in the mechanism analysis and efficiency optimization of the trailing suction dredge. Suction dredger dredging process mode is a complex, non-linear dynamic model, and the model is affected by a variety of factors. This paper presents a genetic algorithm to improve the BP neural network model that is used to predict dredger production. In order to overcome the shortcomings of traditional BP neural network training time long and easy to fall into local minimum, this paper uses genetic algorithm to optimize the initial weights and thresholds of

BP neural network for dredger production prediction. The simulation results show that the genetic BP neural network has a better fitting ability. Compared with the BP neural network, it has the characteristics of good global search ability and high accuracy. The result shows that genetic BP neural network can accurately predict the production.

SaB1-6

A fault diagnosis method of gear based on SVD and improved EEMD

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2 School of Mechatronical Engineering and Automation, Shanghai University, Shanghai, China

Abstract. considering the random noise and the false IMF component which will led to the decrease of the quality of the EEMD decomposition, a fault diagnosis method is presented based on SVD and improved EEMD. First of all, using the SVD method to denoise fault signals for pretreatment, then using the correlation coefficient norm to eliminate the false IMF components which are gained by EEMD decomposition, then refactor the effective IMF components that are bigger than setting threshold, finally gain fault characteristic frequency of fault signal by using the Hilbert transform envelop demodulation. In rotating machinery fault platform QPZZ-II, fault signals of broken teeth, cracked gear and worn gear are acquired, respectively. using the method proposed in this paper, finally successfully extract the fault characteristic frequency of different type.

SaB1-7

Research on fault data wavelet threshold denoising method based on CEEMDAN

Zhouqun Liu, Guochu Chen
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Abstract. In order to carry out fault data denoising effectively, this paper proposes a wavelet threshold denoising method based on Complete Ensemble Empirical Mode Decomposition with the Adaptive Noise (CEEMDAN). This method uses CEEMDAN decomposition to obtain a series of frequency from high to low IMF component and the trend term of the fault data; Using permutation entropy value to determine which containing more noise component; using wavelet threshold denoising method to denoise the IMF component of containing more noise, to retain the effective information in the high frequency IMF component ; Finally, reconstruction the signal by adding the high frequency IMF component after denoising, low frequency component and the trend term to obtain the denoised data. In this paper, through simulation and measured data to verify this method. The results shows that the proposed method can suppress the noise interference, retain the useful fault signal, extract fault signal with high accuracy effectively.

SaB1-8

Evaluation of K-SVD Embedded with Modified l_1 -norm Sparse Representation Algorithm

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2 Department of Computer Science, Curtin University, Perth, Australia

Abstract. The K-SVD algorithm aims to _nd an adaptive dictionaryfor a set of signals by using the sparse representation optimization and constrained singular value decomposition. In this paper, firstly, the original K-SVD algorithm, as well as some sparse representation algorithms including $\boldsymbol{l_0}$ -norm OMP and $\boldsymbol{l_1}$ -norm Lasso were reviewed. Secondly, the revised Lasso algorithm was embedded into the K-SVD process and a new different K-SVD algorithms with $\boldsymbol{l_1}$ -norm Lasso embedded in(RL-K-SVD algorithm) was established. Finally, extensive experiments had been completed on necessary parameters determination, further on the performance compare of recovery error and recognition for the original K-SVD and RL-K-SVD algorithms. The results indicate that within a certain scope of parameter settings, the RL-K-SVD algorithm performs better on image recognition than K-SVD; the time cost for training sample number is lower for RL-K-SVD in case that the sample number is increased to a certain extend.

SaB1-9

Study on Path Planning of Unmanned Vehicle Based on Kinematic and Dynamic Contraints

Li Li, Benshan Zhong, Ziyan Geng
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Abstract. Considering that the conventional A* algorithm does not include vehicle

kinematics and dynamics constraints in the unmanned vehicle path planning, methods based on kinematics and dynamics constraints are proposed to solve problems of path planning for unmanned vehicles in this paper, including improved obstacle scanning method, Divide-and-Conquer Method, Greedy Algorithm and so on. Firstly, the kinematics and dynamics constraints of unmanned vehicles path planning are analyzed. Secondly, the corresponding solutions to these constraints are proposed. Thirdly, the Simulink/CarSim united simulation platform is built and the simulation and analysis are carried out under the condition of different obstacles and different speeds. The simulation results show that the proposed algorithm can better solve the problems of unmanned vehicle path planning with kinematics and dynamics constraints, which provides the basic theory and method for the path planning of unmanned vehicle in engineering.

SaB1-10

A Novel Immune-Endocrine-based Intelligent Algorithm for Information Diffusion on Social Network

Yanjun Liu, Yongsheng Ding, Kuangrong Hao, Lei Chen
Engineering Research Center of Digitized Textile & Apparel Technology, Ministry of Education, College of Information Science and Technology, Donghua University, Shanghai, China

Abstract. At present, most of research on information diffusion is based on epidemic spreading where the probability that the user is infected by the information is regarded as a constant, which has a less ability to reduce the information diffusion in the real network. In this paper, we analyze first the process of immune response and propose a novel information diffusion model based on immune mechanism, where the information tolerance, social reinforcement and memory enhancement is taken into account. Next up, a creative immune-endocrine-based intelligent algorithm (IEIA) for information diffusion is proposed inspired by the hormone transfer mechanism. Through activating the effective user, with the double gland adjustment mechanism, the cost of information diffusion has controlled in IEIA. Experiments show that the model can more accurately describe the process of information diffusion. Using IEIA, the information diffusion has effectively controlled to achieve the controllability of the transmission.

SaB1-11

Design and Optimization of Compliant Revolute Joint Based on Finite Element Method

Li Li, Ziyan Geng, Benshan Zhong
School of Mechatronics Engineering and Automation of Shanghai University, Shanghai, China

Abstract. In this paper, compliant revolute joints after topology optimization are reconstructed, and the finite element modeling of the reconstructed geometric models are carried out by ANSYS. A series of optimized compliant revolute joints are applied the boundary constraint to their external circle and tangential force is applied to their inner hollow circle by ANSYS to make the compliant revolute joints spin in the clockwise/counterclockwise direction. Then, displacement and stress of the compliant revolute joints are analyzed respectively. The results show that these structures after being optimized can achieve greater deformation than the initial one, which can meet the demand for large angle in the engineering applications. Simultaneously, the technology of 3D printing is used to fabricate the compliant revolute joints and the designed experimental program is proposed as well. Thus, the models which designed in this paper not only save materials but also improve the performance, which have a certain guiding significance in engineering applications.

SaB1-12

Optimal sensor placement based on relaxation sequential algorithm

Hong Yin1, Kangli Dong1, An Pan1, Zhenrui Peng1, Zhaoyuan Jiang1, Shaoyuan Li2
1. School of Mechatronics Engineering, Lanzhou Jiaotong University, China
2. School of Electronic Information and Electrical Engineering, Shanghai Jiao Tong University, China

Abstract. Relaxation sequential algorithm for optimal sensor placement is proposed by introducing the idea of edge relaxation operation of Dijkstra's algorithm. An initial solution set is generated by sequential algorithm, and is improved by relaxation till the relaxation operation terminates. The proposed algorithm takes modal assurance criterion (MAC) matrix as the object fitness function. A truss structure is applied as examples to verify the effectiveness of the new algorithm for optimal sensor placement.

SaB1-13

Study on the Magnetic Coupling and Decoupling Algorithm of Electrical Variable

Transmission

Qiwei Xu1, Jing Sun1, Yiming Su1, Weidong Chen1, Jianshu Huang1 and Shumei Cui2
1 Chongqing University, Chongqing, China
2 Harbin Institute of Technology, Harbin, China

Abstract. The Electrical variable transmission (EVT) is an electromechanical energy conversion device, which structure of inner machine (IM) and outer machine (IM) is concentric distribution. The outer rotor of EVT is the common magnetic circuit of IM and OM, which resulting in the serious magnetic coupling between them. In this paper, the internal magnetic field coupling problem of EVT is studied, which based on induction motor principle. Firstly, the finite element method (FEM) simulation is used to study the distribution discipline of the magnetic coupling and its influence on the inductances. The range of the self- and mutual-inductance of IM and OM is calculated quantitatively. Then, the mathematical model of EVT is deduced, then the winding phase current of IM and OM are simulated and analyzed with reference to the variable inductance parameters model. The variable parameter model is reasonable, which consistent with the expected results. Finally, the correctness of the variable parameter decoupling algorithm is verified by the prototype experiment.

SaB1-14

An Improved Dual Grey Wolf Optimization Algorithm for Unit Commitment Problem

Jian Liu 1 and Sanming Liu 2
1 Department of Electrical Engineering, Shanghai Dianji University, Shanghai, China
2 Department of Mathematics and Physics, Shanghai Dianji University, Shanghai, China

Abstract. An improved dual grey wolf optimization (GWO) algorithm with binary and dogmatic parts were proposed. The up and down state of units were optimized by binary grey wolf optimization (bGWO), and the exchange velocity was modified by adding two dynamical factors in random number producing. The GWO was used in units' load scheduling during the process of deciding up-down states and after the solution. One examples with 10 units including 24 period of time was simulated, the results showed the proposed algorithm improved convergence rate and accuracy of the solution.

SaB1-15

A New Quantum-Behaved Particle Swarm Optimization with a Chaotic Operator

Zhenghua Wu1, Dongmei Wu1, Haidong Hu2, Chuangye Wang3, Hao Gao1
1 The College of Automation, Nanjing University of Posts and Telecommunications, Nanjing, China
2 Beijing Institute of Control Engineering, Beijing, China
3 State Grid Guzhen Electric Power Company, Bengbu, China

Abstract. Particle Swarm Optimization has attracted many researcher to do further improvement on many real world problems. The quantum-behaved PSO is tested as an effective improved PSO for getting preferable results on many problems. In this paper, we introduce a chaotic operator into QPSO for further enhancing its global and local searching abilities. The experiments results show that, compared with the other PSOs, our algorithm gets more efficient results. It could be applied in more complex real world problems in our future work.

SaB1-16

A Method of Ridge-NNG-based Multivariate Fault Isolation in Presentence of Collinearity

Yimin Guo1, Jianguo Wang1, Banghua Yang1, Shiwei Ma1, Minrui Fei1, Yao Yuan2, Chen Tao3,
1 School of Mechatronical Engineering and Automation, Shanghai University, Shanghai Key Lab of Power Station Automation Technology, Shanghai, China
2 Department of Chemical Engineering, National Tsing-Hua University, Hsin-Chu, Taiwan
3 Department of Chemical and Process Engineering, University of Surrey, Guildford GU2, UK

Abstract. Multivariate fault isolation is a critical step for monitoring industrial chemical and biological processes. For some complex cases with strong correlation variables which commonly exist in the industry process, conventional methods may perform poorly. Therefore, to further improve the fault prediction accuracy, a fault isolation method based on the ridge nonnegative garrote variable selection algorithm (R-NNG) was proposed in this dissertation, it transformed the multivariate fault isolation problem into a variable selection problem in discriminant analysis, which is proven to be capable for handling strongly correlated variables by the application to the benchmark Tennessee Eastman (TE) process.

SaB1-17

Noise-Removal Method for Manifold Learning

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1 College of Automation and Electrical Engineering，Qingdao University，China
2 School of Mechatronic Engineering and

Automation, Shanghai University, China
3 University of Western Australia, Australia
4 Stage Grid Shandong Electric Power Company, China

Abstract. Manifold learning algorithms are nonlinear dimensionality reduction methods which could find the intrinsic geometry structure of the data points and recover the latent main factors that influence object changes. However, noise is unavoidable for datasets in the process of sampling. The noisy data easily get wrong results when using manifold learning algorithms. This paper proposes a noisy-data pre-processing method for manifold learning algorithms. Firstly, we utilize shrink strategy and adopt the eigenvalue linear criterion to find the tangent hyperplane of each data point. Then, we construct the local coordinate system for each tangent hyperplane and get the projection coordinates of each data point. Finally, we reconstruct the high-dimensional coordinates of each data point by affine transformation. The experiments show that the proposed method is effective and useful.

SaB2
16:30-18:00
Room4 (Peony Hall B)
Topic: Advanced Evolutionary Methods and Applications

SaB2-1

Dynamic Process Fault Isolation and Diagnosis Using Improved Fisher Discriminant Analysis and Relative Error of Variance

Huifeng Tian1,2, Li Jia1
1 Shanghai Key Laboratory of Power Station Automation Technology, Department of Automation, School of Mechatronic Engineering and Automation, Shanghai University, Shanghai 200072, China
2 College of Electric and Information Engineering, Jiangsu University of Science and Technology, Zhangjiagang Jiangsu, China

Abstract. The traditional fault detection methods have certain detection delay for dynamic processes with strong nonlinearity. In order to increase fault detection rate and decrease the fault detection delay, this paper proposed a new fault isolation and diagnosis method. The faulty and normal samples are separated using moving window Fisher discriminant analysis combining with mean and variance of projection error, then obtain the fault point position by hypothesis testing theory. Furthermore, the projection vector is revised by adding the auxiliary deviation. To identify the fault variables, relative error of variance is presented and compared with traditional complete deposition construction plots method. The simulation results of Tennessee Eastman benchmark process fault data sets show the advantages of this proposed method in fault isolation and diagnosis.

SaB2-2

An LMI approach to iterative learning control based on JITL for batch processes

Liuming Zhou, Li Jia
Shanghai Key Laboratory of Power Station Automation Technology, Department of Automation, School of Mechatronic Engineering and Automation, Shanghai University, Shanghai, China

Abstract. In this paper, in order to linearize the nonlinear model of batch processes, a batch process is modeled by just in time learning(JITL) method and dynamic updating locally linear model parameters along batch cycle is also proposed. Considering that the error between the actual model and the prediction model, iterative learning control strategy based on a quadratic performance criterion is proposed and the system controller is solved by linear matrix inequality(LMI) method. Moreover the convergence of tracking error based on ILC is also analyzed and the conditions of convergence is proposed. In order to satisfy the condition, a novel ILC method based on JITL is proposed. To improve the convergence speed, this paper further uses of ILC based on nominal trajectory. As a result, the simulation results show that the system has better accuracy of output. It provides a new way for the control of batch processes.

SaB2-3

Theme-based Spider for Academic Paper

Peifeng Yin1, Qiyu Shao2, Xingfu Wang1, Weihua Wang1,Fuyou Miao1, Chenxi Shao1,3
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2 Department of Computer Science, Dayananda Sagar Institutions, Bangluer University, India
3 Anhui Province Key Laboratory of Software in Computing and Communication, Hefei, China

Abstract. Nowadays contents of the web multiply everyday. However, for particular company or individual, some kind of information has higher priority. For example, among so much information on the internet, web pages containing academic papers are definitely more attractive to a researcher. And the problem lies in how to find that kind of data. Therefore we design a spider that targets only on online academic papers. Besides

reserving three major parts of a traditional spider, we make some modifications on Filter and Parser so that our spider is competent enough to accomplish the mission. And the essential mechanism of recognizing and extracting expected pages primarily lies on keyword-matching and Finite State Machine Theory. After roaming on two web sites, the spider successfully collects desirable information. We can safely see from the result that in future by optimization and modification this theme-based spider may work more efficiently or even expands to other fields of interest.

SaB2-4

Iterative Learning Identi_cation with BiasCompensation for Stochastic LinearTime-Varying Systems

Fazhi Song1, Yang Liu1, Zhile Yang2, Xiaofeng Yang2, and Ping He1
1 Department of Control Science and Engineering, Harbin Institute of Technology, Harbin, China
2 School of Microelectronics, Fudan University, Shanghai, China

Abstract. A novel iterative learning algorithm is proposed for the identification of linear time-varying (LTV) output-error (OE) systems that perform tasks repetitively over a finite-time interval. Conventional LTV system identification normally relies on recursion algorithms in time domain, which are unable to follow fast changing parameters because of an inevitable estimation lag. To overcome this problem, an extra iteration axis is introduced besides the time axis in the parameter estimation process, and identification algorithm performed in iteration domain is proposed. Firstly, a norm-optimal identification approach is presented to balance the tradeoff between convergence speed and noise robustness. Then a bias compensation algorithm is further proposed to improve the estimation accuracy. Finally, numerical examples are provided to validate the algorithm and confirm its effectiveness. The algorithm is effective to estimate both slow and abrupt parameter changes with high accuracy without estimation lags.

SaB2-5

A Skylight Opening Prediction Method Based on Parallel Dirichlet Process Mixture Model Clustering

Yue Yu1,2, Li Deng1,2, Lili Wang1,2, Honglin Pang1,2
1 School of Mechatronics Engineering and Automation, Shanghai University, Shanghai, China
2 Shanghai Key Laboratory of Power Station Automation Technology, Shanghai, China

Abstract. In order to process the massive distributed data, control the agricultural facilities intelligently and improve the production efficiency, a parallel Dirichlet Process Mixture Model (DPMM) clustering method is proposed in this paper based on Spark, which is a memory computing framework. Firstly, the prediction model of skylight opening degree in greenhouse is obtained by training the agricultural environmental and facilities data. Secondly, the model is used to predict the greenhouse skylight opening degree. Thirdly, by compared experiments, both the feasibility and the efficiency of the proposed parallel clustering are verified, the prediction accuracy is also calculated. The experimental results show that the proposed approach has higher efficiency and accuracy.

SaB2-6

Two-layer harmony search algorithm for a robust flow shop scheduling problem

Bo Wu, Bing Wang and Xingbao Han
School of Mechatronic Engineering and Automation, Shanghai University, Shanghai, China

Abstract. This paper discusses a two machines permutation flow-shop scheduling problem with uncertain job processing times, where the criterion is the weighted earliness and tardiness. Uncertain processing times are described by interval scenarios, and a robust scheduling model is established to minimize the maximum penalties for earliness and tardiness. The property for the worst-case scenario of processing times is discussed for this scheduling model. Based on the obtained conclusion, a two-layer harmony search algorithm is proposed to address the characteristic of two-layer searching space. The inner-layer harmony search algorithm is used for searching the scenario space for a given schedule, while the outer-layer harmony search algorithm is used for searching the min-max schedule space. Finally, an extensive experiment is conducted to testify the effectiveness of the proposed algorithm and the characteristics of the min-max robust solution obtained.

SaB2-7

Heuristic based terminal iterative learningcontrol of ISBM reheating processes

Ziqi Yang, Zhile Yang, Kang Li, Wasif Naeem, Kailong Liu

School of Electronics, Electrical Engineering and Computer Science,Queen's University Belfast, Belfast, BT9 5AH, UK

Abstract. The injection stretch blow moulding (ISBM) process is widely used to manufacture plastic bottles for the beverage and consumer goods industry. The majority of the production processes are open-loop systems, often suffering from high raw material and energy waste. In this paper, a heuristic based norm-optimal terminal iterative learning control (ILC) method is proposed to control the preform temperature profiles in the reheating process. The reheating process is a batch process, and ILC can achieve improved tracking performance in a fixed time interval. The terminal ILC (TILC) is a useful strategy when only the terminal temperature profile can be measured in a batch process like the preform reheating in ISBM. To balance the control performance and energy cost, a norm-optimal method is applied, leading to a proposal of the new norm-optimal TILC method in this paper. Heuristic methods including the swarm optimisation (PSO), differential evolution (DE) and teaching learning based optimization (TLBO) are used to calculate the sequence of norm-optimal control inputs for this non-linear batch process. Simulation results confirm the efficacy of the proposed control strategy.

SaB2-8

Application of LSSVM in Performance Test of Pneumatic Valves

Jiayuan Li1, Wei Sun2
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Abstract. Pneumatic valve is an important component of the car and also widely used in the automation industry. The performance of the pneumatic valves can be measured by a number of testing parameters which mainly depend on manual testing in China until now. In order to lessen the labor intensity and improve the test efficiency, we propose a pneumatic valve performance test method based on LSSVM algorithm. This method has tested the parameters of the leakage and pressure of the pneumatic valve so that multi-class data can be divided into multiple regions according to different characteristics. The experimental result shows that the proposed method is more accurate than the manual testing in improving the efficiency.

SaC1
14:00-16:30

Room5 (Yulan Hall A)
Topic: Computational Intelligence in Utilization of Clean and Renewable Energy Resources

SaC1-1

Research on Wind Speed Vertical Extrapolation Based on Extreme Learning Machine

Hui Lv1, Guochu Chen2
Electric Engineering School, Shanghai DianJi University, Shanghai, China

Abstract: In engineering, the method of wind speed vertical extrapolation is based on the actual wind data of the wind tower, and the wind shear index is used to calculate the wind speed at any height in the near ground. The wind shear index is only considered in the neutral state of the atmosphere, without considering the impact of atmospheric stability on the wind shear index, which has some limitations. At the same time, the calculation of the wind shear index is a rather complicated task when considering the atmospheric stability. In order to solve these problems, this paper puts forward to use extreme learning machine for fitting the relationship between wind speed at different heights. Extreme learning machine has the advantages of fast learning speed, good generalization ability and so on. In this paper, the results obtained by the extreme learning machine and traditional methods are compared with the measured values. The results show that the extreme learning machine has a better application prospect in the vertical wind speed extrapolation.

SaC1-2

Optimal scheduling of wind turbine generator units based on the amount of damage of impeller

Kai Lin and Guochu Chen
Department of Electrical Engineering, Shanghai Dianji University, Shanghai, China

Abstract. Impeller (blade and wheel) is one of the key components of wind turbine. According to different degrees of leaf and root damage and hub damage amount, a multi-objective scheduling model of wind farm with wind turbine impeller damage, wind turbine startup rate, and the uncertainty of the output of generator is established to improve the model output allocation strategy. Then optimize the model with the adaptive discrete particle swarm (ADPSO)and artificial bee colony algorithm(ABC), then obtaining the target power value and start-stop group. In combination with the practical example, the

simulation results show that the proposed method optimizes the start-up and shut-down times of the wind turbines and improves the operating life of the wind turbines.

SaC1-3

A short term wind speed forecasting method using signal decomposition and extreme learning machine

Sizhou Sun 1, 2, Jingqi Fu1, Feng Zhu1
1. School of Mechatronic Engineering and Automation, Shanghai University, Shanghai, China;
2. School of Electrical Engineering, Anhui Polytechnic University, Wuhu, China;

Abstract. In this study, a novel hybrid model using signal decomposition technique and extreme learning machine (ELM) is developed for wind speed forecasting. In the proposed model, signal decomposition technique, namely wavelet packet decomposition (WPD), is utilized to decompose the raw non-stationary wind speed data into relatively stable sub-series; then, ELMs are employed to predict wind speed using these stable sub-series, eventually, the final wind speed forecasting results are calculated through combination of each sub-subseries prediction. To evaluate the forecasting performance, real historical wind speed data from a wind farm in China are employed to make short term wind speed forecasting. Compared with other forecasting method mentioned in the paper, the proposed hybrid model WPD-ELM can improve the wind speed forecasting accuracy.

SaC1-4

A novel method for short-term wind speed forecasting based on UPQPSO-LSSVM

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1 School of Mechatronic Engineering and Automation, Shanghai University, Shanghai, China
2 School of Electrical Engineering, Anhui Polytechnic University, Wuhu, China

Abstract: In order to improve the accuracy of the short-term wind speed forecasting, this paper presents a novel wind speed forecasting model based on least square support vector machine (LSSVM) optimized by an improved Quantum-behaved Particle Swarm Optimization algorithm called up-weighted-QPSO (UPQPSO), which uses a non-linearly decreasing weight parameter to render the importance of particles in population in order to have a better balance between the global and local searching. The developed method is examined by a set of wind speeds measured at mean half an hour of two windmill farms located in Shandong province and Hebei province, simulation results indicate UPQPSO-LSSVM model yields better predictions compared with QPSO-LSSVM and ARIMA model both in prediction accuracy and computing speed.

SaC1-5

Structure Design and Parameter Computation of a Seawater Desalination System with Vertical Axis Wind Turbine

Yihuai Hu, Kai Li and Hao Jin
Marine Engineering Department, Shanghai Maritime University, Shanghai, China

Abstract. This paper proposes a method to firstly convert wind energy into thermal energy by a vertical axis wind turbine and then use thermal energy to evaporate seawater for fresh water generation. The working principle and structure characteristics of the S type vertical axis wind turbine， liquid-stirring heater and seawater evaporation chamber are described. Mathematical calculation of bucket diameter and other parameters of the liquid-stirring heater are carried out according to the driving torque of wind turbine. Evaporating chamber capacity for seawater desalination is determined according to the liquid-stirring heater. These calculation models are introduced including power, torque, tip speed ratio, height and diameter of wind turbine; power, torque, rotating speed, blades diameter and other structural parameters of liquid-stirring heater; diameter, height of evaporator chamber. Generated fresh water from the seawater desalination system under rated wind speed is estimated at 239.1 g/h, which verify the feasibility of this kind of wind-powered seawater desalination method.

SaC1-6

Inertial response control strategy of wind turbine based on variable universe fuzzy control

Le Gao, Guoxing Yu, LanLiu, and Huihui Song
School of Information and Electrical Engineering, Harbin Institute of Technology at Weihai, Weihai, China

Abstract. Wind turbines connect to the power grid through power converters, which makes the lack of effective synchronization relationship between generator speed and grid frequency. Existing strategies usually add an additional controller to utilize the hidden kinetic energy in wind turbines for frequency modulation, but this controller heavily dependents on the droop coefficient and the inertia constant. To avoid the influence of the two factors on the frequency modulation, this paper proposes an adaptive fuzzy control

strategy for the inertial response of wind turbine. Its universe can be changed with frequency deviation and rate of change of frequency (ROCOF). By comparison of the synthesize inertia control and common fuzzy control, results of our adaptive fuzzy controller show the advantages of accuracy and applicability.

SaC1-7

Base-load Cycling Capacity Adequacy Evaluation in Power Systems with Wind Power

Jingjie Ma, Shaohua Zhang, Liuhui Wang
Key Laboratory of Power Station Automation Technology, Department of Automation Shanghai University, Shanghai, China

Abstract. Large scale penetration of intermittent wind power may result in base-load cycling capacity (BLCC) shortage problem, which poses an adverse impact on secure operation of power systems. The integration scale of wind power is heavily relevant to the BLCC adequacy. Therefore, it is important to evaluate the BLCC adequacy of power systems. Using probabilistic production simulation technology, a BLCC adequacy evaluation method considering the forced outage of conventional generation units is developed in this paper. In this method, several BLCC adequacy indexes are defined, namely the probability of BLCC shortage index, the expectation of BLCC shortage index, and the expectation of BLCC margin index. A scenario reduction technique is employed to tackle the uncertainty of wind speed. Numerical examples are presented to verify the reasonableness and effectiveness of the proposed method. This work is helpful to determine the appropriate wind power integration scale in power systems.

SaC1-8

MFAC-PID Control for Variable-Speed Constant Frequency Wind Turbine

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1 School of Mechanical, Electronic and Control Engineering, Beijing Jiaotong University, Beijing, China
2 State Key Laboratory of Alternate Electrical Power System with Renewable Energy Sources, North China Electric Power University, Beijing, China

Abstract. Due to the randomness and fluctuation characteristics of wind power, those model-based systems having intrinsically nonlinear are harder to be controlled. Based on the variable-speed constant frequency wind power generator, this paper presents a MFAC-PID control strategy to realize model-free, I/O data based dynamic control. Firstly, a control input criterion is established for optimal design, which realizes the targets of maximum wind energy capture and smoothing power point tracking. Then, by the usage of model free adaptive control (MFAC), a series of equivalent local linearization models are built using time-varying pseudo-partial derivative (PPD), which could be estimated only by I/O measurement data. Finally, considering that both MFAC and PID will generate incremental output, a constrained MFAC-PID algorithm is proposed in order to obtain the optimal input. The proposed strategy is verified with comparison to PID and MFAC methods. Results prove that MFAC-PID algorithm guarantees the convergence of tracking error at full wind speed.

SaC1-9

A Multivariate Wind Power Fitting Model Based on Cluster Wavelet Neural Network

Ruiwen Zheng1, Qing Fang2, Zhiyuan Liu3, Binghong Li1 and Xiao-Yu Zhang1
1 Department of Mathematics, Beijing Forestry University, Beijing, P.R.China
2 Faculty of Science, Yamagata University, Yamagata 990-8560, Japan
3 Posts and Telecommunications, Chongqing University, Chongqing, P. R. China

Abstract. In this paper, we select the hierarchical cluster method to classify the wind energy level with the meteorological data, and then apply the 0-1 output method to quantify the wind energy level. Next, we utilize wavelet neural network to _t multivariate wind power data, which solves the problem of randomness, intermittency and volatility of wind power data. Finally, a wind-power numerical experiment shows the ideal fitting results with an error precision of 1:71% and demonstrates the effectiveness of our model.

SaC1-10

Control Strategy for Isolated Wind-Solar-Diesel Micro Grid System Considering Constant Load

Xuejian Yang * , Dong Yue 1, Tengfei Zhang 1
Institude of Advanced Technolgy, Automatic College, Nanjing University of Posts and Telecommunications, China

Abstract. With the technologies of renewable energy maturing, the micro grid will become more competitive. Based on constant load, the paper builds an experiment of the isolated wind-solar-diesel micro grid system. Furthermore, the experiment achieves the goal

that it can rationally regulate the diesel generators group, allocate the output power of the renewable energy according to the changes of the weather conditions and the power scheduling strategy. The feasibility and the effectiveness of the proposed approach are proved by the result of an isolated micro-grid experiment.

SaC1-11

Equilibrium Analysis of Electricity Market with Wind Power Bidding and Demand Response Bidding

Kai Zhang, Xian Wang, Shaohua Zhang
Key Laboratory of Power Station Automation Technology School of Mechatronic Engineering and Automation Shanghai University Shanghai, China

Abstract: In electricity markets with strategic bidding of wind power, it is important to handle wind power's output deviation. In this paper, the scenario where customers in Demand Response(DR) program matches the wind power's output deviation through strategic bidding is studied, and a stochastic equilibrium model of the electricity market with wind power bidding and demand response bidding is proposed. In this model, linear supply function bidding is applied by both wind power producers and traditional power producers to match power demand in wholesale market. In order to compensate for the wind power's output deviation, two market models in balancing market for demand response are proposed where supply function bidding and demand function bidding are applied by DR customers to match supply deficit and surplus respectively. Furthermore, the penalty cost for output deviation of the wind power producer is determined by the equilibrium price in balancing market. The equilibrium problems are solved by being reverse-engineered into convex optimization problems and the existence and uniqueness of the Nash equilibrium is theoretically proved. A distributed dual gradient algorithm is further proposed to achieve the equilibrium. Numerical examples are presented to verify the validity of the proposed model and effectiveness of the algorithms.

SaC1-12

Stability Analysis of Wind Turbines Combined with Rechargeable Batteries based on Markov Jump Linear Systems

Xiao-kun Dai1, Yang Song1,2, Mira Schüller3, Dieter Schramm3
1 School of Mechatronic Engineering and Automation, Shanghai University, Shanghai, China
2 Shanghai Key Laboratory of Power Station Automation Technology, Shanghai, China
3. Department Mechanical Engineering, University of Duisburg-Essen, Duisburg, Germany

Abstract. To maximize the output power in low wind speed and to maintain the demanded power of the turbine in high wind speed, switch control strategy is applied to wind turbines combined with rechargeable batteries. A mathematical model of a Markov jump linear system is established for such wind turbine systems. The method for determining the transition probability of the Markov chain is also presented. Then sufficient conditions for almost sure ability are proposed for this combined wind turbine system.

SaC1-13

Modeling and Simulation Study of Photovoltaic DC Arc Faults

Zhihua Li, Zhiqun Ye, Chunhua Wu, and Wenxin Xu
Shanghai Key Laboratory of Power Automation Technology, Shanghai University, Shanghai, China

Abstract. The DC arc fault is a major threat to the safety of photovoltaic systems, a large amount of heat from sustained arcs leads to fire accidents. Therefore, detecting the arc faults for PV systems is receiving considerable concern. In order to develop accurate and rapid detection and location methods for arc faults, it is important to establish an arc model to characterize and predict arc characteristics and transient response. In this paper, a new DC arc model is developed from a hyperbolic approximation by observing the arc current and voltage waveforms. Based on the derived model, pink noise is superimposed to obtain better frequency domain characteristics. After comparing the simulation and the experimental results, the model is proved to be suitable for transient simulations. Furthermore, developing detection algorithm and location strategies will also be based on the DC arc model.

SaC1-14

Data Management of Water Flow Standard Device Based on LabVIEW

Shaoshao Qin, Bin Li, Chao Cheng
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Abstract. It is very important to strengthen the research on water flow standard device. The software LabVIEW is used as the development platform of the software control

system for the flow standard device. A large amount of data is involved in the calibration process. A method of combination of the database system and file system is adopted to manage all data involved in the device on the basis of the actual needs. It can simplify data operations, process the calibration data automatically. In this way, a high accuracy for the calibration will be ensured and the automation level of the device will be improved.

SaC1-15

Design and Research of Water Flow Standard Facilities Based on Field Service

Chao Cheng1, Bin Li1, Shaoshao Qin1
School of Mechatronical Engineering and Automation, Shanghai University, Shanghai, China;

Abstract. A flow standard facility based on field service is designed to solve the problem of on-site high-precision parameter metering for water flow standard facilities, in which the water is take as the medium, the mass flowmeters are used as the transfer standard of liquid flow, the variable frequency pump and the surge tank are acted as the secondary regulation system, and the hardware and software platform of LabVIEW are conducted as the development system. The entire facility is small and light weight so that it can be carried to the scene for rapid calibration. Because it changes from sent by customers to sending calibration to customers and saves the standby time caused by disassembling and sending flowmeters, it improves the production efficiency of enterprises greatly. Ultimately, the facility can be produced and it will fill the domestic technical gap of water flow calibration based on field service.

SaC1-16

Fault Diagnosis Method of Ningxia Photovoltaic Inverter Based on Wavelet Neural Network

Guohua Yang 1,2, Pengzhen Wang 1, Bingxuan Li 1, Bo Lei 1, Hao Tang 1, Rui Li 1
1 Department of Electrical Engineering and Automation Ningxia University, Yinchuan, China
2 Ningxia Key Laboratory of Intelligent Sensing & Intelligent Desert, Yinchuan, China

Abstract: Accurate fault diagnosis is the premise to ensure the safe and reliable operation of photovoltaic three-level inverter. A fault diagnosis method based on wavelet neural network is researched in the paper. First of all, the topology and the fault characteristics of three-level inverter are analyzed, the fault features are analyzed for three-level inverter when single and double IGBTs fault, the eigenvectors of phase voltage, the upper bridge arm and the lower bridge arm voltage are extracted by three-layer Wavelet Package Transform, the BP neural network is designed for training data and testing. The simulation model is built by Matlab/Simulink, the simulation results show that the method can accurately diagnose for various fault circumstances.

SaC1-17

Research on Expert Knowledge Base of Intelligent Diagnosis Based on Tubing Leakage of High-pressure Heater in Nuclear Power Plant

Miao Zheng1,2,Hong Qian1,2, Siyun Lin 1,Bole Xiao 3,Xiaoping Chu1
1 School of Automation Engineering, Shanghai University of Electric Power, Shanghai, China
2 Shanghai Power Station automation technology key laboratory, Shanghai, China;
3 Shanghai Power Equipment Research Institute, China

Abstract. In order to improve the accuracy and timeliness of the tubing leakage of the high-pressure heater in the nuclear power plant, the fault diagnosis is carried out with the terminal difference triggered by the heat economy of the unit.Through the mechanism modeling of the tubing leakage of the high-pressure heater, the set of the symptom parameters related to the fault are obtained.The expert knowledge base of the tubing leakage in fault diagnosis system of the high-pressure heater is analyzed by using the mathematical statistics and the experience of the on-site experts.Through the insert of man-made fault in the 1000MW nuclear power model, the intelligent diagnosis expert system is used to fault diagnosis .The results show that the method can accurately diagnose the tubing leakage of the high-pressure heater by analyzing the monitoring parameters at the beginning of the fault, and prove the validity and feasibility of the knowledge base.

SaC2
16:30-18:00
Room5 (Yulan Hall A)
Topic: Intelligent Methods for Energy Saving and Pollution Reduction

SaC2-1

Research on Intelligent Early-warning System of Main Pipeline in Nuclear Power Plants Based on Hierarchical and Multidimensional Fault Identification Method

Hong Qian 1,2 , Siyun Lin1,2 , Miao Zheng1,2 ,

Qiang Zhang3
1 School of Automation Engineering, Shanghai University of Electric Power, Shanghai, China
2 Shanghai Power Station automation technology key laboratory, Shanghai, China
3 Shanghai Power Equipment Research Institute, Shanghai, China

Abstract. In order to improve the timeliness and accuracy of the fault identification for SB-LOCA (small break-loss of coolant accident),a hierarchical and multidimensional fault identification method is proposed, and a intelligent early-warning system is established to locate and evaluate the degree of the fault in the early stage,which can improve the operating safety of nuclear power plants.The faults in different kinds of locations and degrees are artificially inserted into the nuclear power simulator and are recognized by the early-warning system based on the method researched above.The results show that it can accurately locate and evaluate the tiny degree of fault, which verifies the validity and feasibility of the intelligent early-warning system.

SaC2-2

The Early Warning System of Nuclear Power Station Oriented to Human Reliability

Ren Shuai1, Qian Hong1,2
1 Shanghai University of Electric Power, Shanghai, China
2 Shanghai Key Laboratory of Power Station Automation Technology, Shanghai, China

Abstract. In order to improve the reliability of nuclear power plant operators in the face of the abnormal operation of nuclear island, this paper studies the early-warning system of nuclear power plant through the abnormal operation parameters of nuclear island. In this paper, the object studied about is the fault of the passive equipment of the reactor. After the reaction shutdown, operators can take the emergency measures in an accurate and timely manner. The early warning system will show how the fault is expected in the operational measures, so that operators can do respond to prepare. The early warning system studied in this paper is applied to nuclear power simulation system. Through the research on abnormal operation simulated by nuclear power simulation system, the results show that the early-warning system can improve human reliability of nuclear power plant in the face of abnormal operation.

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SaC2-3

Study on Lightweight Design and Connection of Dissimilar Metals of Titanium Alloy TC4 /T2 Copper/304 Stainless Steel

Shun Guo1, Qi Zhou1,*, Peng Xu2, Qiong Gao1, Tianyuan Luo1, Yong Peng1, Jian Kong1, KeHong Wang1, Jun Zhu3
1 School of Materials Science and Engineering, Nanjing University of Science and Technology, Nanjing, China
2 School of Mechanical Engineering and Automation, Shanghai University, Shanghai, China
3 School of Materials Science and Engineering, Nanjing Institute of Technology, Nanjing, China

Abstract. Under the background of lightweight design, manufacturing and improvement of comprehensive performance, dissimilar metals connection has been becoming a research focus recently and will have a broad application prospect. Titanium alloy TC4 and 304 stainless steel have many excellent properties, achievement of effective connection between these two materials has a significant promoting effect on Industrial Technology. However, the bonding connection of TC4/304 is very poor, so it is necessary to redesign the joint and further study the strengthening mechanism. In the paper, connection experiment of TC4/304 was carried out using two methods: Electron Beam Welding and Friction Stir Welding. Optical microscopy, SEM, EDS were applied for the analysis of microstructure and phase structure. The results state that EBW and FSW are effective and the maximum strength are 196Mpa and 178Mpa respectively. Both failure mode are brittle fracture.

SaC2-4

Research on warehouse scheduling optimization problem for broiler breeding

Wenqiang Yang, Yongfeng Li
Henan Institute of Science and Technology, Xinxiang, China

Abstract. Feeding on time, which is a key factor for the healthy growth of broilers. To minimize the feeding delay, a mathematical model considering the time spent on transferring feed is proposed. To solve the model above, a fruit fly algorithm (FFA) is adopted. Considering its disadvantages of trapping into local optima and low convergence accuracy, mutation operator and adaptive step-length is imposed to form an improved fruit fly algorithm(IFFA), which not only enhanced the convergence efficiency, but also ensured the global optimization. Finally, to verify the performance of the proposed algorithm, it is compared with FFA and genetic algorithm (GA). Simulation results prove that the feasibility and superiority of the

proposed algorithm.

SaC2-5

A Comprehensive Optimization of PD^{μ} Controller Design for Trade-off of Energy and System Performance

Ke Zhang1, Min Zheng1;2, and Kang Li3and Yijie Zhang1
1 School of Mechatronic Engineering and Automation,Shanghai University
2 Shanghai Key Laboratory of Power Station Automation Technology, Shanghai, China
3 School of Electronics,Electrical Engineering and Computer Science, Queens University Belfast, Belfast, UK

Abstract. This paper investigates the optimal trade-off between the system performance and control energy consumption for different settings of the control parameters kP , kD, _ and PD_ controller design, and a comprehensive optimization method is proposed to obtain the optimal PD_ controller. Detailed correlation analysis between the control performance and energy consumption is presented. The method is applied to the control of a ball-beam system, and the simulation results confirm that the proposed method is practically useful in the analysis and design of the PD_ controller.

SaC2-6

Hierarchical Time Series Feature Extraction for Power Consumption Anomaly Detection

Zhiyou Ouyang1,2,3, Xiaokui Sun1,2,3, and Dong Yue1,2,3,4
1 School of Automation, Nanjing University of Posts and Telecommunications,Nanjing, P. R. China
2 Hubei Province Collaborative Innovation Center for New Energy Microgrid, China Three Gorges University, Yichang , China.
3 Institute of Advanced Technology, Nanjing University of Posts and Telecommunications, Nanjing, P. R. China
4 Jiangsu Engineering Laboratory of Big Data Analysis and Control for Active Distribution Network, Nanjing University of Posts and Telecommunications, Nanjing, China

Abstract. Anomaly of power consumption, particularly due to electricity stealing, has been one of the major concern in power system management for a long time, which may destroy the demand-supply balance and lead to power grid regulating issues and huge pro_t reduction of electricity companies. One of the essential key to develop machine learning model to solve the above problems is time series feature extraction, which may a_ect the superior limit of machine learning model. In this paper, a novel systematic time series feature extraction method named hierarchical time series feature extraction is proposed, used for supervised binary classification model that only using user registration information and daily power consumption data, to detect anomaly consumption user with an output of stealing probability. Performance on data of over 100,000 customers shows that the proposed methods are outperforming one of the existing state-of-the-art time series feature extraction library tsfresh.

SaC2-7

Prospect Theory based Electricity Allocation for GenCos Considering Uncertainty of Emission Price

Yue Zhang, Shaohua Zhang
Shanghai Key Laboratory of Power Station Automation Technology, Department of Automation Shanghai University, Shanghai, China

Abstract: Under the electricity market environment, power generation companies (GenCos) can either sell electricity through the spot market or sell them through bilateral contracts. GenCos have to make electricity allocation strategies among different trading choices facing uncertainty of spot market prices. In addition, uncertainty of the emission price is increasing and will become an important risk factor for fossil fuel GenCos. In this paper, we develop a risk decision model for fossil fuel GenCos' electricity allocation based on the prospect theory, which considers GenCos' loss aversion characteristic. Under uncertainties of the electricity spot market price and emission price, the model maximizes the GenCo's overall prospect value through allocating reasonably electricity between the spot market and bilateral contracts. The simulation results show that GenCos' psychological expected profit and loss aversion characteristic have significant effects on their risk decision-making. As uncertainty of the emission price increases, fossil fuel GenCos will increase electricity sale in the spot market.

SaC2-8

Dispatching Analysis of Ordered Charging Considering the Randomness Factor of Electric Vehicles Charging

Ling Mao and Enyu Jiang
College of Electrical Engineering, Shanghai University of Electric Power, China

Abstract. With the popularity of Electric Vehicles (EV), the access of electric vehicles makes the load curve of distribution network

becomes more and more steep. The increase of EV load brought big impact on the power system and it is necessary to analyze random factors affecting the electric vehicle charging load. Distribution grid dispatching can reduce the gap between peak load and valley load so as to ensure power grid normal operation and power quality. Firstly EV charging load model is established based on the analysis the random factors affecting EV load, and the accumulation method of EV load is given. Secondly the dispatching model of coordination charging is built considering the randomness of EV charging, and the genetic algorithm was used to solve the model. Finally, with the IEEE 33 node test system, the load curve of power grid is obtained in the mode of disorderly charging and order charging dispatching, which proves the validity of the charging dispatching model, and the feasible strategies are provided by the analysis of simulation results.

SaD
14:00-16:30
Room6 (Yulan Hall B)
Topic: Selected Papers' Speeches

SaD-1

Automated Detection of Targets via a Focus of Attention for SAR Images

Fei Gao1, Fei Ma1, Jun Wang1, Jinping Sun1, Erfu Yang2, Amir Hussain3
1 School of Electronic and Information Engineering, Beihang University, Beijing, China
2 Strathclyde Space Institute, Department of Design, Manufacture and Engineering Management, University of Strathclyde, Glasgow G1 1XJ, UK
3 Cognitive Signal-Image and Control Processing Research Laboratory, School of Natural Sciences, University of Stirling, Stirling FK9 4LA, UK

Abstract. The high-resolution Synthetic Aperture Radar (SAR) images provide the richer features for target detection. However, the absence of efficient feature extraction and merging strategies limits their practicality. Inspired by the Focus of Attention (FOA) mechanism in the biological vision systems, we propose a method for detecting SAR targets. This method mainly includes two stages: global detection (GD) and local detection (LD). The GD stage aims to rapidly predict the location of suspicious areas or targets, while the LD stage aims to locate and segment the salient objects as a whole. The proposed method obtains equal or even better detection rate than that of vintage Constant False Alarm rate (CFAR), demonstrating its better feature extraction and processing capacity.

SaD-2

Passing Control between Driver and Highly Automated Driving Functions

Niko Maas1, Frederic Etienne Kracht1, Mira Schuller1, Weiyan Hou2, and Dieter Schramm1
1 Universitat Duisburg-Essen, Lotharstr. 1, 47057 Duisburg, Germany
2 School of Information Engineering, Zhengzhou University, Zhengzhou, Henan, China

Abstract. In this paper challenges to face in "taking over control from highly automated driving mode" are derived from human driving patterns and a technological analysis of the vehicle state. On the same basis, an automated driving model (driver model) is generated and used for studies in a driving simulator. Finally, strategies, which support the driver in taking over control from highly automated driving are designed in three different levels, implemented and tested in a driving simulator.

SaD-3

Integration of the Demand Side Management with Active and Reactive Power Economic Dispatch of Microgrids

Mohammed K. Al-Saadi1, 2, Patrick C. K. Luk1, John Economou3
1 Cranfield University, Bedford, U.K
2 University of Technology, Baghdad, Iraq
3 Cranfield University, Swindon, U.K

Abstract: This paper presents a fully developed integration of the demand side management (DSM) into multi-period unified active and reactive power dynamic economic dispatch of the microgrids (MGs) combined with unit commitment (UC) to reduce the total operating cost or maximizes the profit with higher security. In the proposed optimization approach all consumers, such as residential, industrial, and commercial one can involve simultaneously in the DSM techniques. The shifting technique is applied to the residential load, while demand bidding programme (DBP) is applied to the industrial and commercial loads. The proposed optimal approach is tested on a low voltage (LV) hybrid connected MG including different types of loads and distributed generators (DGs). The results reveal that the proposed optimization approaches reduce the operating cost of the MG, while there are no impacts of the DSM on the profit.

SaD-4

A Novel Data Injection Cyber-Attack against Dynamic State Estimation in Smart

Grid

Rui Chen, Dajun Du, and Minrui Fei
School of Mechatronical Engineering and Automation, Shanghai University, Shanghai, China

Abstract. Dynamic state estimation is usually employed to provide real-time operation and effective supervision of smart grid (SG), which has been also found vulnerable to a typical data injection cyber-attack submerged into big data. The attacks against dynamic state estimation can purposely manipulate online measurements to mislead state estimates without posing any anomalies to the bad data detection (BDD). Aiming at Kalman filter estimation, a novel data injection cyber-attack is proposed in this paper. Unlike the previous injection attack perfectly escaping the BDD, an imperfect attack targeting state variables is firstly investigated, and these targeted state variables are then determined by a new search approach, i.e., a ″-feasible injection attack strategy. Simulation results confirm the feasibility of the proposed attack strategy.

SaD-5

Analysis of cyber physical systems security issue viauncertainty approaches

Hui Ge1,2, Dong Yue1,2,3, Xiang-peng Xie2, Song Deng2, and Song-lin Hu2
1 School of Automation, Nanjing University of Posts and Telecommunications, Nanjing, P. R. China
2 Institute of Advanced Technology, Nanjing University of Posts and Telecommunications, Nanjing, P. R. China
3 Hubei Province Collaborative Innovation Center for New Energy Microgrid, China

Abstract. From security perspective, cyber physical system(CPS) security issueis investigated in this note. Based on a double-loop security control structure,the typical cyber attack called information disclosure, denial-of-service (DoS),deception attack and stealth attack are analyzed from uncertainty perspective. Theperformance of these attacks are formulated, meaningful models are proposedmeanwhile. According to aforementioned attacks, security control scenarios areobtained via the character of each kind cyber attack. And some novel results are obtained via a well designed double closed loop structure. At last, from traditionalstandpoint, uncertainties of a separately excited DC motor is taken as an exampleto demonstrate the problem.

SaD-6

Hybrid discrete EDA for the no-wait flow shop scheduling problem

Zewen Sun, Xingsheng Gu
Key Laboratory of Advanced Control and Optimization for Chemical Process, Ministry of Education, East China University of Science and Technology, Shanghai, China

Abstract. Flow shop scheduling problem is an important one in the real world production process. As tight constraint condition exits in just-in-time production systems, the no-wait flow shop scheduling problem (NWFSSP) is a typical research topic. In this paper, a hybrid discrete estimation of distribution algorithm (HDEDA) for NWFSSP is proposed to minimize the makespan. The proposed HDEDA utilizes the EDA and bat algorithm (BA). The probability matrix can be a view in the space distribution of the solution well by relying on the knowledge obtained from NWFSSP. The individual generated by sampling has the probability to spread throughout the entire solution space. Then, the designed step-based insertion in the BA stage attains the solution with the best makespan. All of the experiments are performed on the new hard benchmark for flow shop scheduling problems proposed by Ruiz in 2015. Through experimental comparisons, HDEDA shows better effectiveness than other algorithms.

SaD-7

Compact Real-valued Teaching-Learning Based Optimization for Continuous Optimization Problems

Zhile Yang1, Kang Li1, Haiping Ma2, Qun Niu3, Min Zheng3, Chenyang Ding4
1 School of Electronics, Electrical Engineering and Computer Science, Queen's University Belfast, Belfast, BT9 5AH, UK
2 Department of Electrical Engineering, Shaoxing University, Shaoxing, China
3 Shanghai Key Laboratory of Power Station Automation Technology, School of Mechatronic Engineering and Automation, Shanghai University, Shanghai, China
4 Extreme Motion Technologies, Eindhoven, Netherlands

Abstract. The majority of embedded systems are designed for speci_capplications, often associated with limited hardware resources in order to reduce the energy and production cost. Advanced computational intelligent techniques have been widely deployed in engineering problems, but may be hindered by the limited memory size in embedded systems. In this paper, a new compact teaching-learning based optimization method for solving global continuous problems is designed to reduce the system memory requirement without losing the algorithm performance, thus enabling its

easy implementation in embedded systems applications. Here, the recently proposed teaching-learning based optimization method is embedded into a compact estimation distributed based structure. The solutions are generated from an updated normal distribution and information is extracted through the original evolution logic of the algorithm. Numerical experiments on benchmark problems show that the new compact algorithm is capable of maintaining the high performance while the memory requirement is significantly reduced.

SaD-8

Surgical Timing Prediction of Patient-specific Congenital Tracheal Stenosis with Bridging Bronchus by Using Computational Aerodynamics

Juanya Shen1, Limin Zhu1, Zhirong Tong1, Jinfen Liu1, Mitsuo Umezu2, Zhuomin Xu1 and Jinlong Liu1, 3
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2 Center for Advanced Biomedical Sciences, TWIns, Waseda University, TWIns 03C-301, ASMeW Lab, 2-2 Wakamatsucho, Shinjuku 162-8480, Tokyo, Japan
3 Institute of Pediatric Translational Medicine, Shanghai Children's Medical Center, Shanghai Jiao Tong University School of Medicine, Shanghai, China

Abstract. Congenital tracheal stenosis (CTS) has a high clinical mortality in neonates and infants. Although the procedure of slide tracheoplasty (STP) applied over the years, it is still a challenge for clinicians to predict the surgical timing of the CTS correction. In the present study, we studied on three-dimensional (3D) aerodynamic analysis of an original tracheal model from a specific patient with CTS and bridging bronchus (BB) and four new reconstructed models. We constructed a 3D patient-specific tracheal model based on CT images and applied computer-aided design (CAD) to reconstruct four models to imitate the stenosis development of CTS. Average pressure drop (APD), wall shear stress (WSS) and velocity streamlines were calculated to analyze local aerodynamic characteristics for the evaluation of airflow at the inspiration phase and expiration phase, respectively. We found APD, WSS and AEL decreased during the respiration with the decrease of stenosis. Three abnormal gradients in APD were observed between the main stenosis of trachea arrived at 80% and 60%. This implied the surgical correction may be required when the main stenosis reached 60%. The combination of CAD and aerodynamic analysis is a potential noninvasive tool for surgical timing prediction in the management of patient-specific correction of CTS.

SaD-9

A Composite Controller for Piezoelectric Actuators with Model Predictive Control and Hysteresis Compensation

Ang Wang and Long Cheng
State Key Laboratory of Management and Control for Complex Systems, Institute of Automation, Chinese Academy of Sciences, Beijing, China.

Abstract. Piezoelectric actuators (PEAs) are ubiquitous in nanopositioning applications due to their high precision, rapid response and large mechanical force. However, precise control of PEAs is a challenging task because of the existence of hysteresis, an inherent strong nonlinear property. To minimize its influence, various control methods have been proposed in the literature, which can be roughly classified into three categories: feedforward control, feedback control and feedforward-feedback control. Feedforward-feedback control combines the advantages of feedforward control and feedback control and turns into a better control scheme. Inspired by this strategy, a composite controller is proposed for the tracking control of PEAs in this paper. Specifically, the model of PEAs is constructed by a multilayer feedforward neural network (MFNN). This model is then instantaneously linearized, which leads to an explicit model predictive control law. Then, an inverse Duhem hysteresis model is adopted as a feedforward compensator to mitigate the hysteresis nonlinearity. Experiments are designed to validate the effectiveness of the proposed method on a piezoelectric nanopositioning stage (P-753.1CD, Physik Instrumente). Comparative experiments are also conducted between the proposed method and some existing control methods. Experimental results demonstrate that the root mean square tracking error of the proposed method is reduced to 16% of that under the previously proposed model predictive controller.

SaD-10

Intelligent Decentralized Multivariable PID Controller Design of Interacting Multivariable Processes using the Human Learning Optimizer

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1 Department of Electrical (Power) Engineering

Mirpur University of Science and Technology, MUST, Mirpur AJ&K, Pakistan
2 Shanghai Key Laboratory of Power Station Automation Technology School of Mechatronic and Automation, Shanghai University, Shanghai, China

Abstract. Designing a decentralized controller with effective decoupling characteristics for interacting multivariable processes is a challenging task due to strong loop interactions. In this paper, a recently proposed intelligent metaphor called human learning optimizer (HLO) with adaptive learning rates is used in the design of such controllers. In order to achieve adequate decoupling characteristics the design problem is stated in the form of a composite cost functions with embedded design preferences. Simulation studies are carried out on two benchmark processes described by Wood and Berry (WB：2×2) and Ogunnaike and Ray (OR:3×3) having highly interacting control variables. In each of the selected cases, performance of the HLO based designed controllers is compared with some recently reported intelligent methods such as binary coded extremal optimization [BECO], state transition algorithm [STA], linear programming (LP) as well as with conventional methods. In the first case, the performance indices such as integral of the absolute error (IAE) are computed both with PIDs in full mode and with the derivative action switched off. Similarly, in the second instance, the IAEs for set-point tracking and interaction attenuation in aggregate and in each of the individual loops are also computed. On the basis of the simulation studies it is observed that the HLO based designed controllers exhibit improved transient performance and effective decoupling than the other controllers considered in the comparison on the selected benchmark instances. Based on the simulation studies, it is further inferred that the new metaphor is competitive with the other state of the art metaheuristics and reflects excellent exploration, exploitation and convergence characteristics.

SaD-11

Technology of Cortical Bone Trajectory on The Influence of Stability in Fixation of Burst Fracture of Thoracolumbar Spine: A Finite Element Analysis

Jianping Wang1, Juping Gu1, Jian Zhao2, Xinsong Zhang1, Liang Hua1, Chunfeng Zhou3
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2 Department of Orthopaedics, Changzheng Hospital, Second Military Medical University, Shanghai, China
3 Department of Orthopaedics, Rich Hospital of Nantong, Nantong, China

Abstract. Objective To study the biomechanical stability of a new screw-setting technique, we used cortical bone trajectory (CBT) in injury vertebra relative to the traditional pedicle screw-setting technique.
Methods: We used thoracolumbar spine CT data of a healthy adult male volunteer and engineering data of internal fixation system of spine to simulate intact state, burst fracture state and combination of three kinds of internal fixation state of the spine: (1) 4 pedicle screws cross segment and 2 rods (P4); (2) 4 pedicle screws, 2 CBT screws at injured vertebrae and 2 rods (P4C2); (3) 6 pedicle screws and 2 rods (P6). Then we compared differences of the stability of the corresponding fixed system and stress distribution of fixation models of three groups above.
Results: The total deformation of all nodes of the fracture spine model of P4C2 was less than the fracture spine model node group of P4 and larger than the fracture spine model node group of P6 during normal weight status, rotation(right), bending forward, stretch and lateral bending(right) state. The equivalent stress of all nodes of internal fixation system of P4C2 was smaller than the fixation model node group of P4 and bigger than the fixation model node group of P6 during normal weight status, rotation(right), bending forward, stretch and lateral bending(right) state.
Conclusion: CBT technology for injured vertebra fixation could provide more stability of the vertebral body and reduce stress concentration of internal fixation system compared to the traditional P4 fixation.

SaD-12

Dynamical characteristics of anterior cruciate ligament deficiency combined meniscus injury knees

Wei Yin1, Shuang Ren2, Hongshi Huang2, Yuanyuan Yu2, Zixuan Liang2, Yingfang Ao2, and Qiguo Rong1
1 Department of Mechanics and Engineering Science, College of Engineering, Peking University, Beijing, China
2 Beijing Key Laboratory of Sports Injuries, Institute of Sports Medicine, Peking University Third Hospital, Beijing, China

Abstract. It has been commonly believed that concomitant meniscus injuries may alter the dynamical condition of knee joint. The aim of this study was to analyze dynamical characteristics of ACLD knees with or without

meniscus deficiency during level walking. The results indicated that meniscus plays an important role in bearing knee rotation moment. Additionally, the deficiency of meniscus could affect the dynamical condition of ACLD knees, especially during mid-stance phase and mid-swing. Future studies should focus on dynamical characteristics during those phases and related muscles.

SaA3
16:45-18:00
Room6 (Yulan Hall B)
Topic: Modeling and simulation of life systems and Data Driven Analysis

SaA3-1

Research of Model Identification for Control System Based on Improved Differential Evolution Algorithm

Li Zheng 1, Daogang Peng 1, Yuzhen Sun 1, Sheng Gao 2
1. College of Automation Engineering, Shanghai University of Electric Power, Shanghai, China;
2. Shanghai Power Equipment Research Institute, Shanghai, China

Abstract. Differential evolution algorithm is a heuristic global search technology based on population, which has received extensive attention from the academic community. Evolution algorithm is applied to the identification and optimization of double-tank system in this article. Firstly, the paper introduces the basic principle of the system identification and differential evolution algorithm. Secondly, design the identification scheme of double-tank system based on differential evolution algorithm. Identify the system according to the data measured in the experiment. Based on the commonly used three models and combined with DE/rand/1/bin, the model structure which best complies with the original experimental data is selected, and the improved form of the difference algorithm is further studied on the basis of the model structure. A large number of experiments have been carried out, the algorithm in other references may only improve one of CR or F, and the two will be all compared in this paper. The results of comparative analysis show that the improved differential evolution algorithm is, to some extent, superior to the basic differential evolution algorithm on identification accuracy of double-tank.

SaA3-2

Multi-variety fresh agricultural products distribution optimization based on an improved cuckoo search algorithm

Wenqiang Yang, Junpeng Xu, Yongfeng Li
Henan Institute of Science and Technology, Xinxiang, China

Abstract. To minimize the losses of multi-variety perishable agricultural products, a mathematical model considering time sensitive feature of each perishable agricultural product is proposed. Meanwhile, a cuckoo search algorithm(CSA) is introduced to minimize the total losses of agricultural products. In view of poor exploration and exploitation ability of CSA, adaptive adjusting discovery probability and dynamic step-length is imposed to form an improved cuckoo search algorithm(ICSA). Finally, to verify the performance of the proposed algorithm, it is compared with cuckoo search and genetic algorithm (GA). Simulation results prove that the feasibility and superiority of the proposed algorithm.

SaA3-3

Research on Indoor Fingerprint Localization System Based on Voronoi Segmentation

Ang Li1, Jingqi Fu1, Huaming Shen1
1 Department of Automation, College of Mechatronic Engineering and Automation, Shanghai University, Shanghai, China

Abstract. The location of entities in a smart indoor environments is an important context information. To this end, several indoor localization algorithm have been proposed with the received signal strength fingerprint (RSS-F) based algorithm being the most attractive due to the higher localization accuracy. However, RSS-F based localization accuracy is highly degraded on account of non-line-of-sight (NLOS) propagation in indoor or harsh environment. This thesis proposes an approach for NLOS self-monitoring and autonomous compensation. Firstly, the localization area is regionalized according to Voronoi Diagram. Then, the self-monitoring and autonomous compensation is realized by propagation environment similarity represented by the dynamic path attenuation index between the domains. The verification experiment results show that the proposed algorithms can adaptively identify the NLOS interference and accomplish compensation. Compared with other localization algorithm, the maximum error is reduced from 3.04m to 1.71m, the average error is reduced to 0.90m, and the localization time is reduced to 2.113s (contain 10 test point) compared with other tracking algorithm.

SaA3-4

Co-Simulation Using ADAMS and MATLAB for Active Vibration Control of Flexible Beam with Piezoelectric Stack Actuator

Haotian Liu, Yubin Fang, Bing Bai1, Xiaojin Zhu
1 School of Mechatronic Engineering and Automation, Shanghai University, Shanghai, P.R. China

Abstract. Co-simulation using ADAMS and MATLAB is implemented for active vibration control of flexible beam with piezoelectric stack actuator. The virtual prototype of flexible beam with piezoelectric actuator is created in ADAMS, and the implement of prototype provides an approach for acquiring the information of dynamic and kinematic properties. When the properties analysis is finished, the controller based on FXLMS algorithm is established in MATLAB. The controller calculates the signals of acceleration which are measured from virtual prototype, then the force is generated to suppress the vibration of flexible beam. The results and analysis prove that active vibration control for flexible beam has a great suppression performance.

SaA3-5

Review of research on simulation platform based on the crowd evacuation

Pei-juan Xu1 and Ke-cai Cao1,2,
1 Nanjing University of Posts and Telecommunications, Nanjing, China
2 Nanjing University of Aeronautics and Astronautics, Nanjing, China

Abstract. As the security accidents in public places frequently emerge, the research based on crowd evacuation gets more and more people's attention. Now, the crowd evacuation research has shifted from the traditional live exercise to computer simulation. This paper chose five kinds of crowd evacuation simulation platform and summarized Cellular Automata, Agent-based model, network model they involved. Then, the thesis introduced the software, analyzed the performance of them and stated the respective advantages and disadvantage in order to help user choose proper platform to achieve fast and efficient results of crowd evacuation simulation.

SaA3-6

A TopicRank based Document Priors Model for Expert Finding

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2 College of Information System and Management, National University of Defense Technology, Changsha, Hunan, China.
3 Xi'an Communication Institute, Xi'an, Shaanxi, China
4 School of Biomedical Engineering, Fourth Military Medical University, Xi'an, Shaanxi, China

Abstract. Document priors that encode our prior knowledge about the importance of different documents are essential to an expert finding system. This study proposed a TopicRank-based document priors model for expert finding. TopicRank algorithm is an extension of the DocRank algorithm. Latent dirichlet allocation was used to extract topics of the documents. We assumed there was a link between two documents that share common topics. Link analysis techniques were then used to obtain document priors. The proposed model was evaluated using the CSIRO Enterprise Research Collection and the results showed that the performance of the expert finding system was dramatically improved by introducing TopicRank-based document priors. In particular, Mean Average Precision increased 19.9% while Mean Reciprocal Rank rose as much as 23.4%.

SaA3-7

Algorithm Design for Automatic Modeling of the First and the Second Level of Airway Tree

Yue Lou, Xin Sun
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Abstract. The models of airway tree designed in this paper are different from the general visual models. The model preserves all the information of the space data when it is created. The space data is mainly consisted by the coordinates of the boundary pixels and the spatial functions of the model surfaces. The algorithm consists of three main steps. Firstly, the boundaries of the airway tree are extracted by Sobel operator. Then, the boundary pixels are ring-likely sorted according to the distance between each other. Finally, each three pixels belong to the adjacent layers form a surface. An airway tree model can be eventually created by iterating the main steps. What's more, the algorithm has also been optimized, we can mostly get a model in 50 seconds.

SaA3-8

Light-weight Mg/Al dissimilar structures welded by CW laser for weight saving applications

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Abstract. With the increasing demand of light-weight alloys, such as magnesium (Mg) and aluminum (Al), the need for joining these two alloys is unavoidable. In this study, AZ31B Mg and 1060 Al alloys were joined by continuous wave laser micro-welding using a 0.05 mm thick Cu/Zn interlayer. The microstructure and phases constituent of the weld seam were examined by optical microscope, SEM and EDS. The formation and distribution of the intermetallic compounds (IMCs) and the relationship between these structures and the micro-hardness of the weld were discussed in detail. The effect of Cu/Zn interlayer on the performance of Mg/Al joint was also analyzed. The results showed that Mg/Al IMCs were formed in the weld, which indicates that the Cu/Zn foil could not prevent the reaction between Mg and Al. However, the addition of Cu and Zn into the weld pool refined the microstructure by improving the number of eutectic structures. The micro-hardness of Mg/Al IMCs in the middle of the weld was very high which can be detrimental to the toughness of the Mg/Al joints.

SaA3-9

Modeling and simulation of intelligent substation network under intrusion attack

Xiaojuan Huang1 , Rong Fu1, Yi Tang2, Mengya Li2, Dong Yue1
1 College of Automation, Nanjing University of Posts and Telecommunications, Nanjing, China
2 College of Electrical Engineering Southeast University, Nanjing, China

Abstract. Recent advancement in the integration of power systems and information communication technology has brought the key concerns towards security operation of cyber physical power system. This paper focuses on realizing the unified system modeling under intrusion attacks and refining the attack effects on communication network by simulation research. We start this survey with an overview of the system operation and crucial intrusion attacks associated with operational security from fusion system perspective. A novel limited stochastic Petri net (LSPN) graph theory is introduced to establish the unified firewall protection system model of intelligent substation network. By proposing quantitative computational methodology of communication throughput variation, the potential consequence on the communication network is determined with information transmission constraints. The final test on IEEE-30 node power system illustrates the usefulness of the proposed model analysis. The research work would raise awareness of the cyber intrusion threats and provide the basis for security defense.

SaA3-10

Analysis of Temperature and Gas Flow Distribution inside Safety Helmet Based on Numerical Simulation

HengMa, RuiLi, KeQian, YiboGao, LingChen
Zhejiang Huadian Equipment Testing Institute (Zhejiang Key Laboratory for Protection Technology of High - Rise Operation), Hangzhou Zhejiang, China

Abstract. Aiming at the problem that the low heat dissipation of the safety helmet has an impact on the workers which can easily lead to safety accidents under high temperature and high strength, this paper analyzed the temperature field and gas flow field inside the safety helmet by using Finite Element Analysis, modeled and meshed the real safety helmet, obtained the distribution nephogram of temperature and heat flux by steady state and transient thermal analysis, calculated the results of the hot gas flow inside safety helmet and the gas flow nephogram by turbulence model. The results show that the temperature inside the safety helmet decreases gradually from bottom to top, the heat transfer rate of the contact part with the head is faster, only a small amount of hot gas can be vented from the vent while most of the hot gas is still concentrated inside the safety helmet difficult to vent. Therefore, it is necessary to improve the design of safety helmet and the comfort of the operation to ensure the safety of the workers.

SaA3-11

Analysis of Influence of Moving Axial Load on Elevated Box Bridge of Slab Track

Xiaoyun ZHANG, Guangtian SHI, Xiaoan ZHANG and Yanliang CUI
School of Mechanical Engineering, Lanzhou Jiaotong University, Lanzhou, China

Abstract. Due to the increasingly usage of the heavy-load train, the effect of the moving axial load on the noise radiation of elevated bridge structure should be concerned. In this paper, high speed train-track-bridge coupled model is established, and the train axle load, which is taken as the boundary condition of the load, is applied to the finite element model

of elevated box bridge structure to calculate the vibration response of the surface of a box bridge. In this model, the vibration response is taken as the acoustic boundary conditions and is added to the boundary element model of elevated box bridge structure to study its sound radiation. The results show that the plate-shell unit can well reflect the overall and local vibration characteristics of the bridge structure, and under the effect of moving axial load, the vibration frequencies of box bridge structure concentrate in 0-300 Hz and the main peaks are in 10-160 Hz; the finite element-boundary element method can effectively analyze the low frequency noise radiation of box bridge caused by the moving axial load; the most of structure noise induced by moving axial load is below the audible range of which the noise is greatly harmful to human body, thus it must be taken seriously.

SaA3-12

Low-Carbon Architectural Design and Data Analysis Based on BIM

Xiaoxing Ou, Qiming Li and Dezhi Li
Department of Construction and Real Estate, Southeast University, Nanjing, China

Abstract. Through an analysis of the design contents of different architectural disciplines under the requirements of sustainable and low-carbon development, this study analyzes the low-carbon architectural design process and the makeup of relevant information from the various disciplines using a building information modeling (BIM) system. Based on BIM, we have constructed a carbon emission budgeting platform that captures the whole building life cycle, and have set forth evaluation criteria for the quantitative analysis of low-carbon buildings. In light of the above research, evaluation and optimization of low-carbon building designs, as well as the subsequent reduction of carbon emissions during the lifecycle of newly constructed buildings, can be achieved using BIM.

SaA3-13

Survey of 3D Map in SLAM: Localization and Navigation

Aolei Yang, Yu Luo, Ling Chen, Yulin Xu
Shanghai Key Laboratory of Power Station Automation Technology, School of Mechatronic Engineering and Automation, Shanghai University, Shanghai, China.

Abstract. 3D mapping is a difficult problem due to real-world places whose appearance and scale can be various. Owing to the rapid development of computer and robot system, remarkable improvements of performance are achieved in 3D map technology, which in turn contribute to the significant advances in SLAM. This paper presents the state-of-the-art 3D map technology and system, which is classified into topological maps, metric maps and semantic maps. Additionally, the advantages and disadvantages of various 3D map technologies are analyzed in different aspects, including navigation performance, localization performance, visual perception, scalability, computation cost and mapping difficulty. In order to better understand them, the key performance parameters of the 3D map technologies are compared in a table. Finally, the paper ends with a discussion on the open problems and future of 3D map technology.

SaA3-14

An Adaptive Immune-Endocrine Algorithm for Service-Oriented Agricultural Internet of Things

Zhen Yang1,2, Yongsheng Ding1, Kuangrong Hao1, Xin Cai1
1 Engineering Research Center of Digitized Textile & Apparel Technology, Ministry of Education, College of Information Science and Technology, Donghua University, Shanghai, China
2 College of Information Engineering, Huzhou University, Huzhou, China

Abstract. Aiming at producing multiple requests at stochastic moment in the agricultural Internet of Things, which have the characteristics of multi-source, multi-type and unequal amount of task, we build a mathematical optimization model of minimum service cost, and propose an adaptive immune algorithm based on endocrine regulation (AIAE) to solve the problem of dynamic service for multiple requests. Based on this model, two service providing strategies are put forward, i.e. single service and collaborative service. The former means that one request task is completed by one service provider. The latter means that one request task is collaboratively completed by multiple service providers. The service cost and service time are respectively evaluated under two service providing strategies. The simulation results verify the feasibility and effectiveness of proposed AIAE through comparison to the immune algorithm without endocrine regulation. Meanwhile, results also demonstrate that the proposed algorithm can obtain more excellent performance than GA and PSO.

September 24, PM, 2017 Sunday

SuE2
14:00-18:00
Room 2 (Amethyst Hall)
Topic: Workshop on Intelligent System and Control

SuE2-1

Necessary Communication Schemes in Networked Measurement and Control Systems

Cheng Peng
Shanghai University, China

SuE2-2

Edge Computing for the Next Generation Vehicular Networks

Zhou Su
Shanghai University, China

SuE2-3

Neural-network-based tracking control of offshore steel jacket platforms

Zhi-Hui Cai1, Bao-Lin Zhang1, and Xian-Hu Yu2
1 China Jiliang University, Hangzhou, China
2 Ningbo Radio and TV University, Ningbo, China

Abstract. This paper deals with the problem of neural network tracking control for an offshore platform system under external wave forces. A feedforward backpropagation neural-network-based tracking controller (NNTC) is designed to attenuate the displacement response of the offshore platform. In the simulation, the proposed NNTC scheme can effectively improve the stability of the offshore platform. Furthermore, the designed NNTC is more robust than the feedforward and feedback optimal tracking controller (FFOTC) in terms of system parametric perturbations and external wave loads.

SuE2-4

Temperature and Humidity Compensation for MOS Gas Sensor Based on Random Forests

Peng Xu1, Kai Song1, Xiaodong Xia2, Yinsheng Chen3, Qi Wang1, Guo Wei1
1 Department of Automatic Testing and Control, Harbin Institute of Technology, Harbin, China
2 Institute of Aerospace System Engineering Shanghai, Shanghai, China
3 Department of Measurement and Control Technology and Instrument, Harbin University of Science and Technology, Harbin, China

Abstract. The outputs of Metal Oxide Semiconductor (MOS) gas sensors drift due to the change of temperature and humidity in the environment. This phenomenon leads to additional errors in the measurement and the test precision and measurement stability of gas sensor are greatly affected. A novel strategy for temperature and humidity compensation for MOS Gas Sensor is proposed in this paper. The environmental gas concentrations are measured separately and accurately based Random Forest (RF) method to demonstrate that the proposed strategy is superior at both accuracy and runtime compared with the conventional methods, such as RBF neural network and BP neural network. Results show that the proposed methodology provides a better solution to temperature and humidity drift. The accuracy of the environmental gas sensor array improves about 1%.

SuE2-5

Mean Squared Error vs. Frame Potential forUnsupervised Variable Selection

Federico Zocco and Sean McLoone
School of Electronics, Electrical Engineering and Computer Science, Queen's University Belfast, Northern Ireland, UK

Abstract. Forward Selection Component Analysis (FSCA) provides a pragmatic solution to the NP-hard unsupervised variable selection problem, but is not guaranteed to be optimal due to the multi-modal nature of the mean squared error (MSE) selection metric used. Frame potential (FP) is a metric that has recently been shown to yield near-optimal greedy sensor selection performance for linear inverse problems. This paper explores if FP offers similar benefits in the unsupervised variable selection context. In addition, the backward elimination counterpart of FSCA is introduced for the first time (BECA) and compared with forward and backward FP based variable selection on a number of simulated and real world datasets. It is concluded that FP does not improve on FSCA and that while BECA yields comparable results to FSCA it is not a competitive alternative due to its much higher computational complexity.

SuE2-6

Data reconciliation based on an improved robust estimator and NT - MT for gross error detection

Shengxi Wu, Jinmeng Xu, Wei Liu, Xiaoying Wu and Xingsheng Gu
Key Laboratory of Advanced Control and Optimization for Chemical Processes, East China University of Science and Technology, Ministry of Education, Shanghai, China

Abstract. The quality of measurement data

can be improved by data reconciliation. More accurate data will be provided for chemical process industry. However, the reconciliation results may be affected by gross errors. The influence of gross errors cannot be reduced effectively by classical method. Aimed at this problem, an improved robust NT-MT steady-state data reconciliation method is proposed in the paper. NT-MT method is used to detect suspicious nodes and variables with gross error. The suspicious variables are detected by critical value of adjustment detection. Robust estimator is used in data reconciliation. Finally, the measurement data is reconciled by the proposed robust estimator. The advantages of robust estimator and NT-MT method is combined together in this method. The simulation results show that the influence of gross error can be reduced effectively by the method proposed in the paper, thereby a better reconciliation results can be obtained.

SuE2-7

Improved Artificial Weed Colonization Based Multi-objective Optimization Algorithm

Ruochen Liu1, Ruinan Wang1, Manman He2 and Xiao Wang1
1 Key Laboratory of Intelligent Perception and Image Understanding of Ministry of Education, Xidian University, Xi'an, China.
2 School of Computer, Xi`an Shi you University, Xi'an,China

Abstract. Nondominated Neighbor Immune Algorithm (NNIA) is a Representative algorithm for multi-objective problems (MOPs). However, for some test problems, the diversity or convergence of NNIA cannot always keep very well. In order to avoid this phenomenon as well as not to increase the number of function evaluations as far as possible, a modified Invasive Weed Optimization (IWO) operator is introduced into NNIA and we proposed an improved NNIA for MOPs, denoted as NNIAIWO. There are three modifications for basic IWO. Firstly, each parent weed generates two weeds called associated parent weeds which do not join in the evaluation but produce new seeds; Secondly, these new seeds generated by the associated parent weeds distribute obey Cauchy distribution near them; Thirdly an oscillator factor is adopted in the calculation of the standard deviation during the iteration process. Fifteen benchmark problems are used to validate the performance of the proposed algorithm. Experimental results shows that NNIAIWO can obtain improved performance on some test problems, meanwhile the numbers of function evaluation do not increase. And for five complex unconstrained MOPs, namely UF, NNIAIWO also presents a better performance than NNIA.

SuE2-8

Modelling and Control Design for Membrane Potential Conduction along Nerve Fibre using B-spline Neural Network

Qichun Zhang, Francisco Sepulveda
University of Essex, Colchester, CO45FT, UK

Abstract. Based on B-spline neural network, the analysis of membrane potential conduction has been presented for peripheral nerve fibres whereby the effects of the interactions between axons have been taken into account.In particular, the modelling problem is investigated firstly with the vector-valued weight transformation and parameter identification.Using the presented model, the control design is proposed to reproduce the membrane potential along nerve fibres. The algorithm procedure and interaction characterization for coupled axons are given while the numerical simulation illustrates the effectiveness of the presented algorithm.

SuE2-9

Design of Output Feedback Controller for Networked Control Systems with Delay and Packet Dropout

Jun Xiang Dai, Ying Zhou, Chao Sun, Jin Xing Lin
College of Automation, Nanjing University of Posts and Telecommunications, Nanjing, China

Abstract. The design problem of controller for a dynamic output feedback networked control system with uncertain short time delay and packet dropout is studied. The data packet dropout is assumed to be satisfied with the Bernoulli distribution sequence with known probability. The dynamic output feedback networked control system is modeled as a discrete time-varying system with uncertainties. Sufficient conditions for the existence of the controller are given by the linear matrix inequality (LMI) method and the Lyapunov principle. And the controller design problem is transformed into solving the feasible solution of LMI. Finally, a simulation example is given to prove the effectiveness and feasibility of the design method.

SuE2-10

Orthogonal Matching Pursuit for MultilayerPerceptions Neural Networks Model Reduction

Xiaoquan Tang1, Xiaolin Wang2 and Long Zhang3

1 School of Automation, Huazhong University of Science and Technology Wuhan, China
2 School of Electronic Information and Electrical Engineering, Shanghai Jiaotong University, China
3 School of Electrical and Electronic Engineering, University of Manchester Manchester, M13 9PL, UK

Abstract. Neural networks have drawn much attention in modern ma-chine learning community as they have achieved many successful applications, such as image recognition, speech recognition and system identification. According to the principle of parsimony, simpler neural models are preferable to more complex ones if they have similar generalization performance. However, when building a neural networks model, the neuron number is often determined randomly or by trial-and-error. These methods can often lead to the over-complex networks with many redundant neurons and therefore may result in over-fitting problems. In this paper, a new approach is proposed for obtaining a simplified neural networks with fewer neurons but still keeping a good performance comparing to the initial fully networks. More specifically, the initial neural model with a fixed model size is built using Matlab toolbox. Then, the orthogonal matching pursuit method is employed to select important neurons and drop out redundant neurons, leading to a more compact model with reduced size. Two simulation examples are used to demonstrate the effectiveness of the proposed method.

SuE2-11

Compressed Binary Discernibility Matrix Based Incremental Attribute Reduction Algorithm for Group Dynamic Data

Fumin Ma1, Mianwei Ding2, Tengfei Zhang2
1 College of Information Engineering, Nanjing University of Finance and Economics, Nanjing, China
2 College of Automation, Nanjing University of Posts and Telecommunications, Nanjing, China

Abstract. The datasets in real-world applications often vary dynamically over time. Moreover, datasets increase by group data in many cases rather than single object one by one. The traditional incremental attribute reduction approaches for single dynamic object may not be applied to such datasets.
Focusing on this issue, a compressed binary discernibility matrix is introduced and an incremental attribute reduction algorithm for group dynamic data is developed. This algorithm is not only suitable for single dynamic object but also group dynamic objects. According to the dynamic data is a single object or group objects, different branches can be chosen to update the compressed binary discernibility matrix, on basis of which, an incremental reduction algorithm for group dynamic objects is further designed. The validity of this algorithm is demonstrated by simulation and experimental analysis.

SuE2-12

Study of Perfusion Kinetics in Human Brain Tumor using Leaky Tracer Kinetic Model of DCE-MRI Data and CFD [MSTT]

A.Bhandari1, A. Bansal2, A. Singh3, 4 and N. Sinha1
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2 Department of Mechanical and Industrial Engineering, Indian Institute of Technology, Roorkee-247677, India
3 Centre for Biomedical Engineering, Indian Institute of Technology, Delhi-110016, India
4 Department of Biomedical Engineering, All India Institute of Medical Sciences, Delhi-110016, India

Abstract. A computational fluid dynamics (CFD) model based on realistic voxelized representation of human brain tumor vasculature is presented. The model utilizes dynamic contrast enhanced magnetic resonance imaging (DCE-MRI) data to account for heterogeneous porosity and permeability of contrast agent inside the tumor. Patient specific arterial input function (AIF) is employed in this study. Owing to higher accuracy of Leaky Tracer Kinetic Model (LTKM) in shorter duration human imaging data, the model is employed to determine perfusion parameters and compared with General Tracer Kinetic Model (GTKM). The developed CFD model is used to simulate and predict transport, distribution and retention of contrast agent in different parts of human tissue at different times. In future, a patient specific model can be developed to forecast the deposition of drugs and nanoparticles and tune the parameters for thermal ablation of tumors.

September 24, PM, 2017 Sunday

SuA4
14:00-16:30
Room 3 (Peony Hall A)
Topic: Image and video processing

SuA4-1

A Hybrid Generative-Discriminative Learning Algorithm for Image Recognition

Bin Wang1 , Chuanjiang Li1, Xiong Li2 , Hongwei Mao1,
1 College of Information, Mechanical and Electrical Engineering, Shanghai Normal University, Shanghai, China
2 National Computer Network Emergency Response Technical Team, Beijing, China

Abstract. Feature representation is usually a key point in image recognition. The recognition performance can be potentially improved if the data distribution information is exploited. In this paper, we propose an image recognition approach based on generative score space. Specifically, we first leverage probabilistic latent semantic analysis (pLSA) to model the distribution of images. Then, we derive the mid-level feature from the model in a generative feature learning manner. At last, the derived feature is embedded into a discriminative classifier for image recognition. The advantages of our proposed approach are two folds. First, the probabilistic generative modeling allows us exploiting information hidden in data and has good adaptation to data distribution. Second, the discriminative learning process can utilize the information of label effectively. To confirm the effectiveness of our method, we perform image recognition on three datasets. The results demonstrate its advantages.

SuA4-2

Multi-channel Feature for Pedestrian Detection

Zhixiang He1, Meihua Xu1, Aiying Guo1
1 School of Mechatronics Engineering and Automation, Shanghai University, Shanghai, China

Abstract. Multi-channel feature for pedestrian detection is proposed to solve problems of real-time and accuracy of pedestrian detection in this paper. Different from traditional low level feature extraction algorithm, channels such as colours, gradient magnitude and gradient histogram are combined to extract multi-channel feature for describing pedestrian. Then classifier is trained by AdaBoost algorithm. Finally the performance of the algorithm is tested in MATLAB. The result demonstrates that the algorithm has an excellent performance on both detection precision and speed.

SuA4-3

Detection Method of Laser Level Line Based on Machine Vision

Xiaozhen Wang1, Haikuan Wang1, Aolei Yang1, Minrui Fei1, and Chunfeng Shen2
1 Shanghai Key Laboratory of Power Station Automation Technology, School of Mechatronic Engineering and Automation, Shanghai University, Shanghai, China
2 Shanghai Baosight Software Co., Ltd. Shanghai, China

Abstract. Laser lines emitted by the laser level are mostly detected manually and laser particle and optical effects also bring difficulties on measurement. In this paper, we design a detection system for the five-line laser level and propose a laser line measurement method based on ma- chine vision. Image processing is divided into two stages: in the first stage, we use random sample consensus (RANSAC) algorithm combined with Hough transform to fit the laser axis, which can get its position information. In the second stage, a laser edge extraction method based on conditional random fields (CRFs) is proposed, and the sub-pixel width of laser line is obtained by spline interpolation algorithm. The results confirm that the laser level detection method proposed in this paper can realize the corresponding detection precision and requirement.

SuA4-4

An Accurate Calibration Method of a Multi Camera System

Song Han, Xiaojing Gu, Xingsheng Gu
Key Laboratory of Advanced Control and Optimization for Chemical Process, Ministry of Education, East China University of Science and Technology, Shanghai, China

Abstract. In this paper, we proposed a novel method of geometric calibration and synchronization for a multi camera system. Traditional calibration methods of visible cameras can't be applied to thermal cameras. According to the imaging characteristics of thermal cameras, we designed a new calibration board using materials with different emissivity for calibration. Our calibration board can accurately calibrate RGBD cameras and thermal cameras. In general, thermal cameras have regular

non-uniformity corrections, which will result in camera interruption about 1.5 to 2 seconds and can impact synchronization. In this respect, we adopted the method named nearest adjacent time using timestamp to solve the problem of non-uniformity corrections and synchronization. We evaluated our methods and the experiments showed that our methods had an ideal result for camera calibration and synchronization.

SuA4-5

A Novel Memory Gradient based for Efficient Image Segmentation

Kun Zhang1,2, Jianguo Wu1, Peijian Zhang1,
1 School of Electrical Engineering, Nantong University, Nantong, China
2 Nantong Research Institute for Advanced Communication Technologies

Abstract. Image segmentation is a very important phase in automatic image analysis. Of the developed techniques for image segmentation, iterative methods have been proven to be one of the most effective algorithms in the literature. Mean shift algorithms is one of the iterative approaches which have been successfully deployed to many applications. However, despite its promising performance, mean shift has shown its weaknesses in convergence in some of the application areas. In this paper, an improved version of the standard mean-shift algorithm using a memory gradient method is proposed and implemented in order to achieve fast convergence rates by integrating mean shift and memory gradient. Experimental results on real images demonstrate that our proposed algorithm not only improves the efficiency of the classical mean shift algorithm, but also achieves better segmentation results.

SuA4-6

Research on cigarette filter rod counting system based on machine vision

Hongjun Qu1, Peijian Zhang1, Kun Zhang1,2, Jianguo Wu1
1 School of Electrical Engineering, Nantong University, Nantong, China
2 Nantong Research Institute for Advanced Communication Technologies

Abstract. The traditional method for on-line detection of cigarette filter stick packing is manual sampling, which has low efficiency, high labor cost and can't detect all products. Therefore, it is necessary to establish a set of image processing system [10] based on machine vision. This system uses CCD image sensor to get the filter rod section image, through the image smoothing, edge detection, Binarization and feature extraction, the region of interest is analyzed, and finally get the number of filter rods. The filter rod arrangement on the production line is not completely flat. Using the dynamic area threshold method to calculate the number of filter rod in the flat area. 3D reconstruction of a single image is used to calculate the number of filter rod in the uneven area. The accuracy and practicability of the system are verified by theoretical analysis and experimental comparison.

SuA4-7

Circular Mask and Harris Corner Detection on Rotated Images

Le Wang1, Minrui Fei1 ,Taicheng Yang2
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Abstract. Corners are the key feature of image. Stable corners are particularly important in the industrial pipelining of beer cap surface defects detection, greatly affecting the efficiency of image matching and detection precision. To find a stable algorithm for the cap surface defects detection, Stable Corner and Stable Ration are proposed to evaluate the stability of corner detectors, which are able to give an intuitive and unified stability description of various corner detection algorithm. After comparing the stability with Difference of Gaussian (DOG) and Features from Accelerated Segment Test (FAST), Harris is selected as the detector of cap surface images due to its high stability. To eliminate the redundant corners detected by Harris, Circular Mask and Harris (CMH) corner detection is proposed. In CMH, a circular mask with an adaptive threshold is adopted to remove the redundant corners, whereby comparing the intensity between the center pixel and others on the mask in a rapid way, more stable corners are obtained eventually. The effectiveness and robustness of CMH are verified in this paper, and the Stable Ratio increased by 16.7% relatively.

SuA4-8

MEG Source Imaging Algorithm for Finding Deeper Epileptogenic Zone

Yegang Hu1,2, Yicong Lin3, Baoshan Yang1,2, Guangrui Tang1,2, Yuping Wang3, Jicong Zhang1,2
1 School of Biological Science and Medical Engineering, Beihang University, Beijing, China
2 Beijing Advanced Innovation Center for Big Data-Based Precision Medicine, Beihang University, Beijing, China

3 Department of Neurology, Xuanwu Hospital, Capital Medical University, Beijing, China

Abstract. In recent years, magnetoencephalography (MEG) has played a prominent role on neocortical epilepsy preoperative evaluation. However, its clinical utility with locating deeper sources may be more challenging such as the mesial temporal structures. We proposed a new source imaging algorithm for finding the epileptogenic zone in mesial temporal lobe epilepsy (mTLE). Since the localization results using the Elekta MEG method are very sensitive to some MEG noises, the source modeling was modified by spatial filtering in wavelet domain and cerebral cortex constraint. Two surgical patients randomly selected with medically refractory mTLE, which were diagnosed based on a comprehensive preoperative evaluation, had been studied in this manuscript. The localization results using proposed method on individual MRI showed that the deeper regions had been exactly found in the mesial temporal lobe. Yet, the results using the Elekta Neuromag Software only appeared in the lateral temporal lobe. Thus, the proposed algorithm maybe become an effective method in detecting deeper epileptogenic zone.

SuA4-9

A New Meanshift Target Tracking Algorithm by Combining Feature Points from Gray and Depth Images

Lu Lu1, Minrui Fei1, 2, Haikuan Wang1, Huosheng Hu3.
1 School of Mechatronic Engineering and Automation, Shanghai University, China
2 Shanghai Key Laboratory of Power Station Automation Technology, Shanghai University, China
3.School of Computer Science & Electronic Engineering, University of Essex, UK

Abstract: The traditional MeanShift algorithm cannot obtain accurate tracking results in some complex situations where tracking targets have scale changes or similar color with background. In this paper, a new MeanShift target tracking algorithm, namely DEPTH & SIFT-MeanShift algorithm, is proposed by using a depth camera and SIFT (Scale Invariant Feature Transform) feature metric. The algorithm firstly combines feature points extracted from gray and depth images respectively, and then represents tracked objects with Modulus, i.e. Direction distribution histogram of feature points in the tracking object field, so that targets can be effectively tracked. Experimental results show that the proposed algorithm can achieve good tracking performance when the tracking target changes its scale, and have the strong adaptability to occlusion. Moreover, it is very robust to illumination changes, and able to discriminate targets from background very well.

SuA4-10

A Novel 3D Expansion and Corrosion Method for Human Detection based on Depth Information

Xiexin Qi1, Minrui Fei1,2, Huosheng Hu3, Haikuan Wang1
1 School of Mechatronics Engineering and Automation, Shanghai University，China
2 Shanghai Key Laboratory of Power Station Automation Technology, Shanghai University, China
3 School of Computer Science & Electronic Engineering, University of Essex, UK

Abstract. The existing body detection methods based on depth images mostly depend on the extraction of image gradient features, which is the evolution of the traditional 2D plane image processing method for human body detection. Although their detection accuracy is high, the algorithms consume a large amount of computing and storage resources. Aiming at the real-time demand of safe-driving of forklift trucks in industry, this paper presents a novel 3D expansion and corrosion method for human detection by using depth information. A depth image of human body is detected based on the characteristics of human Head-Shoulder-Body Density (HSBD), which can reduce the error and loss of the depth information caused by changing light conditions, complex background scenes and various distances from objects. Experimental results show that the recognition rate of the proposed method is over 96%, and the recognition speed is over 15 frames per second. This can satisfy the safe-driving demands of forklift truckers in factory.

SuA4-11

An Adaptive Edge Detection Algorithm Based On Improved Canny

Aolei Yang1, Weiwei Jiang1, Ling Chen
Shanghai Key Laboratory of Power Station Automation Technology, School of Mechatronic Engineering and Automation, Shanghai University, Shanghai, China

Abstract. Edge detection is the key to image processing and has a significant impact on the high level of description, classification and matching of subsequent images. The traditional Canny algorithm requires human intervention in the selection of Gaussian

function and its fixed parameters. To solve these problems, an improved algorithm based on Canny algorithm is proposed in this paper. The approach introduces the edge preserving filter to replace the original Gaussian filter, and calculates the magnitude and direction of image gradient with a new designed templates from x direction, y direction, and two oblique directions (45°, 135°). Meanwhile, the Otsu algorithm is used to calculate the thresholds, which avoids the problem that the thresholds need to be set repeatedly. The proposed method is successfully applied to the metal plate detection system. Experimental results show that the algorithm has good performance in bright and dark domains.

SuA4-12

Design of the Traffic Sign Recognition System Based on Android Platform

Jie Qiang, Shujing Wang and Zhenhua Shan
Shanghai University, Shanghai, China

Abstract. An algorithm based on HOG (Histograms of Oriented Gradients) and SVM (Support Vector Machine) is developed for traffic sign recognition on Android platform, and the dynamics link library is used as the native layer of Android end by employing Android NDK (Native Development Kit) technology. The test results show that the algorithm can be successfully applied to the Android platform, and Android NDK technology can implement the cross-platform and portability of the programs, while improving the detection and recognition speed.

SuA4-13

Apical growing points Segmentation by using RGB-D data

Pengwei Liu1, Xin Li12, Qiang Zhou2
1 School of Mechatronic Engineering and Automation, Shanghai University, Shanghai, China
2 Shanghai Dushi Green Co. Ltd., China

Abstract: Generally, plant grows slowly and is difficult to be observed, the apical growing points can reflect the changes of plant, such that the extraction of apical growing points is helpful for the analysis of plant growth. In this paper, a new digital visual-based method of tomato apical growing points segmentation is proposed, which is depended on depth segmentation, color segmentation and position histogram statistic. First of all, use the depth image captured by KinectV2 to remove complex background through depth segmentation. Then, position histogram of the two value image after depth segmentation has been obtained to get the column position of the apical growing points. Using the KinectV2 coordinate mapping mechanism to restore the color information of the two value image, and then the RBG-D image can be color segmented. Finally, the region of the apical growing points is segmented by coordinate mapping, and the apical growing point is extracted by the contour detection. The experimental results show that the method to segment the growth environment is effective.

SuA4-14

Towards Visual Human Tracking of Quadcopter: A Survey

Ling Chen, Xinxing Pan, Aolei Yang, Yulin Xu
Shanghai Key Laboratory of Power Station Automation Technology, School of Mechatronic Engineering and Automation, Shanghai University, Shanghai, China.

Abstract. In recent years, visual human tracking of quadcopter has become a topic of interest to many research institutions. To overview the recent research status of visual human tracking based on quadcopter, firstly, the problem of human tracking is divided into quadcopter control and vision based human tracking which are discussed separately. The present controlling means and the latest applications of quadcopter are summarized systematically. The advantages and disadvantages of each human tracking method are compared and the tracking strategies are summarized. Then, the difficult issues on visual human tracking are discussed specifically. Finally, the future research directions of visual human tracking based on quadcopter are prospected by summarizing related literatures.

SuA4-15

Consensus of Multi-agent Systems with Diverse Time-varying Communication Delays and Self-delays

Zhaoxia Wang2, Dajun Du1, Minrui Fei1, and Yuchu Tian3
1 Shanghai Key Laboratory of Power Station Automation Technology, School of Mechatronic Engineering and Automation, Shanghai University, Shanghai, China
2 School of Electrical Engineering and Automation, Qilu University of Technology, Jinan, China
3 School of Electrical Engineering and Computer Science, Queensland University of Technology, GPO Box 2434,Brisbane QLD 4001, Australia

Abstract. In a multi-agent system (MAS), each agent needs to process massive information, inducing an input delay or self-delay. In a communication network environment, the

presence of diverse time-varying communication delays and self-delays in MASs may cause complicated communication constraints and system performance deterioration. This makes the convergence of consensus of MASs more difficult. To address this issue, a new weighted consensus protocol is proposed in this paper with diverse time-varying communication delays and self-delays. From this protocol, a system model with reduced dimensions is constructed, which contains the disagreement eigenspace of network topology only. Some sufficient delay-dependent conditions are further established for weighted consensus.With these sufficient conditions, the consensus problem with identical time-varying delays can be conveniently solved. Numerical examples are also given to demonstrate the theoretical results.

SuA4-16

A Remote Control System with Dual Mode in Multi-channel Designed for Pigeon's Nerve Stimulation

Yunguo Chang 1, Xinlin Liu 1,2 Weiyan Hou1,3
1 School of Information Engineering, Zhengzhou University, Zhengzhou, Henan, China

Abstract. A Bio-Robot's Motion Control system was designed in this paper, the core control idea was based on wireless communication and computer technologies, combined with biological neural research achievements to control flying animals (also called biological robot). Constant current source circuit was designed, and the boost circuit, analog switch circuit, Bluetooth module and GPS module were described. Wireless communication module used Bluetooth and GPS modes with the TCP protocol and heartbeat mechanism to ensure the control terminal and the server's long-lived connection and animal online management. The control terminal aimed to upload GPS as well as altitude information and generate the neural electric pulse signal with different pulse frequency, duty ratio, pulse intensity, cluster number. Furthermore, the control instructions and sensor information's can be displayed on the UI software. The result of the experiment shown that when load impedance was lower than 10 KΩ, the control system's output constant current range was between -1.2mA and +1.2mA. The animal can be selected and controlled by the server to fly in the specified direction, obtained the visualized control distance range from10 meters to 3 kilometers.

SuB3
16:45-18:00
Room 3 (Peony Hall A)
Topic: Advanced Machine Learning Methods and Applications

SuB3-1

A Two-Stage Optimal Detection Algorithm Research for Pedestrians in front of the Vehicles

Yunlian Shao 1,2 and Mei-hua Xu1 and Feng Ran3 and Dong-yang Shen1
1 Department of Automation, College of Mechatronics Engineering and Automation,Shanghai University, Shanghai, China
2 School of Physics and Electronic Electrical Engineering, Huaiyin Normal University Huai' an, China
3 Microelectronic R&D Center, Shanghai University, Shanghai, China

Abstract. In this paper, a two-stage optimal detection algorithm is presented for pedestrians in front of the vehicles. It uses the idea of combing the coarse-grain and fine-grain to effectively classify and filter. First, it uses the combination of Color Self-Similarity features based on rectangular block summing and AdaBoost classifier based on greedy strategy to coarse-grained screen the pedestrian detection window, then it uses the combination of HOG feature and libsvm classifier to fine-grained confirm the previous screened pedestrian detection window, Finally, the target windows is integrated by the greedy strategy. The AdaBoost classifier's training time is theoretically shorten to the 1/T time of original algorithm. With the training process, The Color Self-Similarity features shorten to 250 dimensions by the feature selection. Then, the method makes full use of the image information and ensures the detection accuracy.

SuB3-2

Collision Free Path Planning for Welding Robot Based on CG-MOPSO

Xuewu Wang and Yixin Yan and Xingsheng Gu
Key Laboratory of Advanced Control and Optimization for Chemical Processes of Ministry of Education, East China University of Science and Technology, Shanghai, China

Abstract. For spot welding task, reasonable welding path is useful for welding efficiency improvement. Obstacle avoidance is essential for safe welding, and energy consumption is another factor needed to be considered in the process of welding robot path planning. The shortest path length and energy consumption are considered as optimization objectives, and obstacle avoidance is set as the constraint

condition in this article. After analysis of geometric obstacle avoidance strategy, energy consumption, and robot path length, the multi-objective welding path optimization model is given first. Then, the clustering guidance multi-objective particle swarm algorithm (CG-MOPSO) is presented. At last, the improved algorithm is applied to realize the welding robot path optimization, and the algorithm effectiveness is verified through the Pareto optimal solution.

SuB3-3

Taxi Driving Anomalous Route Detection Using GPS Sampling Data

Zhiguo Ding
College of Mathematics, Physics and Information Engineering, Zhejiang Normal University, Jinhua, Zhejiang, China

Abstract. This paper proposed a method of detecting taxi driving anomalous route using the GPS sampling data. After analyzing the characteristics of sampling data, such as discrete and uneven, and taking into account that the traditional anomaly detection methods are hard to be applied directly in this field as well as high computation complexity, the mapping trajectory is defined and the new anomaly detection method is proposed based on the grid concept, which doesn't require measure the distance or density during anomaly detection procedure and thus alleviates the computing resource requirements. To validate the proposed method, the real-life GPS sampling dataset is used and the experimental results confirm that our proposed method is effective.

SuB3-4

Study on Flame Combustion Stability Based on Particle Swarm Optimization Feature-weighted SVM

Rongbao Chen, Honghui Jiang YangLiu
Hefei University of Technology, Hefei, China

Abstract. In order to achieve the automatic monitoring of the combustion stability of the boiler, and to quantitatively determine the stability of the combustion, the combustion stability evaluation model of the particle swarm optimization feature weighted support vector machine is proposed. The eigenvalues of the combustion state in the flame image is extracted, and the feature weight of each eigenvalue is obtained. Then, the kernel function of the support vector machine is modified by feature weighting vector. Particle swarm is used to optimize penalty factors and kernel parameters, and the same set of samples are used to test the classification ability of support vector machine and feature weighted support vector machine. The results show that the support vector machine model with feature weighting has higher recognition rate and can judge the combustion state accurately and effectively, which can meet the real-time requirement of stability judgment.

SuB3-5

Study on Lamb Wave Dispersion Curves for the Testing of Metal Plates

Jinggang Xu1,2, Jingshan Deng1,3
1 Shanghai University, Shanghai, China
2 Changzhou Vocational Institute of Engineering, Changzhou, China
3 State Nuclear Power Plant Service Company, Shanghai, China

Abstract. For using Lamb wave to test metal plates extensively, Lamb wave dispersion curves[1]-[5] for the testing of metal plates are studied. A suit of software for drawing Lamb wave dispersion curves specially has been designed though the arithmeticanalyzing of symmetrical and asymmetrical modes of Lamb wave frequency characteristic equation, and achieves it by the software of VC++. And the problem of drawing and application for Lamb wave dispersion curves has been resolved. It is fit for metal plates of different materials and types.

SuB3-6

Automatic Character Detection System for IC Test Handler Based on Active Learning SVM

Tianshan Wang, Fan Jiang, Xiaojin Zhu, Hesheng Zhang, Zhiyuan Gao
School of Mechatronic Engineering and Automation, Shanghai University Shanghai, P. R. China

Abstract. An automatic character detection system for IC test handler is designed to recognize the characters on the surface of IC chip based on active learning SVM. Firstly, industrial camera is employed to collect a large number of chips' surface image. Secondly, image preprocessing is carried out, including image grayscale, binarization and filter processing. Thirdly, the features of the preprocessed image are extracted. To reduce the annotation cost for training data and improve recognition rate, active learning algorithm is used to label the training data, while support vector machine algorithm is used to classify those data. Comparison with SVM algorithm, template matching and BP neural network shows the effectiveness of the proposed algorithm

SuB3-7

Active RFID Tags for Smart Shelf Based on LF Assistant Devices

Bing Bai, Xiaojin Zhu, Hesheng Zhang, Zhaoxun Zhang,
School of Mechatronic Engineering and Automation, Shanghai University Shanghai, P. R. China

Abstract. An active RFID tag with 2.4GHz radio communication function and LF wake-up module is designed in this paper. On the basis of this, a smart shelf system is proposed to reduce the time of searching for specified goods and improve operation efficiency of warehousing management. The location of the tags attached to the items on the shelf is estimated by the weighted centroid localization algorithm. With the deployments of the assistant LF label nodes, the shelf doesn't have to be divided into several fixed electromagnetic shielding space. These advantages help the shelf to achieve greater flexibility of cargo storage management

SuB4
14:00-16:30
Room 4 (Peony Hall B)
Topic: Intelligent Modeling, Monitoring, and Control of Complex Nonlinear Systems

SuB4-1

Zero-Shot Image Classification via Coupled Discriminative Dictionary Learning

Lehui Liu, Songsong Wu, Runqing Chen and Mengquan Zhou
Nanjing University of Post and Telecommunication, Nanjing, China

Abstract. In this paper, we propose a Coupled Discriminative Dictionary Learning framework to tackle the zero-shot image classification problem. Instead of the original attribute vectors and sample feature vectors, we use their corresponding sparse coefficients attained from sparse coding to do the classification. The purpose of our framework is that, when an unseen-class sample shows during test time, we first attain its corresponding sparse coefficient through learned feature dictionary. Then we use a mapping method to map it to the attribute sparse coefficients category histogram domain where we can accomplish the classification. We evaluate our method performance on two benchmark datasets for zero-shot image classification. The results are compelling to other state-of-the-art, especially on fine-grained dataset.

SuB4-2

Multivariate Fault Isolation in Presence of Outliers Based on Robust Nonnegative Garrote

Jianguo Wang1, Zhifu Deng1, Banghua Yang1, Shiwei Ma1, Minrui Fei1, Yuan Yao 2, Tao Chen 3
1.School of Mechatronic Engineering and Automation, Shanghai University, Shanghai Key Lab of Power Station Automation Technology, Shanghai, China
2. Department of Chemical Engineering, National Tsing-Hua University, Hsin-Chu, Taiwan
3. Department of Chemical and Process Engineering, University of Surrey, Guildford GU2 7XH, UK

Abstract. Fault isolation is essential to fault monitoring, which can be used to detect the cause of the fault. Commonly used methods include contribution plots, LASSO, Nonnegative garrote, construction-based methods, branch and bound algorithm (B & B), etc. However, these existing methods have shortcomings limiting their implementation when there exist vertical outliers and leverage points, Therefore, to further improve the fault prediction accuracy, this paper present a strategy based on robust nonnegative garrote(R-NNG) variable selection algorithm, which is proved to be robust to outliers in the TE process.

SuB4-3

Secant Method Based U-model Identification and Generalized Predictive Controller for Nonlinear Dynamic Systems

Ting Zhou, Jie Ding*, Hui Deng
School of Automation, Nanjing University of Posts and Telecommunications, Nanjing, China

Abstract. Generalized predictive controller of nonlinear systems are analyzed, to improve the efficiency, a secant method is employed to estimate the parameters of U-model that considered as an easy and effective modelling method for nonlinear dynamic plants. In this way, the final controller output of the nonlinear systems is transformed into solving a polynomial equation based on the available controller output, which greatly decreases the difficulties in the design of nonlinear control systems. The controller output can be derived from the secant method, which does not need to calculate the derivative, reduces the computational complexity and have faster convergence rate. In order to illustrate the design process and its effectiveness of the algorithm, a simulation is conducted to verify the method.

SuB4-4

Research on nonlinear Lamb wave based structural damage monitoring

Wang Qiang, Ji Dongchen, Zhou Chen
College of Automation, Nanjing University of Posts and Telecommunications, Nanjing, China

Abstract. Due to limitation of traditional Lamb wave based structural damage monitoring methods, early micro damages which are smaller than the wavelength of the

waves usually can hardly be detected and evaluated. In this paper, major efforts were focused on nonlinear Lamb wave, including its propagation characteristic and sensitivity to micro damages. The relationship between the nonlinear characteristic parameters of Lamb wave and the degree of damage is revealed by experimental study. The cumulative (S1, S2) symmetric mode Lamb wave were adopted in the research so that nonlinear second harmonic signals could be obtained to measure metallic structural material's nonlinear changes quantitatively. In view of dispersion and multiple models characteristic that affect signal analysis, the time-frequency analysis method, STFT, was adopted to extract the fundamental Lamb wave mode and second harmonic mode respectively. Experimental results on T6061 aluminum plates shown that the nonlinear characteristic parameters were sensitive to the artificial fatigue damages. It can be also found that the nonlinear characteristic parameters were grown with the degree of the damages.

SuB4-5

Second-order Average Consensus with Buffer Design in Multi-agent System with Time-varying Delay

Junxian Yang1,2 Li Hui1,2 Peidong Wang3 and Yang Li4,5*
1 Shandong Provincial Key Laboratory of Ocean Environment Monitoring Technology, Qingdao, China.
2 Shandong Academy of Sciences Institute of Oceanographic Instrumentation, Qingdao, China.
3 Qingdao Institute of product quality supervision and inspection, Qing'dao, China
4 College of Mechanical & Electronic Engineering, Shandong Agricultural University, Tai'an, China
5 Shandong Provincial Key Laboratory of Horticultural Machinery and Equipment, Tai'an, China

Abstract. In this paper, we focus on the average consensus problem with varying time-delays for second-order dynamic agents within a network of fixed topologies. Some typical network effects are elaborated, such as network conditions that induced delays, packet dropouts, error-sequence, etc.. Based on Gersgorin Disks theorem, we discuss in-depth the necessary condition and the time delays' upper bound for system stability. Then the stability theory is used in consensus strategy design, avoiding the communication error caused by network time-delays. A group agents consensus algorithm with transmission-receive buffer and buffer length a selection method are proposed. Using this buffer design method, agent can transmit and receive data with original order. The proposed algorithm is test in MATLAB simulation environment with 2 typical examples. The simulation results show the effectiveness of the algorithm. With the proposed consensus algorithm, all agents are matched with the average speed, and network time-delay effects are reduced.

SuB4-6

Adaptive consensus-based distributed targettracking in sensor networks

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2 the Department of Control Science and Engineering, Tongji University, Shanghai, 200092, P. R. China
3 the Key Laboratory of Advanced Control and Optimization for Chemical Processes of Ministry of Education, School of Information Science and Engineering, East China University of Science and Technology, Shanghai, P. R. China

Abstract. This paper is concerned with the distributed Kalman state estimation with an adaptive consensus factor for a discrete-time target linear system over a sensor network. Both optimal filter gain and average disagreement of the estimates are considered in the filter design. In order to estimate the state of the target more accurately, an optimal Kalman gain is obtained by minimizing the mean-squared estimation error. The considered disagreement is employed to adjust the optimal gain as well as to acquire a better filtering performance. An illustrative example has been presented to prove the correctness of the conclusion and show the tracking performance of the filters

SuB4-7

Event-Triggered Consensus Tracking Control ofMulti-Agent Systems With Lipschitz-TypeDynamics

Yang Yang1 and Dong Yue1, 2
1 College of Automation, Nanjing University of Posts and Telecommunications,Nanjing, China
2 The Jiangsu Engineering Laboratory of Big Data Analysis and Control for ActiveDistribution Network, Nanjing University of Posts and Telecommunications, Nanjing, China

Abstract. In this paper, we consider the leader-following tracking control problem for a class of nonlinear multi-agent systems (MASs) with Lipschitz-type dynamics via event-triggered approaches. For a directed communication topology, a distributed consensus control scheme is developed on the basis of event-triggered mechanism. In addition, to avoid continuous monitor of

measurement information, a technical approach is presented for generation of the combinational information from their own neighboring agents only at event instants. The stability of the closed loop system is given, and it is proven that the Zeno behavior is ruled out.

SuB4-8

Formation Problem of Second-order Multi-agent Systems with Input Delay and Communication Delay

Yun Chai1 and Ke-cai Cao1,2,
1 Nanjing University of Posts and Telecommunications, Nanjing, Nanjing, China
2 Nanjing University of Aeronautics and Astronautics, Nanjing, China

Abstract. Distributed formation control of Second-order Multi-agent Systems has been discussed in this paper. A consensus-based cooperative formation control strategy with both input delay and communication delay has been proposed. The control strategy not only consider the deviation between the actual speed and the standard speed, but also, on the basis of this, consider the deviation between the actual displacement and the standard displacement. In order to achieve a faster consensus seeking, the tow-hop relay protocol has been introduced into the strategy. The control strategy makes agents can build up stable and desired formation and move at expected speed. Based on the frequency-domain analysis and matrix theory, the distributed conditions are proved for the formation control of system. A six-vehicle formation control example is shown in simulation as an illustrative example.

SuB4-9

Fault Estimation Observer Design of Nonlinear Systems with Actuator Faults

Xiangpeng Xie1;3 and Yanan Liu2
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2 School of Automation, Nanjing University of Posts and Telecommunications, Nanjing, China
3 Hubei Province Collaborative Innovation Center for New Energy Microgrid, China Three Gorges University, Yichang, China

Abstract. This paper introduces a relaxation design of fault estimation observer for some nonlinear dynamical plants by means of the Takagi–Sugeno method. A featured fuzzy fault estimation observer is produced by utilizing the named maximum-priority-based switching law, which is di_erent from these existing ones. For each enabled switching signal, the appropriate piece of enabled matrices can be produced to explore certain serviceable properties of the considered plants by introducing a piece of matrix-valued variables. Owing to the more useful information of the considered nonlinear plant could be properly updated and effectively employed at each time instant, the conservatism of the given result can be significantly released, at the same time, the result is less restraint than that previous ones. At last, there are some simulation results of the considered nonlineartruck-trailer plant are given to prove the profit of our theoretic approach.

SuB4-10

Stability Analysis of Event-Triggered Networked Control Systems with Time-Varying Sampling

Huaibin Xie1, Songlin Hu2
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2 Hubei Provincial Collaborative Innovation Center for New Energy Microgrid, CTGU, China
2 Institute of Advanced Technology, Nanjing University of Posts and Telecommunications, Nanjing, China

Abstract. In this paper, the stability analysis of event-triggered networked control systems is investigated. First, a more advanced event-triggered algorithm is introduced. Second, the nonperiodic sampled-data system is modeled as a state delay system. Third, a stability result is derived based on Lyapunov-Krasovskii functional approach. Finally, some simulation results are given to verify the effectiveness of the proposed method.

SuB4-11

State Estimation-based Security Control forNetworked Systems under Hybrid Attacks

Hao Zhang1, Chen Peng1 and Hongtao Sun1
Shanghai Key Laboratory of power Station Automation Technology, School of Mechatronic Engineering and Automatic, Shanghai University, Shanghai, China

Abstract. This paper is concerned with the security control of networked systems under denial of attacks and false data injection attacks. Firstly, an observer is designed to estimate the system state under hybrid attacks, and the system is modelled as a stochastic closed-loop system with an observer-based security controller. Then, by use of the Lyapunov theory, sufficient security stability and stabilization criteria are derived to ensure the asymptotically stable of the studied system in the mean-square sense under hybrid attacks. Finally, an example is given to illustrate the

effectiveness of developed method.

SuB4-12

Hopf bifurcation in a delayed two-neuronfractional network with incommensurate-order

Lingzhi Zhao1 , Beibei Shi1, Min Xiao2
1 School of Information Engineering, Nanjing Xiaozhuang University, Nanjing, China
2 College of Automation, Nanjing University of Posts and Telecommunications, Nanjing, China

Abstract. In this paper, a delayed fractional two-neuron network with incommensurate-order is proposed. By analyzing the characteristic equation of the proposed network and using time delay as the bifurcation parameter, the conditions of stability and Hopf bifurcation are educed. And then, it is demonstrated that each order has important influence on the creation of bifurcation. Finally, a numerical example is given to illustrate the effectiveness of the proposed results.

SuB4-13

Networked control system based on LQ tracking and response strategy under data injection attack

Xinchun Jie2, Minrui Fei1, Dajun Du1, T C Yang3
1 School of Mechatronic Engineering and Automation, Shanghai University, Shanghai, China
2 School of Information and Engineering, Inner Mongolia University of Science and Technology, Baotou, China
3 Department of Engineering and Design University of Sussex, Brighton BN1 9QJ, UK

Abstract. It is one of the most important research topics in the field of automatic control to ensure stability of networked control system and keep controlled parameters unchanged in the presence of data injection attacks. On the basis of linear system state feedback, a linear quadratic (LQ) method keeping output error close to zero is presented. Stability condition of closed-loop system is given. Using integral control and LQ infinite time tracking strategy, a protective closed-loop control system is illustrated in detail. Simulation results show that the control strategy can reduce or remove the influence of illegal injecting data at sensor's output terminal in some degree. Controlled parameters are limited within small variation range. The control method has certain application prospect and popularization value.

SuB4-14

Filtering for Stochastic Systems withTransmission Delays and Out-of-Order Packets

Li Liu1⋆, Aolei Yang2, Wenju Zhou1, Qiang Tao3, Xiaowei Tu2, and Jun Yue1
1 School of Information Science and Electrical Engineering, Ludong University, Yantai, China
2 Shanghai Key Laboratory of Power Station Automation Technology, School of Mechatronic Engineering and Automation, Shanghai University, Shanghai, China
3 Department of Student Affairs, Shandong Commerce Vocational College, Yantai, Shangdong, China

Abstract. The robust filter is designed for a class of discrete-time stochastic systems with data random transmission delays and out-of-order packets in this paper. To drop packet disorders and improve system performance, the systems are modeled synthetically by utilizing the signal choosing scheme of logic zero-order-holder (ZOH). Moreover, a finite horizon robust Kalman-type filter is designed based on the established model, and minimizing error covariance matrices by the augmented state-space model are obtained from estimation variance constraints. And then, a linear delay compensation method is proposed to improve the filter performance by using the re-organized measurement. The simulation results are performed to show the effectiveness of the proposed method.

SuB4-15

Local Bifurcation Analysis of a Fractional-Order Dynamic Model of Genetic Regulatory Networks with Delays

Qingshan Sun1, Min Xiao1, Lingzhi Zhao2, Binbin Tao1
1 College of Automation, Nanjing University of Posts and Telecommunications, Nanjing, China
2 College of Information Engineering, Nanjing Xiaozhuang University, Nanjing, China

Abstract. This paper proposes a mathematical model of gene networks, which includes the fractional derivative and delays. We obtain the conditions of the stability and Hopf bifurcation, and find that a Hopf bifurcation occurs when the sum of delays crosses the critical value, which can be calculated exactly. The fractional order can be used to effectively control the dynamics of such fractional-order model, and the stability domain can be changed by manipulated the order. Finally, a numerical example is presented to demonstrate the theoretical analysis.

SuB4-16

l_2/l_∞ Filtering for Wireless Networked Control Systems with Communication Constraints and Packet Losses

Li-sheng Wei, Yun-qiang Ma
School of Electrical Engineering, Anhui Polytechnic University, Wuhu City, Anhui, P. R. China

Abstract. The issue of l_2/l_∞ filter designing for Wireless Networked Control System (WNCS) with both communication constraints and packet losses is discussed in this paper. By using the discrete Markov chain, the state of limited channel can be described. And the packet losses behavior is assumed to obey the Bernoulli random sequence. Then the WNCS is modeled as an Asynchronous Dynamic System (ADS) with random parameters and nonlinear term. The l_2/l_∞ filter design is also presented by using Linear Matrix Inequality (LMI) method. The sufficient condition of the closed-loop WNCS to be stable is obtained by using the ADS approach. Finally, a numerical example is presented to demonstrate the effectiveness of the proposed result.

SuB4-17

Observer-based H_∞ Output Feedback Control for Switched Systems with Sojourn Probability Method

Lei Wang1, Juan Li1, Engang Tian1, Yinghui Hu1
1 School of Electrical Engineering and Automation Engineering, Nanjing Normal University, Nanjing, China

Abstract. This paper investigates the observer-based H_∞ output feedback control for a class of switched systems with time delay. Different from some existing methods, the switching rule in the considered systems is governed by the sojourn probability information (the probability of the switched system staying in one subsystem). In order to rebuild the switched systems and utilize those probability information, a set of random variables are introduced to represent the switching law of the switched systems. The expectation of the random variable is the sojourn probability of the subsystems. In such a way, new type of switched systems with random variables are built. The purpose of the addressed problem is to design the observer-based output feedback controller and to obtain sufficient conditions for the mean square stability of the system. By using a multiple Lyapunov functional method, one theorem is derived, and the controller and observer gains can be computed by solving a set of linear matrix inequalities. A simulation example is proposed to illustrate the effectiveness of the developed design method.

SuB5

16:45-18:00
Room 4 (Peony Hall B)
Topic: Advanced Methods for Networked Systems

SuB5-1

Event-triggered Communication and H_∞ Filtering Co-design for Networked Control Systems

Weili Shen1, Jingqi Fu1 , Jie Wu1,Weihua Bao2,Zhengming Gao
1 Department of Automation, College of Mechatronics Engineering and Automation, Shanghai University, Shanghai, China
2 Shanghai Automation Instrumentation Co. Ltd., China

Abstract. In this paper, the issue of event-triggered H∞ filtering for networked control systems (NCSs) with transmission delay is investigated. First of all, a strategy called event-triggered is introduced where tasks are generated only at the time that the event-triggering condition set before on the sampled measurements of the plant is satisfied. Then considering the double effects of the communication delay and the event-triggering technique, transform the filtering error system into a time-delay system the problem of which can be derived by the existing theory. A co-design method of event-triggered mechanism and H∞ filtering which also guarantees the asymptotic stability of the NCSs is obtained by constructing a properly Lyapunov-Krasovskii functional and LMI technique based on the new model. Finally an example of verification is given to show the validity of the proposed method.

SuB5-2

State Estimation for Discrete-time Complex Dynamical Networks with Markovian Packet Losses

Shengnan Cao, Youhong Wan*
College of Automation, Nanjing University of Posts and Telecommunications, Nanjing, China

Abstract. In this paper, the state estimation problem is investigated for discrete-time output coupled complex networks with Markovian packet losses. Unlike the majority of emerging research on state estimation with Bernoulli packet dropout, the Markov chain is used to describe the random packet losses. In use of the Lyapunov functional theory and stochastic analysis method, the explicit description of the estimator gains is presented in the form of the solution to certain linear matrix inequalities (LMIs). At last, simulations are exploited to illustrate the proposed estimator design scheme is

applicable.

SuB5-3

Coverage and Control of Diffusion Process in Cyber-Physical Systems

Ke-cai Cao1,2 and Fujiao Zhou1 and Minglou Qian1
1 Nanjing University of Posts and Telecommunications, Nanjing, China
2 College of Automation Engineering, Nanjing University of Aeronautics and Astronautics, Nanjing, P. R. China

Abstract. Coverage and control of a diffusion process using multiple robots have been studied in this paper. Two control strategies such as CVT (Centroidal Voronoi Tessellations)-Allocation-Motion Algorithm and CVT-Obstacles Avoidance-Motion Algorithm have been proposed for cooperative control of multiple robots in realizing the task of coverage and control of diffusion process that is modeled by parabolic partial differential equation. Reliability and transient performance have been improved based on the algorithms that is proposed in this paper. Simulation results using Diff-MAS2D for the diffusion process illustrate the effectiveness of the theoretical results.

SuB5-4

Jamming Attacks against Control Systems: A Survey

Yanbo Dong, Peng Zhou
School of Mechatronic Engineering and Automation, Shanghai University, Shanghai, China.

Abstract. Modern control systems are now combining advanced network technology for control optimization and efficiency, but, on the other side, induce network attack as a new threat to control security. A typical network attack targeting control systems is Denial of Service (DoS) jamming attack. This attack can disable control operations by simply flooding network traffic to the control-network channels, and therefore is easy to deploy and hard to defend. In this paper, we conduct a comprehensive review on this attack and report our results in three aspects: the attacking strategies of jamming attack, the defending solutions to this attack and the arms race between them. To this end, we also discuss the potential research directions on this topic.

SuB5-5

State Estimation For Complex Network With One Step Induced Delay Based On Structural Controllability and Pinning Control

Wei Wang, Youhong Wan *, Xinyuan Liang
College of Automation, Nanjing University of Posts and Telecommunications,Nanjing, China

Abstract. In this paper, the design of state estimation for the complex network with one-step induced delay are studied that only need a part of the network node's output measurement, based on structural controllability. Firstly, vwe selected the driver nodes according to the maximum matching method instead of the topological degree's size, and then estimated all nodes' information with these driver node's measurement output. By using the Lyapunov stability theory and the stochastic analysis method, the conditions for the existence of the gain matrix of the state estimator are presented in the form of linear inequalities. Finally, the simulation example is given to verify the present theoretical analysis in this study.

SuB5-6

Distributed economic dispatch based on consensus algorithm under event-triggered mechanism

Shengxuan Weng1, Dong Yue1, Chongxin Huang1
Institute of Advanced Technology, Nanjing University of Posts and Telecommunications, Nanjing, China.

Abstract. This paper investigates the problem of distributed eventtriggered economic dispatch method for generators in power system. Considering the issue of limited bandwidth of communication network in practical application, the novel distributed event-triggered mechanism are introduced to reduce the information transmission pressure, and the distributed economic dispatch method is constructed based on the triggering schemes. Under the designed method, the economic dispatch problem can be solved and the generation-demand equality constraint is satisfied. Simulation results show the effectiveness of the proposed method.

SuB5-7

MTMDs-based Noise Control for Box-girder Bridge of High Speed Railway

Xiaoan ZHANG1,2*, Guangtian SHI1, Jianjin YANG2 and Xiaoyun ZHANG1
1 School of Mechanical Engineering, Lanzhou Jiaotong University, Lanzhou, China
2 Train and Track Research Institute, State Key Laboratory of Traction Power, Southwest Jiaotong University, Chengdu, China

Abstract. The environmental issues induced by the high speed railway become more and more serious with its rapid development. In order to control the low-frequency structure

noise of the box-girder bridge of high speed railway, this paper proposes a new idea that the multi-mass-dampers (MTMDs) may be used. A sound radiation analysis model of the box-girder bridge is developed to validate the idea and to evaluate the control effect. Firstly, a vehicle-track-bridge coupled dynamic model is established to obtain the dynamic responses of the box-girder bridge induced by the excitation of German railway spectra of low irregularity. Then the sound radiation analysis model of the box-girder bridge is established using boundary element method and the dynamic responses are used as the boundary condition to solve the acoustic radiation characteristics of the box-girder bridge. The mechanism of noise radiation of the box-girder bridge is analyzed combined the acoustic radiation efficiency, the vibration response and the vibration distribution. Finally, the MTMDs are using to control the noise radiated by the box-girder bridge based on its mechanism of noise radiation and the control effect is evaluated.

SuB5-8

The re-optimization strategy of multi-layer hybrid building's cooling and heating load soft sensing technology research based on temperature interval and hierarchical modeling techniques

Kai Liu1,2 Ting-Zhang Liu1,2 Ping Fang1,2 Zhan-Pei Li1,2
1. Department of Automation, College of Mechatronics Engineering and Automation, Shanghai University
2. Shanghai Key Laboratory of Power Station Automation Technology, Shanghai, China

Abstract. Building thermalload prediction is one of the key factors in the success of energy-saving measures. Many computational models available in the industry today have been developed from either forward orinverse modeling approaches. However, most of these models require extensive computer resources and involve lengthy computation. This paper discusses the use of hybrid intelligent approaches and re-optimization strategy, amulti-layer hybrid model (APNN) has been proposed by hybridizing an autoregressive model with exogenous inputs (ARX) and a particle swarm optimization neural network (PSO-NN) to make a good use of the comprehensive information of the meteorological data and historical data. In order to further improve the prediction precision and generalization ability of the multi-layer hybrid model, temperature interval and hierarchical modeling techniques were used. According to the re-optimization strategy, there are two improvements of the previous proposed APNN model， which are based on temperature interval and hierarchical modeling by solar radiation intensity. Compared with the basic prediction models，validation results show that accuracies of the optimized models are greatly improved. What's more, the optimization of multi-layer hybrid building's cooling and heating load soft sensing technology enhancing learning and generalization capability of the basic APNN model.

SuC3
14:00-16:30
Room 5 (Yulan Hall A)
Topic: Advanced Computational Methods in Energy, Power, Electric Vehicles and Their Integration

SuC3-1

A Contract Based Approach for Electric Vehicles Charging in Heterogeneous Networks

Huwei Chen1, Zhou Su1, Yilong Hui1, Hui Hui1, and Dongfeng Fang2
1 School of Mechatronic Engineering and Automation, Shanghai University, P. R. China.
2 Department of Electrical and Computer Engineering, University of Nebraska-Lincoln (UNL), USA.

Abstract. With the help of mobile charging stations (MCSs), the charging service of electric vehicles (EVs) can be provided more easily with higher payoff and lower consumption, compared with the fixed charging stations (FCSs). Although many traditional approaches have been used to decide the pricing plans for FCSs, it can not be efficient to design the optimal pricing strategy for MCSs. In this paper, we propose a contract based scheme to solve the problem of supplying power service to EV users. Firstly, considering quality of service (QoS) and mobility of MCS in the heterogeneous networks, we study and develop the utility function based on the relationship for MCS and EV users. Then, the charging problem for EV users is formulated as an optimization problem through the contract theory. Thirdly, we present the iterative algorithm to achieve the optimal solution. Our simulation results show the effectiveness of the proposed strategy.

SuC3-2

Review of the Four Ports Electromechanical Converter used for Hybrid Electric Vehicle

Qiwei Xu1, Jing Sun1, Meng Zhao1, Xiaobiao Jiang1, Yunqi Mao1, and Shumei Cui2
1 Chongqing University, Chongqing, China
2 Harbin Institute of Technology, Harbin, China

Abstract. Four Ports Electromechanical Converter (FPEC) is a device based on electromagnetic principle to realize speed distribution, torque distribution and electromechanical conversion. The performance of FPEC directly affects the dynamic properties and fuel economy of hybrid electric vehicle (HEV), which can achieve the functions of continuously variable speed, power compensation, brake energy feedback, starter and generator mode by constituting a complete series-parallel hybrid system combining with the internal combustion engine (ICE) and energy storage. This paper has discussed the FPEC used for the hybrid power system and focused on the analysis of magnetic coupling and electrical coupling, which lays the foundation for the further research and practical application of FPEC in the HEV.

SuC3-3

Location Model Research of Charging Station for Electric Vehicle Based on Users' Benefit

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Abstract. To improve the electric vehicle charging infrastructure and accelerate the development of electric vehicles, the optimization of electric vehicle charging stations' location and size are studied in this paper. The annual comprehensive cost of society, including user cost and charging station cost, is regarded as the objective function. Weight coefficients are added to the function for increasing the proportion of user cost. An optimized mathematical model for electric vehicle charging stations based on users' benefit is established. The improved Quantum-behaved Particle Swarm Optimization (QPSO) algorithm is adopted to solve this mathematical mode, and result which contain the optimal location and size of electric vehicle charging stations is obtained. Finally, an actual area is taken as the case study to optimize the location and size of electric vehicle charging stations by solving the mathematical model proposed in this paper with the improved QPSO algorithm. Rationality and validity of the model are well improved by the scientific reasonable result.

SuC3-4

Research on Double Fuzzy Control Strategy for Parallel Hybrid Electric Bus

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State Key Laboratory of Power Transmission Equipment & System Security and New Technology, Chongqing University, Chongqing, China

Abstract. In this paper, a double fuzzy control strategy(DFLS) for parallel hybrid electric bus(HEB) is proposed. Firstly, the basic parameters of HEB is designed. Then, the single fuzzy logic control strategy(SFLS) is proposed based on the parameters. SOC and torque demand scale factor are taken as the input of fuzzy controller. Combining with the braking energy recovery strategy, this paper proposes a double fuzzy control strategy, which is taken SOC, required torque and bus speed as the input. And this paper makes a comparison of the both strategies in Chinese Bus Driving Cycle(CBDC) based on the simulation results.

SuC3-5

Optimal Battery Charging Strategy Based on Complex System Optimization

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2 Department of Electrical Engineering, Shaoxing University, Shaoxing, Zhejiang, China
3 School of Electronics, Electrical Engineering and Computer Science, Queen's University Belfast, Belfast, UK
4 Shanghai Key Laboratory of Power Station Automation Technology, School of Mechatronic Engineering and Automation, Shanghai University, Shanghai, China

Abstract. This paper proposes a complex system optimization method to obtain an optimal battery charging strategy. First, a real-world lithium-ion battery charging model is built as a complex system problem, which includes electric subsystem and thermal subsystem. The optimization objectives of electric subsystem includes battery charging time and energy loss, and the optimization objectives of thermal subsystem includes battery internal temperature rise and surface temperature rise. Then a called biogeography-based complex system optimization (BBO/Complex) algorithm is introduced, which is a heuristic method for

complex system optimization. Finally, BBO/Complex is applied to the complex system of battery charging strategy, and the results show that the proposed method is a competitive algorithm for solving batter charging problem studied in this paper.

SuC3-6

Design of Adaptive Predictive Controller for Superheated Steam Temperature Control in Thermal Power Plant

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2 Shanghai Key Laboratory of Power Station Automation Technology

Abstract. In this paper, an adaptive model predictive controller for overheating steam temperature control of thermal power plants is designed, which is based on the control object with large delay, large inertia, nonlinearity and strong time-varying properties. Through the on-line identification and control of different models, compared with predictive controllers in a general model, in terms of adjusting the superheat steam temperature, it can shorten adjusting time drastically, reduce even eliminate the overshoot and improve the dynamic performance greatly when applying in adaptive model predictive controller. The results show that the adaptive model predictive controller, because of its simple implementation, can be used in power plants, and also can be applied to solve similar problems, which has a broad application prospects.

SuC3-7

Extended State Space Predictive Control of Gas Turbine System in Combined Cycle Power Plant

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2 Beijing Hualian Electric Power Engineering Supervision Company，Building 40 No.188 South 4th Ring Road，Fengtai District, Beijing, China

Abstract. In this paper, an extended state space predictive control (ESSPC) strategy has been applied to gas turbine in combined cycle power plant. This proposed predictive control needn't solve Diophantine equation online. In addition, in order to overcome the shortcoming of the conventional state space predictive control (SSPC) which only takes output errors into consideration, the objective function of ESSPC includes both output errors and the variation of the system states. In the rolling optimization part, the quadratic program (QP) method is applied to deal with the limitations on the inputs of system. Simulation results show that the proposed algorithm has better tracking ability and stability compared with conventional state space predictive controller in the same condition.

SuC3-8

Decentralized H$_I$ load frequency control for multi-area power systems with communication uncertainties

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2 School of Civil Engineering, Lanzhou Jiaotong University, Lanzhou, Gansu, China

Abstract. This paper investigates the distributed load frequency control (LFC) for multi-area power systems with communication switching topologies and data transmission time-delays. For stabilizing the power flow frequency while encompassing situations of seldom subsystem disconnections, a decentralized Markov switching control scheme is proposed. To further reduce conservative of the controller, a time-delay equipartition technique is developed. In addition, the distributed cooperative control (DCC) scheme is also discussed and proved to be unsuitable as a LFC strategy. Finally, illustrative examples are provided to validate effectiveness of the proposed methods.

SuC3-9

Cyber Security Against Denial of Service of Attacks on Load Frequency Control of Multi-Area Power Systems

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2 School of Communication and Information Engineering, Shanghai University, Shanghai, China
3 School of Electrical Engineering, University of Belgrade,Belgrade, Serbia

Abstract. While open communication infrastructures are embedded into multi-area power systems to support data transmittion, it make communication channels vulnerable to cyber attacks, reliability of power systems is affected. This paper studies the load frequency control (LFC) of multi-area power systems under DoS attacks. The state space model of

power systems under DoS attacks is formulated, where event-triggered control scheme is integrated for the multi-area power systems under DoS attacks. By utilizing average dwell time design approach, exponential stability and $L2$-gain of the multi-area power systems can be obtained for event-triggered LFC scheme under DoS attacks, if choosing an unavailability rate of communication channels for DoS attacks properly. Finally, the example shows that the convergences of frequency deviation of threearea power systems are compared under different DoS attack scenarios, when the proportion of the total time of DoS attacks can obtain the
result properly.

SuC3-10

Detecting Replay Attacks in Power Systems:A Data-Driven Approach

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Shanghai University, China
University of Bahrain, Bahrain

Abstract. Detecting replay attacks in power systems is quite challenging, since the attackers can mimic normal power states and do not make direct damages to the system. Existing works are mostly model-based, which may either suffer from a low detection performance or induce negative side effects to power control. In this paper, we explore purely data driven approach for good detection performance without side effects. Our basic idea is to learn a classifier using a set of labelled data (i.e., power state) samples to detect the replayed states from normal ones. We choose the Support Vector Machine (SVM) as our classifier, and a self-correlation coefficient as the data feature for detection. We evaluate and confirm the effectiveness of our approach on IEEE bus systems.

SuC3-11

A Novel Dynamic State Estimation Algorithm in Power Systems under Denial of Service Attacks

Mengzhuo Yang1, Xue Li1, and Dajun Du1
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Abstract. The paper is concerned with a dynamic state estimation algorithm in power systems under denial of service (DoS) attacks. Firstly, the character of data packet losses caused by DoS attacks is described by Bernoulli distribution, and the dynamic model of power system is reconstructed. Using Holt's two-parameter exponential smoothing and extended Kalman filtering techniques, a dynamic state estimation algorithm is proposed, where the recursion formula of the parameter identification, state prediction and state filtering contain the statistical properties of data packet losses. Simulation results confirm the feasibility and effectiveness of the proposed algorithm.

SuC3-12

H_∞ prediction triggering control of multi-area power systems load frequency control under DoS attacks

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3. School of Automation, Nanjing University of Science and Technology, Nanjing, China

Abstract. This paper is concerned with load frequency control of multi-area power system under DoS attacks. We introduce inner virtual event triggering mechanism under framework of model based predictive control to design load frequency control. Then Lyapunov stability theory is used to analysis H_∞ predictive control problem. Sufficient condition is derived in form of linear matrix inequalities which guarantees the closed loop system is stable with H_∞ performance. Simulation of a two-area power system is given to illustrate the effectiveness of the proposed method in dealing with long duration DoS attack.

SuC3-13

New Framework Mining Algorithm Based Main Operation Parameters Optimization in Power Plant

Wencheng Huang 1, Li Jia 1and Daogang Peng 2
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2 College of Automation Engineering, Shanghai University of Electric Power, Shanghai Key Laboratory of Power Station Automation Technology, Shanghai, China

Abstract. Association rule mining algorithm based on support-confidence framework is widely applied to the optimization of main operating parameters value in thermal power plant. But some important potential knowledge is easy to be overlooked by the framework in the actual mining process.

Moreover, the simulation experiments show that there is a great relationship between mining results and a given minimum support threshold. Thus a dynamic interestingness-support framework mining algorithm based on metarules guided is proposed by which parameters for multidimensional association rules can be determined. The new framework reduces the redundancy of results by metarule-guided mining. And it mainly screens association rules with the index of interestingness except support, so as to weaken the dependence between mining results and the minimum support threshold. What is more, a new similarity criterion is introduced in dividing production process condition, to avoid the single spherical cluster determined by the Euclidean distance. Therefrom overcome the shortness of traditional dividing. The simulation results show that the algorithm proposed in this paper can effectively tap out the rules. And the rules can correctly reflect the knowledge of the unit and improve the accuracy of main operation parameters value in thermal power plant.

SuC3-14

A Consensus-based Distributed Primal-dual Perturbed Subgradient Algorithm for DC OPF

Zhongyuan Yang1, Bin Zou1, Junmeng Zhang1
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Abstract. In this paper, an consensus-based distributed primal-dual perturbed subgradient algorithm is proposed for the DC Optimal Power Flow(OPF) problem. The algorithm is based on a double layer multi-agent structure, in which each generator bus and load bus in electric power grid is viewed as bus agent and connects with the grid by a network agent. In particular, network agents employ the average consensus method to estimate the global variables which are necessary for bus agents to update their generation using a local primal-dual perturbed subgradient method. The proposed approach is fully distributed and realizes the privacy protection. The employment of primal-dual perturbation method ensuring the convergence of the algorithm. Simulation results demonstrate the effectiveness of the proposed distributed algorithm .

SuC3-15

Optimized Control of Ship DC Electric Propulsion System with Energy Storage Unit

Feng Ding1, Shuofeng Wang2 and Shaohua Zhang1
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2 Shanghai Marine Equipment Research Institute, Shanghai, China

Abstract. The frequent load fluctuations caused by the marine environmental variability and the operational requirements of the ship itself will have adverse impacts on the economics and reliability of the ship power grid. To alleviate these adverse impacts, the energy management technology is adopted and the super capacitor is employed as the energy storage unit in the ship DC electric propulsion system. In addition, the smooth fluctuation power control method is used, and the particle swarm optimization algorithm is applied to optimize the cut-off frequency of the low-pass filter and the capacity of super capacitor. As results, the fuel consumption cost of the diesel generator and energy storage cost can be minimized, and the negative impact caused by the ship load fluctuations can be mitigated. Finally, the simulation results show that the proposed methods can effectively improve the performance of ship propulsion system.

SuC3-16

The Application of the Particle Swarm Algorithm to Optimize PID Controller in the Automatic Voltage Regulation System

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2 Xu Chang electric power supply company, Xu Chang City, Henan Province, P. R. China
3 College of Electrical Engineering, Shanghai University of Electric Power, Shanghai, P. R. China

Abstract. Automatic voltage regulation (AVR) is a system that used to adjust the voltage stability and balance reactive power and also for regulating power plant generator. Focusing on the traditional PID automatic voltage regulation system, this paper investigated the effct of particle swarm optimization (PSO) algorithm in optimizing the parameters of PID controller in AVR system, and compared with genetic algorithm (GA) for PID parameters optimization. The simulation results showed that the AVR system optimized by PSO had more stability and robustness, which indicated the good application prospect of the proposed method.

SuC3-17

Research on the Bio-electromagnetic Compatibility of Artificial Anal Sphincter Based on Transcutaneous Energy Transfer

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1 School of Mechatronics Engineering and Automation, Shanghai University, Shanghai Key Laboratory of Power Station Automation Technology, Shanghai, China
2 Naval Aeronautical University Qingdao Campus, Qingdao, China

Abstract. For the treatment of anal incontinence, a new type of artificial anal sphincter is designed. The artificial anal sphincter system based on transcutaneous energy transfer mainly consists of sensor execution subsystem, wireless communication control subsystem and transcutaneous energy supply subsystem. Aim at the energy supply problem and the electromagnetic compatibility of the device, the energy transmission circuit is designed and optimized. At the same time, the three-dimensional model of the transmitting coil is constructed, and the high precision electromagnetic model of human body is carried out by using the finite difference time domain method. The distribution of specific absorption rate of different tissues is obtained. The safety analysis is carried out according to the International standard for electromagnetic safety of human body. The simulation results show that the artificial anal sphincter can stably and reliably supply energy to the internal device and it features favorable bio-electromagnetic compatibility. This study makes a firm theoretical foundation for the application of artificial anal sphincter.

SuC4
16:45-18:00
Room 5 (Yulan Hall A)
Topic: Modeling, Simulation and Control in Smart Grid and Microgrid

SuC4-1

The Role of Intelligent Computing in Load Forecasting for Distributed Energy System

Pengwei Su, Yan Wang1, Jun Zhao 1, Shuai Deng1, Ligai Kang1, Zelin Li1,Yu Jin1
1 Key Laboratory of Efficient Utilization of Low and Medium Grade Energy, Tianjin University, Ministry of Education of China, Tianjin, China

Abstract. The integration of renewable energy into the distributed energy system has challenged the operation optimization of the distributed energy system. In addition, application of new technologies and diversified characteristics of the demand side also impose a great influence on the distributed energy system. Through a literature review, the load forecasting technology, which is a key technology inside the optimization framework of distributed energy system, is reviewed and analyzed from two aspects, fundamental research and application research. The study presented in this paper analyses the research methods and research status of load forecasting, analyses the key role of intelligent computing in load forecasting in distributed energy system, and realizes and explores the application of load forecasting in practical energy system.

SuC4-2

Intelligent Control Methods of Demand Side Management in Integrated Energy System: Literature Review and Case Study

Yan Wang, Pengwei Su, Jun Zhao, Shuai Deng, Hao Li, Yu Jin
Key Laboratory of Efficient Utilization of Low and Medium Grade Energy, Tianjin University, Ministry of Education of China, Tianjin, China

Abstract. Demand side management (DSM) would become an important method to guarantee the stability and reliability of the innovative energy structure model, have received increasing attention. DSM is regarded as an integrated technology solution for planning, operation, monitoring and management of building utility activities. However, there are several problems and technical challenges on the research level of fundamental methodology, which causes difficulties for the practical application of intelligent DSM control strategy. Therefore, optimization would play a vital role in the implementation process of DSM. A real case study was presented to demonstrate how to relieve and solve the existing technical challenges by the application effective optimization strategy and methods of DSM. At last, several possible research directions, that application of intelligent methods in the development of DSM optimization techniques, were presented.

SuC4-3

Optimal Design and Operation of Integrated Energy System Based on Supply-demand Coupling Analysis

Qiong Wu and Hongbo Ren
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Abstract. In this study, a bottom-up energy system optimization model is developed to assist the decision-making towards a

sustainable energy system in the local area, while accounting for both supply-side and demand-side measures. The demand-side energy efficiency measures have been modeled as virtual energy generators, so as to be considered within a uniform optimization framework. The optimization model can provide feasible system configuration of both supply-side and demand-side appliances, as well as corresponding operating strategies, in terms of either economic performance or environmental benefit. As an illustrative example, a residential area located in Kitakyushu, Japan, is employed for analysis. The simulation results suggest that the combination of distributed energy resources and energy efficiency measures may result in better economic, energy and environmental performances. Moreover, it is technically and economically feasible to achieve more than 40% reduction in CO_2 emissions within the local area.

SuC4-4

Control strategies for the microgrid control system with communication delays

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1 College of Electrical Engineering, Shanghai University of Electric Power, Shanghai,China
2 School of Electronics, Electrical Engineering and Computer Science, Queen's University Belfast, UK
3 School of Computer and Information, Luoyang Institute of Science and Technology, Luoyang, China

Abstract. In this paper, two kinds of microgrid system architectures and the control approaches are studied. The proposed architectures are designed above a kind of communication network. The communication network characteristic is mainly described by network-induced delays which have greater influences on the control system performance. The network-induced delays in this paper is depicted by the inverse Gaussian distribution function. The proposed control strategies are implemented depending on the achitectures of themselves. The principle of event-triggered and droop-based approach are employed to restrain the different disturbances such as the break of main grid and insertion of new load. Some numerical examples are used to illustrated the effectiveness of the control approaches in this paper.

SuC4-5

Secondary voltage control of microgrids with distributed event-triggered mechanism

Jing Shi, Dong Yue, and Shengxuan Weng
School of Automation and the Institute of Advanced Technology, Nanjing University of Posts and Telecommunications, Nanjing, China

Abstract. This paper presents a secondary voltage control scheme with distributed event-triggered mechanism for multiple distributed generators in microgrids. First, to mitigate the over-provisioning of communication resources in microgrids, a distributed event-triggered mechanism is proposed. Then, based on the proposed triggering scheme, distributed secondary controllers are designed for distributed generators. Finally, simulation results demonstrate that with the adoption of the control strategy, the voltages of distributed generators are synchronised to their nominal values.

SuC4-6

Frequent Deviation-Free Control for Micro-Grid Operation Modes Switching Based on Virtual Synchronous Generator

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2 Jiangsu Engineering Laboratory of Big Data Analysis and Control for active distribution network, Nanjing, China

Abstract: The virtual synchronous generator (VSG), which overcomes the impact of the traditional inverter without the moment of inertia to the power grid, improves the stability of the power system and has received extensive attention in Micro-grid. However, since the VSG uses the traditional active power-frequency droop control, there is a frequency deviation in island mode, which will adversely affect the load in Micro-grid. A frequent deviation-free control strategy based on VSG is proposed, i.e., the frequency proportional-integral (PI) module feedback is used to replace the traditional damping module. It will eliminate the frequency deviation of Micro-grid in island mode and realize the Micro-grid inverter to work in multi-mode control. The simulation results show that the effectiveness of the presented VSG based frequent deviation-free control strategy.

SuC4-7

Research on Field Service Scheduling Problem Based on Hybrid Fruit Fly Optimization Algorithm

Bin Wu , Min Dong
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Abstract. With the development of the O2O

business model, field services related to individual customer needs and customized services are becoming increasingly important. Field service scheduling problem is the core problem in the field service. For the present study, it is not considered that the scheduling result is affected by the skill proficiency of the worker. The model considering the skill level of the staff is establish based on the optimization goals of the travel time, service time and waiting time in the paper. A hybrid Fruit Fly Optimization algorithm is proposed to optimize the model. Based on the feature of the problem and the merit of the algorithm, an encoding method based on the matrix is designed. And then three search operators are proposed, and the smell-based search strategy and the vision-based search strategy for the Fruit Fly Optimization algorithm are redesigned. At the same time, in order to improve the performance of the algorithm, an initialization operator based on the nearest heuristic algorithm and the post-optimization process based on 2-Opt and Or-Opt are constructed. Through the simulation experiments, the proposed operators and strategies are compared and analyzed and the hybrid Fruit Fly Optimization algorithm are compared with other algorithms. The simulation results show that the hybrid Fruit Fly Optimization algorithm is an effective method to solve the problem of field service scheduling problem.

SuC5
14:00-16:30
Room 6 (Yulan Hall B)
Topic: Optimization Methods and Computational Methods for Sustainable Environment

SuC5-1

A Novel Combination of Forecasting Model Based on ACCQPSO-LSSVM and Its Application

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2 School of Electrical Engineering, Anhui Polytechnic University, Wuhu, China
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Abstract. This paper proposed a novel combination of prediction model based on Adaptive Cauchy and Chaos Quantum-behaved Particle Swarm Optimization (ACCQPSO) and Least Squares Support Vector Machine (LSSVM) to forecast the short-term output power more accurately. To improve the performance of QPSO, chaotic sequences are used to initialize the origin particles, and particle premature convergence criterion, Cauchy and Chaos algorithm are employed, which can effectively increase the diversity of population and avoid the premature convergence. The kernel parameters of LSSVM are optimized by ACCQPSO to obtain hybrid forecasting model. To verify the proposed method, the seven days actual data recorded in a wind farm located in Anhui of China are utilized for application validation. The results show that the proposed combinational model achieves higher prediction accuracy.

SuC5-2

Research on Power Terminal Access Control Technology Supporting Internet Interactive Service in Smart Grid

Song Deng, Liping Zhang, Dong Yue
Institute of Advanced Technology, Nanjing University of Posts and Telecommunications, Nanjing, China

Abstract. With the continuous development of smart grid interactive business applications, the existing terminal access mechanism is difficult to ensure that all types of power terminals access to power information network security. Based on the idea of trusted computing and trusted network connection, this paper proposes a power terminal security access architecture for power interactive business from terminal security access and access control, terminal encryption and content filtering, and establishes architecture of supporting for interaction business from Internet and terminal security access, enhances the external network interactive services and terminal access authentication and access control capabilities in order to improve the security of terminal access to protect the strength of the Internet to ensure interactive services and terminal access to the trustworthy.

SuC5-3

An Improved Multi-objective Differential Evolution Algorithm for Active Power Dispatch in Power System with Wind Farms

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2 College of Electrical Engineering, Shanghai University of Electric Power, Shanghai, China

Abstract. For the uncertainty of wind power

and load, a reserve risk index is defined from minimum of load loss and maximum of utilizing wind power. Then, the index is introduced into optimizing for active power dispatch. Considering three indexes which consist of fuel cost, pollutant emission amount and the reserve risk index, a multi-objective optimization model for active power dispatch in power system with wind farms is established. For better solving model, an improved multi-objective differential evolution algorithm is proposed. This algorithm contains chaos initialization strategy, parameter adaptive strategy, dynamic non-dominated sorting strategy introduced to enhance the global searching ability. With the Pareto solution set, the entropy-based TOPSIS (Technique for Order Performance by Similarity to Ideal Solution) is adopted to sort the optimal solution set for the final scheme. The results and data analysis demonstrates the model is reasonable and the algorithm is valuable.

SuC5-4

Multi-level Maintenance Economic Optimization Model of Electric Multiple Unit Component Based on Shock Damage Interaction

Hong Wang 1, Yong He1, Lv Xiong1, Zuhua Jiang2
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2 School of Mechanical Engineering, Shanghai Jiao Tong University, Shanghai, P. R. China

Abstract. In order to simulate the reliability evolution process of Electric Multiple Unit (EMU) components under external shock and improve maintenance economy. The multi-level preventive maintenance method is established and the influence of maintenance period and allocation of multi-level imperfect maintenance on the maintenance economy are discussed respectively. Numerical experiments show that the multi-phase preventive maintenance model can reduce the maintenance cost rate. The analysis of bi-level imperfect maintenance capacity indicates that two-level preventive maintenance can extend the mileage of four-level preventive maintenance and three-level preventive maintenance can reduce the maintenance cost rate. Finally, some recommendations for the allocation of maintenance efforts are provided according to the different railway route features.

SuC5-5

Numerical Investigation of the Environment Capacity of COD, Inorganic Nitrogen and Phosphate in the Bohai Bay

Hao Liu and Zhi-kang Zhang
Shanghai Ocean University, Shanghai, China

Abstract. An ocean dynamic model is used to simulate the tides and currents in the Bohai Bay. Model results are validated by comparing with observations. Furthermore, the conservative tracer is used to estimate the water exchange rate of the Bohai Bay, and it is found that about 62% of the seawater is transported out of the bay annually. At last, the grade 2 quality of the seawater is taken as the criteria to investigate the environment capacity of three major pollutants. It is found that the static capacity of COD, inorganic nitrogen and phosphate is about 3.999×10^5, 3.999×10^4 and 3.999×10^3 t/a, respectively, if the water exchange is not considered. furthermore, the process-controlled environment capacity for three pollutants can be 6.478×10^5, 6.478×10^4 and 6.478 t/a, respectively, and the consequence-controlled environment capacity may be as high as 1.052×10^6, 1.052×10^5 and 1.052×10^4 t/a, respectively.

SuC5-6

An Artificial Neural Network Model for Predicting Typhoon Intensity and Its application

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2 College of Harbour, Coastal and Offshore Engineering, Hohai University, Nanjing, China
3 Department of Mathematics, College of Science, Beijing Forestry University , Beijing, China
4 Faculty of Science, Yamagata University, Yamagata 990-8560, Japan

Abstract. Considering that the typhoon intensity ’ s statistical predictors have the characteristics of inaccuracy, incompleteness and uncertainty, and the optional factors are factors are usually lots in a practical application,but the predictive ability will decline if using too many factors in a model, and may also lost the important information by choosing the inappropriate factors. Latitude and longitude of storm center, minimum central pressure,maximum wind speed near the storm center were chosen to be predictors, and a neural network model for predicting typhoon intensity was established by using every 6 hours of current and former 18 hours of these information directly. In this study, 61-year data set from 1949 to 2009 was used to train the networks, and 5-year data set from

2010 to 2014 was used to test the trained network. Compared with other typhoon predicting models, and results showed that the model has obtained a good predicting accuracy.

SuC5-7

Analysis of Power Spectrum Feature Based on Slurry Noise in Electromagnetic Flowmeter

Jie Chen, Qiong Fei, Bin Li, Xiaojie Zheng
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Abstract. As an essential part of measuring technology, flowmeters have been widely used in industrial production. Accurate flow metering will not only improve the quality of products, promoting economic efficiency and management level, but lays foundation for the assessment of energy saving and environmental sewage discharging. Electromagnetic flowmeter is suitable for slurry flow measurement since it has high reliability, strong corrosion resistance, high measurement precision, and no stopped medium components in the measuring pipe. In order to improve the measurement of slurry noise problem, this paper will analyze the power spectrum of the slurry noise, and then find the relationship between slurry noise and excitation frequency as to provide theoretical basis for frequency switch of the variable frequency electromagnetic flowmeter.

SuC5-8

A Two-stage Agriculture Environmental Anomaly Detection Method

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2 Shanghai Key Laboratory of Power Station Automation Technology, Shanghai, China

Abstract. In order to process abnormal problems of massive distributed greenhouse environmental data, a novel anomaly detection algorithm based on the combination of Support Vector Machine (SVM) and Gaussian Mixture Model (GMM) is proposed and realized under the Spark framework, which is utilized to detect the environmental anomaly during crop growth. At the first stage, SVM is adopted to classify the data, Spark framework is utilized to solve optimization problem iteratively; at the second stage, GMM is used to do clustering on the classified data respectively. Spark framework is utilized to update the models internationally until stable, during every iteration, Map phase implements the distribution of the sample points to the models, Reduce phase renew the numbers of models and the parameters. Finally, the detection of environmental anomaly is completed by taking advantages of the clustering result. The results show that the proposed approach can be well applied to actual production.

SuC5-9

Building a Virtual Reality System for Intelligent Agriculture Greenhouse based on Web3D

Qun Huang 1,2, Li Deng1,2,* , Minrui Fei 1,2 , Huosheng Hu3
1 School of Mechatronics Engineering and Automation, Shanghai University, China
2 Shanghai Key Laboratory of Power Station Automation Technology, Shanghai University
3 School of Computer Science & Electronic Engineering, University of Essex, UK

Abstract. The inevitable trend of agricultural development in China is to realize real-time monitoring, visualization and management of intelligent agriculture greenhouse. This paper presents a virtual reality system that is developed for an intelligent agricultural greenhouse using Web3D. Both virtual reality and image matching technology are integrated to construct such a VR system. The basic roaming interactive function of the system is realized using 3DS MAX modelling technology and virtual reality platform (VRP). An improved SIFT algorithm is proposed to complete panoramic image mosaic, which is on the basis of SIFT feature matching algorithm combined with Harris algorithm. Finally, the 3D visualization of agricultural greenhouse, the data management and real-time interactive control are realized and tested.

SuC5-10

Short-term Optimal Scheduling with the Consideration of Electric Vehicle Driving Rules

Xiaolin Ge, Chenhao Pei
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Abstract. Taking into account the daily driving rules of electric vehicle (EV), a novel short-term optimal scheduling model is proposed. And to describe the driving characteristics of the EV, EVs are divided into four types according to the detailed driving rules. And the stochastic driving time, access time and daily mileage of different types of

EVs are simulated by a large number of scenes. Besides, the interaction between the EV and the power systems is added to establish the coupling between the output of units, and the operation of EVs. Due to the complexity of the constraints, the stochastic nonlinear unit commitment model is converted into mixed integer linear programming problem and solved by CPLEX. Case studies show the necessity of considering the stochastic driving rules of EVs, and the classification of EVs can make the dispatching decision more reasonable.

SuC5-11

Unit Commitment Dynamic Unified Active and Reactive Power Dispatch of Microgrids with Integration of Electric Vehicles

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1 Cranfield University, Bedfordshire, UK
2 University of Technology, Baghdad, Iraq
3 Cranfield University, Swindon, UK

Abstract: Electric vehicles (EVs) play a vital role in the reduction of emission of the greenhouse gases by reducing the consumption of fossil fuel. This paper presents a fully developed integration of the EVs with a security-constrained unified active and reactive power dynamic economic dispatch of microgrids (MGs) to minimize the total operating cost or maximizes the profit. The formulation of the overall optimization problem considers the reactive power production cost and relevant constraints, the environmental costs, and the battery degradation cost. A comprehensive set of constraints including active and reactive security constraints, limitation of the greenhouse gases constraints, and constraints relevant to the integration of the EVs with the MG are considered as well. The bi-directional penetration of the EVs with the MG is modelled and incorporated with unit commitment (UC) optimization problem. The results show that the proposed approach of the integration of the EVs with the MG reduces the total operating cost and increases the profit.

SuC5-12

Security-Constrained Two-Stage Stochastic Unified Active and Reactive Power Management System of the Microgrids

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2 University of Technology, Baghdad, Iraq

Abstract: This paper presents a developed robust two-stage scenario-based stochastic unified active and reactive power economic management system of microgrids (MGs) based on the unit commitment (UC) to minimize the total operating cost. The security constraints, the environmental costs, and the storage battery operating cost are considered in the proposed optimization approach. The mathematical stochastic models of the generation fluctuation of wind turbines (WTs) and photovoltaic panels (PV), and open market prices (OMPs) are developed and incorporated with UC optimization problem of the MG. The proposed stochastic approach is a two-stage optimization, where the first stage is the day-ahead scheduling based on the forecasted data, whereas the second stage mimics the real-time by considering the WT, PV, and OMP variability, where the UC is not changed in the second stage. The proposed optimization algorithm is tested on the low voltage connected MG. The results reveal that the feasible solution can be obtained for all scenarios.

SuC5-13

Optimal design and planning of electric vehicles within microgrid

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Abstract Optimal allocation and economic dispatch of the distributed generators (DGs) and electric vehicles (EVs) are very important to achieve resilience operating of future microgrids. This paper presents a new energy management concept of interfacing EV charging stations with the microgrids. Optimal scheduling operation of DGs and the EVs is used to minimize the total combined operating and emission costs of a hybrid microgrid. The problem was solved using a mixed integer quadratic programming (MIQP) approach. Different kinds of distributed generators with realistic constraints and charging stations for various EVs with the view to optimizing the overall microgrid performance are investigated. The results have convincingly revealed that discharging EVs could reduce the total cost of the microgrid operation.

SuC5-14

Charging and discharging strategy of electric vehicles within a hierarchical energy management framework

Mohammed Alkhafaji1, Patrick Luk2, John Economou3
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Abstract. As the number of EVs is increasing modern methods are required to understand their impact to the power grid (operators and users). In order to reduce/manage fluctuations on voltage stability and angle stability there is a need for a management control strategy. This paper presents an energy management concept of Charging Station System (CSS) to charge or discharge power of EVs in different situations while retaining system integrity. A suitable objective function is formulated of frequency deviation and voltage deviation on the optimal operation of the charging station are evaluated by formulating and solving the optimisation problem using mixed integer linear programming. The results show that EVs act as a regulator of the microgrid which can control their participation role by discharging active or reactive power in mitigating frequency deviation and/or voltage deviation. The optimisation algorithm is evaluated by formulating and solving the optimisation problem using mixed integer linear programming. Case studies are used to show the viability of the proposed energy management concept.

SuC5-15

State-of-Charge Estimation of Lithium Batteries Using Compact RBF Networks and AUKF

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2 School of Electronics, Electrical Engineering and Computer Science, Queen's University Belfast, UK

Abstract. A novel framework for the state-of-charge (SOC) estimation of lithium batteries is proposed in this paper based on an adaptive unscented Kalman filters (AUKF) and radial basis function (RBF) neural networks. Firstly, a compact off-line RBF network model is built using a two-stage input selection strategy and the differential evolution optimization (TSS DE RBF) to represent the dynamic characteristics of batteries. Here, in the modeling process, the redundant hidden neurons are removed using a fast two-stage selection algorithm to further reduce the model complexity, leading a more compact model in line with the principle of parsimony. Meanwhile, the nonlinear parameters in the radial basis function are optimized through the differential evolution (DE) method simultaneously. The method is implemented on a lithium battery to capture the nonlinear behaviours through the readily measurable input signals. Furthermore, the SOC is estimated online using the AUKF along with an adaptable process noise covariance matrix based the developed RBF neural model. Experimental results manifest the accurate estimation abilities and confirm the effectiveness of the proposed approach.

SuC5-16

An improved multi-objective bare-bones PSO for optimal design of solar dish Stirling engine systems

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Abstract. An improved bare-bones multi-objective particle swarm optimization, namely IMOBBPSO is proposed to optimize the solar-dish Stirling engine systems. A new simple strategy for updating particle's velocity is developed based on the conventional Bare-Bones PSO, aiming to enhance the diversity of the solutions and accelerate the convergence rate. In order to test the effectiveness of IMOBBPSO, four benchmarks are used. Compared with the Non-dominated Sorting Genetic Algorithm-II (NSGAII) and multi-objective particle swarm optimization algorithm (MOPSO), it is revealed that IMOBBPSO can quickly converge to the true Pareto front and efficiently solve practical problems. IMOBBPSO is then used to solve the design of the solar-dish Stirling engine. It is shown that IMOBBPSO obtains the best optimization results than NSGAII and MOPSO. It further achieves significant improvements 25.6102% to 29.2926% in terms of the output power and entropy generation rate when it is compared with existing results in the literature.

SuB6
16:45-18:00
Room 6 (Yulan Hall B)
Topic: Advanced Sliding Mode Control and Applications and Advanced Analysis of New Materials and Devices

SuB6-1

Influences of Stiffness of rail pads on system dynamic performances of heavy haul railway

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Abstract. In order to solve the problem that the track structure is oversimplified in the dynamics study of heavy haul railway, a wagon vehicle-track coupled dynamic model is proposed in this paper. The track structure is more detailed and is modelled by a composite double-layer dynamic model. The upper layer is composed of two rails and the lower layer is composed of many sleepers. The rails are connected with sleepers by the rail pads. This more detailed model is then used to study the influences of the stiffness of the rail pads on the system dynamic performances of heavy haul railway. The results reveal that the proposed model is more practical to study the dynamic problems of heavy haul railway, and the model is able to subtly analyze the dynamic influences of local structure on the wagon vehicle-track coupled dynamic system. The results also shows that the stiffness of the rail pads has a great impact on the vertical wheel/rail force, the dynamic responses of the wagon and the vertical displacement of the rail. The smaller stiffness of the rail pads will worsen the wear process of the rail and aggravate the vibration displacement amplitude of the fasteners by increasing the vibration of the rail. Therefore, an appropriate stiffness of the rail pads is of great significance to extend the service life of the track and to reduce the maintenance and operation cost.

SuB6-2

Noise observer based sliding mode control for time-varying delay systems

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2 School of Civil Engineering, Lanzhou Jiaotong University, Lanzhou, Gansu,China
Abstract. This paper investigates the control issue for noise-perturbed time-varying delay systems. A novel state and noise observer (SNO) based sliding mode control (SMC) law is designed, meanwhile, a weighted energy-to-energy performance (WEEP) is proposed for reducing the negative influence of the observer-induced complex exogenous noises. By a novel free-weight matrix method, the stability condition is conveniently obtained. By the proposed method, the exponential stability of close-loop system can be guaranteed while a WEEP is simultaneously achieved, moreover, the exponential convergence rate can be pre-specified. Numerical examples are provided to demonstrate the effectiveness of the proposed methods.

SuB6-3

Research on Speed Identification of Induction Motor Based on Sliding Mode Observer

Qiwei Xu, Meng Zhao, Xiaoxiao Luo, Xiaobiao Jiang, Yunqi Mao, Weidong Chen and Yiming Su
Chongqing University, Chongqing, China
Abstract. An improved integral sliding mode observer in this paper is proposed for speed identification in induction motor, compared with traditional sliding mode observer, the steady-state error and buffeting of the control system are reduced, and the integral saturation is effectively suppressed. Based on the phase-locked loop decoding technique, the rotor position angle is calculated. The system has a good performance in speed tracking and has a satisfied accuracy of identified speed in full speed range. Finally, the correctness of the speed identification strategy proposed in this paper is verified by simulation and experimental study.

SuB6-4

Magnetic Field Measurement Instrument Based on Asymmetric Giant Magneto-impedance Effect

Feng Jiang1, 2, Shulin Liu1
1 School of Mechatronic Engineering and Automation, Shanghai University, Shanghai, China
2 School of Mechatronic Engineering, Jiangsu College of Information Technology, Wuxi, China
Abstract. A magnetic field measurement instrument based on asymmetric giant magneto-impedance effect is developed by using $Co_{66.3}Fe_{3.7}Si_{12}B_{18}$ amorphous ribbon. The signal processing circuit of the sensor and the hardware circuit of the measurement instrument are designed, and the experiment result is given. The result shows that this instrument can measure the weak magnetic field ranging from -260 to +260 A/m. The sensitivity is 0.01A/m and measurement accuracy is ±0.55% because of applying sensor nonlinear compensation technique through microcontroller. The instrument has high sensitivity, high repeatability, high frequency response characteristic, which is widely used in aerospace, aviation, national defense and other fields.

SuB6-5

Analysis of Effective Transmission Distance of Double Transmitters in Magnetic Coupled Resonant WPT System

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Abstract. The coupling coefficient between the transmitters and receivers is a key factor of power transfer efficiency for magnetic resonant coupling wireless power transfer system. Firstly, the equivalent circuit model of double-transmitter (DT) structure is established. The correlation between the transmission power and coupling coefficient of both single-transmitter (ST) and DT structure is compared and analyzed. The result shows that the critical coupling coefficient of DT structure is reduced to 0.707 times of the ST structure, when there are peak transfer power. And it means that the former can increase the transmission distance. In this paper, the effective transmission area is defined, and the effective transmission areas of DT structure can be obtained in two cases of symmetric and asymmetric structures, respectively. Finally the numerical simulation analysis is conducted and a conclusion is drawn that the effective transmission area in over-coupling area can be significantly enlarged with frequency tracking measures, which validates the correctness of the aforesaid theoretical analysis.

SuB6-6

Analysis on Al-Cu Dissimilar Materials Friction Stir Welding Butt Joint based on J Integral Model

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Abstract. The fracture J Integral Model was build on the actual Al-Cu dissimilar materials Friction Stir Welding joint to investigate the microdefects ont properties of the joint. The calculation results showed that the severe stress concentration emerged at the tip of crack in interface, the pack stress could reach up to 379 MPa, which was higher than the strength of the base metal, and resulted in the joint fracture. Further, the x-direction stress was much higher than the y-direction stress. In the J Integral Model, the x-direction stress would lead to the opening fracture and the y-direction stress would lead to the shearing fracture, thus the opening fracture with small shearing fracture was the character of the Al-Cu joint.

SuB6-7

Pinched hysteresis loop characteristics of a fractional-order HP TiO2 memristor

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2 Hubei Province Collaborative Innovation Center for New Energy Microgrid, China Three Gorges University, Yichang, P. R. China

Abstract. A memristor is a nonlinear resistor with time memory. Usually, the memory without any loss is an ideal case. Recent studies show that there is a memory loss of the classic HP TiO2 linear model, which has memory effect be- tween no memory and ideal memory (complete memory). To describe the mem- ory property, we propose a fractional-order HP TiO2 memristor model with the order α between 0 and 1, and the pinched hysteresis loop characteristics are studied as the fractional-order model under periodic external excitation. Compared with the classic integer-order memristor model, numerical simulations show that the fractional-order derivative α is also an important parameter effects the pinched hysteresis loop area,

SuB6-8

Integral Sliding Mode Based Precision Motion Control for PMLM

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2 School of Microelectronics, Fudan University, China

Abstract. In ultra-precision fabrication, permanent magnet linear motor (PMLM) is generally applied thanks to its excellent performance. Thus, it is expected to meet high accuracy and high speed simultaneously. However, it is difficult to reach the goal using the tradition control strategies. In this paper, a novel method is proposed to improve response speed and tracking accuracy, which employs an integral sliding mode controller that switches between PD control and PID control according to the value of tracking errors. Based on the modeling of PMLM, an integral sliding mode controller is constructed, taking the advantages of both PD and PID control. Thus, the closed-loop system could respond rapidly and ideally reduce state error. To optimize the performance of the proposed control strategy, its parameters are adjusted using particle swarm optimization (PSO) algorithm. The validity of the method is verified by simulation under different inputs

and constant disturbance in a 1DOF precision stage.

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