

ICCSS 2016

2016 International Conference on Informative and Cybernetics for Computational Social Systems



August 26–29, 2016

Jinzhou, Liaoning, China.

CONFERENCE DIGEST

Sponsored by



Conference Digest
2016 IEEE International Conference on
Informative and Cybernetics for
Computational Social Systems
IEEE ICCSS 2016

Aug 26-29, 2016

Jinzhou, Liaoning, China.

Organized by

Liaoning University of Technology, China

University of Macau, Macau, China

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IEEE Systems, Man and Cybernetics Society

IEEE SMCA Technical Committee on Computational Psychophysiology

IFAC Technical Committee on Economic, Business, and Financial Systems (TC 9.1)

Welcome Message

Welcome to the 2016 International Conference on Informative and Cybernetics for Computational Social Systems (ICCSS 2016)!

ICCSS 2016 provides an international forum that brings together those actively involved in computational social systems, cybernetics, and information processing, to report on up-to-the-minute innovations and developments, to summarize the state-of-the-art, and to exchange ideas and advances in all aspects of social systems, computation, cybernetics, and information processing.

We would like to take this opportunity to thank the Technical Program Committee comprising of many Area Chairs and Reviewers from all over the world, who have worked diligently to ensure that high quality papers will be presented and published in the proceedings. We also acknowledge the support of and express our sincere appreciation to the members of the local organizing committee. We are also grateful to the advice and guidance of the Executive Committee of the Liaoning University of Technology, University of Macau and the IEEE SMC Society (SMCS). Lastly and most importantly, we thank all of you, the authors and delegates, for participating in ICCSS 2016, sharing your knowledge and experience and contributing to the advancement of science and technology for the improvement of the quality of our lives.

We wish each and every one a most pleasant experience at ICCSS 2016 in Jinzhou.



Shaocheng Tong
General Chair, ICCSS 2016



C. L. Philip Chen
General Chair, ICCSS 2016

IEEE ICCSS 2016 Conference Digest

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Committees

| | |
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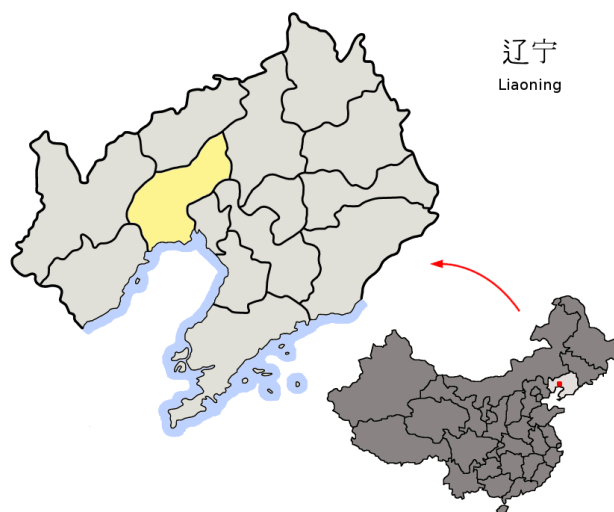
General Information

Jinzhou



Jinzhou (锦州) is a prefecture-level city of Liaoning province, People's Republic of China. It is a geographically strategic city located in the "Liaoxi Corridor" (辽西走廊), which connects land transportation between North China and Northeast China. Jinzhou is China's northernmost seaport and the coastal economic center of West Liaoning on the north-western shore of the Bohai Sea. The total area under the jurisdiction of Jinzhou is 10,111 square kilometers (3,904 sq mi), most of which is rural, encompassing a coastline of 97.7 km (60.7 mi).

It is one of the biggest cities in Liaoning with a population of 3,126,463 at the 2010 census, of whom 1,091,799 reside in the built-up area made of 3 urban districts.



Location of Jinzhou

The name "Jinzhou" came into use in the Liao dynasty, when it belonged to Zhongjing prefecture. In the Jin dynasty, it was part of Dongjing Township and Beijing township. It belonged to Liaoyang Xingzhongshu in the Yuan dynasty and to Liaodong township in the Ming dynasty. It was ruled by Tianfu during the Qing dynasty, when its name was changed from Jinzhou to Jinxian. It was previously known in English as Chihhsien and Chinchow.

Local Time

GMT/UTC + 08:00 hour

Electricity

The electric system is 220 Volt AX (50 HZ). There are many plugs and sockets available for use in the hotel. Travelers with shavers, computers, and other personal electronics should carry a plug-adaptor kit.

Conference Information

The 2016 International Conference on Informative and Cybernetics for Computational Social Systems (ICCSS 2016) will take place in Liaoning University of Technology, Jinzhou, Liaoning, China from August 26 to 29, 2016. Jinzhou is an ancient city with over a thousand years of history. Originally known as Tuhe (徒河), it was part of Yan in the Warring States period. Under the Qin dynasty, the majority of what is now Jinzhou became part of Liaodong Township. It was part of Changli Township in Youzhou during the Han dynasty and Three Kingdoms periods, but fell under the jurisdiction of Yingzhou in the Beiwei, Dongwei, and Beiqi periods, before becoming part of Liucheng township and then Yan township during the Sui Dynasty and Tang dynasty. During the Tang, it was the seat of the Andong Township.

(Address: [Liaoning University of Technology](#), 169 Shiying Street, Guta District, Jinzhou, Liaoning, P.R. China.)



Liaoning University of Technology

Access to Liaoning University of Technology



- 锦州火车站
Jinzou Railway Station
 - About 5 kilometers
 - Taxi: about 15 minutes, RMB 8.00
 - NO.7 Bus (get off Liaoning University of Technology: about 27 minutes, RMB 1.00)
- 锦州南站
Jinzou South Railway Station
 - About 17.5 kilometers
 - Taxi: about 35 minutes, RMB 40.00
 - NO.205 Bus (get off Jinzhou Railway Station): about 40 minutes, RMB 2.00



Conference Registration

A conference registration desk will be set up and opened at the Petroleum Hotel 64 JingyeBeili(敬業北里 64 號), Jinzhou, China from August 26 (13:00) to August 28 (12:00) as followings.

August 26, 2016: 13:00 ~ 18:00 Registration Area, E4-1063, 1 floor, Petroleum Hotel 64 JingyeBeili(敬業北里 64 號), Jinzhou, China.

August 27, 2016: 14:00 ~ 18:00 Registration Area, 1 floor, Petroleum Hotel 64 JingyeBeili(敬業北里 64 號), Jinzhou, China.

August 28, 2016: 09:00 ~ 12:00 Registration Area, 1 floor, Petroleum Hotel 64 JingyeBeili(敬業北里 64 號), Jinzhou, China.

Map of Conference Rooms



IEEE ICCSS 2016

Program at a Glance

August 26-29, 2016
Jinzhou, Liaoning, China

Friday, August 26, 2016

13:00 - 18:30 Registration Desk Open (**Registration area, 1st floor, Petroleum Hotel 64 JingyeBeili(敬業北里64號), Jinzhou, China**)

Saturday, August 27, 2016

8:30 - 9:00 Opening Ceremony
9:00 - 9:50 **Plenary Talk #1** (Prof. Tianyou Chai)
9:50 - 10:20 Morning Break
10:20 - 11:10 **Plenary Talk #2** (Prof. Yuqiang Wu)
11:10 - 11:20 Transition Break
11:20 - 12:10 **Plenary Talk #3** (Prof. Gang Feng)
12:30 - 14:00 Lunch Break
14:00 - 15:40 Technical Sessions SAR1 (**Conf. Room, 4, 5, 7F**)
15:40 - 16:00 Afternoon Break
16:00 - 18:00 Technical Sessions SAR2 (**Conf. Room, 4, 5, 7F**)
18:00-20:00 Banquet, Petroleum Hotel 64 JingyeBeili(敬業北里64號), Jinzhou, China

Sunday, August 28, 2016

9:00 - 9:50 **Plenary Talk #4** (Prof. Thierry Marie Guerra **Conf. Room, 8F**)
9:50 - 10:10 Morning Break
10:10 - 12:10 Technical Sessions SuR (**Conf. Room, 5, 7, 8F**)
12:10 - 14:00 Lunch Break

Monday, August 29, 2016

City Tour in Jin Zhou

*15 minutes (Speech: 12 minutes, Q&A:3 minutes) are scheduled for oral presentation including discussions for each paper.

Technical Program Schedule

Wednesday, August 26, 2016

13:00-18:30 Registration Desk Open (1st floor Petroleum Hotel, Registration area)

Saturday, August 27, 2016

Opening Ceremony: 8:30 AM - 9:00 AM

Keynote session: 9:00AM-12:10AM

Room: The library lecture Hall of Liaoning University of Technology.

Keynote Speech I: 9:00AM-9:50AM

Prof. Tianyou Chai, Northeastern University, China

Title: Smart optimization control system for energy-intensive equipment

Tea break: 9:50 AM -10:20 AM

Keynote Speech II: 10:20 AM -11:10 AM

Prof. Yuqiang Wu, Qufu Normal University, China

Title: Study of Stabilization and Tracking Control for Nonholonomic Systems with Velocity and Acceleration Constraints

11:10 - 11:20 Transition Break

Keynote Speech III: 11:20 AM -12:10 AM

Prof. Gang Feng, City University of Hong Kong, Hong Kong, China

Title: Fuzzy Controllers are Universal Controllers

12:30-14:00 Lunch Break

Session SaR: 14:00-18:00 Petroleum Hotel.

Session SaR1-A: 14:00-15:40 Chair: Yanjun Liu, Liaoning University of Technology

5th Floor, Conference room, Jinzhou

#60: A Kernel Logistic Neural Network based on Restricted Boltzmann Machine, Qiu-Xia Lv, De-Gang Wang, Hong-Xing Li, Wen-Yan Song, Hong-Li Lin

#88: Random Feature based Multiple Kernel Clustering, Jin Zhou, Yu-Qi Pan, Lin Wang, C. L. Philip Chen

#4: Edge Enhanced SIFT for Moving Object Detection, Ting-Wei Chu, Shun-Feng Su, Ming-Chang Chen, Sendren Sheng-Dong Xu, Kao-Shing Hwang

#18: Exponential Distributed Leader-Follower Consensus Formation Control of a Networked Fourth-Order Multi-Quadrotor System, Ching-Chih Tsai, Chia-Wei Kuo

#9: Strong boundedness implies strong Markov property, Zhao-Jing Wu

#44: Adaptive Fuzzy Fault Tolerant Control of Unmeasured States Nonlinear Systems Based on Fault Alarm, Yong-Ming Li, Shao-Cheng Tong

#6: Observer-based fuzzy adaptive control for a class of MIMO nonlinear systems, Wu-Xi Shi, Dong-Wei Wang, Rui Luo

#41: UKF for Nonlinear Systems with Event-triggered Data Transmission and Packet Dropout, Li Li, Dong-Dong Yu, Hong-Jiu Yang, Ce Yan

Session SaR1-B: 14:00 -15:40 Chair: Jin Zhou, Jinan University

4th Floor, Conference room, Jinzhou

#93: Approximation learning methods of Harmonic Mappings in relation to Hardy Spaces, Zhu-Lin Liu, C. L. Philip Chen

#74: Comparison between genetic algorithm and differential evolution algorithm applied to one dimensional bin-packing problem, Shi-Yuan Han, Xiao-Yu Wan, Lin Wang, Jin Zhou and Xiao-Fang Zhong

#76: Pupil location Method Based on Region projection, Kun-Peng Yang, Ji-Wen Dong and Heng-Jian Li

#81: Three-dimensional Cement Image Registration Based on Multi-layer PSO and Mutual Information, Liang-Liang Zhang, Bo Yang, Lin Wang, Xiu-Yang Zhao, Jin Zhou, Mei-Hui Li, Ya-Min Han

- #82: Prediction of protein tertiary structural classes based on ensemble learning, Lu-Yao Wang, Chun-Sun Duan, Dong Wang, Shi-Yuan Han, Jin Zhou
- #84: Parallel Rational World based Privacy Preservation Mechanism for Group Privacy, Kun Zhang, Qing-Bei Guo, Lin Wang, Shou-Ning Qu
- #79: S-KNN: an efficient approach for processing k-NN queries over moving objects, Rui-Zhi Han, Hao Teng, Dong Wang, Shi-Yuan Han, Jin Zhou
- #86: Prediction of Share Price Trend Using FCM Neural Network Classifier, Shuang-Rong Liu, Bo Yang, Lin Wang, Xiu-Yang Zhao, Jin Zhou, Ji-Feng Guo

Session SaR1-C: 14:00 - 15:40 Chair: Lin Wang, Jinan University

7th Floor, Conference room, Jinzhou

- #69: Clothes Classification Based on Deep Belief Network, Xue Lin, Li-Zhi Peng, Guang-Zhun Wei, Xiao-Fang Wang, Xiu-Yang Zhao
- #71: Zone-code Based Optimal Connecting Layer Scheme in Fog MMVE, Zhong-Tao Li, Kai Wang, Xiang-Yu Kong, Bo Zhang
- #37: Fault estimation and fault tolerant control for T-S fuzzy systems, Yue Wu, Jiu-Xiang Dong
- #78: The Prediction of Cement Compressive Strength Based on Gray Level Images and Neural Network, Mei-Hui Li, Bo Yang, Lin Wang, Yu Liu, Xiu-Yang Zhao, Jin Zhou, Liang-Liang Zhang
- #80: Ensemble of Flexible Neural Tree and Ordinary Differential Equations for Inferring Gene Regulatory Networks, Qing-Fei Meng, Dong Wang, Yue-Hui Chen, Rui-Zhi Han, Jin Zhou
- #85: The Applied Research of the Electric Curtain Control System Based on the Fuzzy Increment PID Control Algorithm, Xi-Ye Feng, Mei-Hui Xu
- #87: A Fast Texture Synthesis using Gene Expression Programming, Ji-Feng Guo, Na Zhang, Lin Wang, Bo Yang, Xiu-Yang Zhao, Jin Zhou, Shuang-Rong Liu.
- #92: Consensus control for nonlinear multi-agent systems with packet dropouts and measurement noises, Ren Chang-E, C. L. Philip Chen, Long Chen
- #94: Compressed auto-encoder building block for deep learning network, Qi-Ying Feng, Long Chen, C. L. Philip Chen

Tea break: 15:40 -16:00

Session SaR2-A: 16:00-18:00 Chair: Yue Wu, Northeastern University

5th Floor, Conference room, Jinzhou

- #27: Fuzzy Attitude Tracking Composite Control for Mars Entry Vehicles with Time-Varying Input Delay, Xiao-Feng Xu, Tao Li, Zhu-Xiang Dai
- #37: Fault estimation and fault tolerant control for T-S fuzzy systems, Yue Wu, Jiu-Xiang Dong
- #57: Time-varying Output Constraint for DC Motor Control, Lei Ma, Shu-Min Lu, Ming-Zhe Gong, Jie Chen and Yan-Jun Liu
- #55: Numerical Modeling of the Influences of the Duty Cycle on Plasma Immersion Ion Implantation, Yi Li, Xiao-Dan Jing, Jiu-Hui Li
- #45: Nonlinear Control of the Electronic Throttle under Input Saturation, Rui Bai, He-Bin Wang, Dong Guo
- #77: MRF Parameter Estimation Based on Weighted Least Squares Fit Method, Jin-Yan Wu, Bo Yang, Lin Wang, Kun Ma, Xiu-Yang Zhao, Jin Zhou.
- #51: Dynamic Surface Sliding Mode Algorithm Based on Approximation for Course-Keeping Control of Ship, Kai Zhang, Wen-Ming Qiao, Tie-Shan Li, Zi-Fu Li
- #11: An improved adaptive stabilization control scheme for nonlinear systems with dynamic uncertainties and unknown gain directions, Huan-Qing Wang, Wei-Yi Qian, Yu-Feng Zhang

Session SaR2-B: 16:00-18:00 Chair: Xiangpeng Xie, Nanjing University of Posts and Telecommunications

4th Floor, Conference room, Jinzhou

- #83: Microblog Rumors Features and the Governance in Universities of Guangdong Province, Wo-Lin Ye, Qin-Tao Yao, Jun-Ying Guo, Ying Jiang
- #14: Global State-Feedback Control for a Class of Upper-Triangular Stochastic Nonlinear Systems With Time-Delay in Input, Liang Liu, An-Liang Chen
- #89: Architecture Strategies and Data Models of Software as a Service: A Review, Hui-Xin Chen
- #30: Improved Adaptive Backstepping Sliding Mode SVC Controller Design for Multi-Machine Power System, Li-Ying Sun, Yan Zhao
- #12: Fuzzy Observer of Discrete-Time Nonlinear Systems via An Efficient Maximum-Priority-Based Switching Mechanism, Xiang-Peng Xie
- #20: Reduced-Order Observer and Adaptive Fuzzy-Based Dynamic Surface Control for Induction Motors with Iron Losses, Cheng Fu, Yu-Mei Ma, Jin-Peng Yu, Quan-Wen Zhao, Fa-Tao Shi

- #53: Research on the Auxiliary panoramic parking technology based on Fast image mosaic, Chun-Bao Huo, Guang-Wen Men, Li-Hui Zhao
- #22: Chinese micro blogs multi-intensity sentiment classification method based on rough set theory, Zhou-Peng Ji, Fei-Fei Zhao, Xian-Jun Chen

Session SaR2-C: 16:00-18:00 Chair: Wei Sun, Liaocheng University

7th Floor, Conference room, Jinzhou

- #10: Sampled-Data Stability Criterion for T-S Fuzzy Systems With Time-Varying Delay, Zhen-Bin Du, Qiang Jia, Zhen-Kun Qin, Zi-Fang Qu
- #23: Constrained optimal control problems of nonlinear systems based on improved Newton algorithms, Xiang Wu, Kan-Jian Zhang
- #36: Output Regulation for heterogeneous second-order linear multi-agent systems, Guo-Da Tian, Hua-Gang Zhang, Jing-Ge Wang, Hong-Jing Liang
- #35: Non-fragile State Estimation for Discrete Neural Networks Ya-Jing Yu, Hong-Li Dong, Feng-Cai Huo, Chao-Hai Kang, Jia-Hui Li.
- #19: Decentralized Adaptive Neural Network Dynamic Surface Control Design for Multi-machine Excitation Systems, Xiu-Yu Zhang, Shi-Lei Hu
- #70: On the Image Enhancement histogram Processing, Jin-Wen Yang, Wei-He Zhong, Zheng Miao
- #29: Adaptive fuzzy fault accommodation of uncertain complex dynamical networks with nonlinear couplings, Xiao-Jian Li, Chong-Xiao Shi, Guang-Hong Yang
- #24: Group Recommendation in Social Tagging Systems by Consistent Utilization of Items and Tags Information, Xiao-Fang Wang, Xiu-Yang Zhao, Jin Zhou, Ming Xu

Banquet: 18:00-20:00

Location: Petroleum Hotel 64 Jingye Beili(敬業北里 64 號), Jinzhou, China.

Technical Program Schedule

Sunday, August 28, 2016

Keynote session: 9:00AM-9:50AM

Room: 8th Floor, Conference room, JinzhouPetroleum Hotel64 JingyeBeili(敬業北里 64 號), Jinzhou, China.

Keynote Speech IV: 9:00AM-9:50AM

Prof. Thierry Marie Guerra, University of Valenciennes et du Hainaut-Cambrésis (UVHC), France

Title: Fuzzy Control turns 50: maturity?

Tea break: 9:50 AM -10:10 AM

Session SuR: 10:10-12:10 Petroleum Hotel64 JingyeBeili(敬業北里 64 號), Jinzhou, China.

Session SuR-A: 10:10-12:10 Chair: Jiang-Bo Yu, Shandong Jianzhu University

5th Floor, Conference room, Jinzhou

#73: The seismic performance simulation analysis and research about light steel portal frame joint, Jun Zheng, Xiao-Dong Zhang, Jian-Wei Xue

#32: Image-Based Visual Servoing Control for Robot Manipulator with Actuator Backlash, Fu-Jie Wang, Lu-Lu Song, Zhi Liu

#43: Guaranteed Cost Control of Interval Type-2 T-S Fuzzy Systems with Time-Varying Delays, Jia-Hui Wang, De-Yin Yao, Zi-Ran Chen, Hak-Keung Lam, Hong-Yi, Li

#56: A Hybrid Modified DEA Efficient Evaluation Method in Electric Power Enterprises, Zhi-Guang Hu, Jing-Jing Yang, Shuai-Wei Wang, Qin-Min Yang

#63: Adaptive NN Tracking Control for a Class of Nonstrict-feedback Stochastic Nonlinear Systems, Zhang Si, Tie-Shan Li, Zi-Fu Li

#26: Predictor-based Consensus Control of Uncertain Nonlinear Strict-feedback Systems, Wei Wang, Yang Yu

#8: State-feedback Stabilization for a Class of Nonholonomic Systems with Unmodelled Dynamics, Yan Zhao, Chun-Xiao Wang, Jiang-Bo Yu

#90: Research on network evolution model based on computer virus transmission mechanism, Hui-Xin Chen, Xiao-Dong Wang

Session SuR-B:10:10-12:10 Chair: Fang Wang, Shandong University of Science and Technology

7th Floor, Conference room, Jinzhou

#21: State quantized feedback control of continuous-time multi-agent system, Fang Wang, Bing Chen, Yu-Mei Sun, Hong-Hong Wang

#39: Globally Stable Adaptive Cooperative Path Following Controller Design for Multiple AUVs, Hao Wang, Kai-Zhou Liu, Shuo Li

#31: Research on Control Method and Controller Design for Micro Quadrotor Aircraft, Jin-Liang Zhao, Jian Zhang

#52: Maximum Power Point Tracking Control of Solar Power Generation Systems, Shun Zhang, Tie-Chao Wang

#42: An SDN-Based Fault-Tolerant Routing Protocol with One Wormhole Routing Technique, Jichiang Tsai, Yi-Qiao Zhang, Jih-Chung Deng

#75: An Overview of Dynamic Data Mining, Jing-Xin Du, Jun Zhou, Chang Li, Lin Yang.

#34: Fuzzy Control of Spacecraft Attitude Maneuver by Delta Operator Approach, Ce Yan, Yang Xu, Hong-Jiu Yang, Ji-Yong Lu

#13: Adaptive Fuzzy Trajectory Tracking Control of Unmanned Surface Vehicles with Unknown Dynamics, Ke Feng, Ning Wang, Dan Liu, Meng Joo Er

Session SuR-C: 10:10-12:10 Chair: Ben Niu, Dalian University of Technology

8th Floor, Conference room, Jinzhou

#3: H_∞ fuzzy filtering design by applying non-quadratic Lyapunov function, Li-Wen Hu, Li-Kui Wang

- #15: Adaptive Control for Mobile Manipulators with Affine Constraints, Wei Sun, Jian-Wei Xia
- #33: Fuzzy Tracking Control of Uncertain Nonlinear Systems With Time-Varying Actuator Failures, Guan-Yu Lai, Lu-Lu Song
- #62: Scene image classification method based on Alex-Net model, Jing Sun, Xi-Biao Cai, Fu-Ming Sun, Jian-Guo Zhang
- #91: Influence of different mixing methods on the axial compressive strength of basalt fiber recycled concrete, Rui-Jin Guo, Zhong Bi, Fu Wang
- #7: Adaptive Neural DSC for Switched Pure-Feedback Nonlinear Time-Delay System, Tian Qin, Xiao-Dong Fan, Ben Niu
- #40: Asymptotic Fuzzy-approximation based Control of MIMO Systems with Unknown Input Nonlinearities and Control Direction, Ci Chen, Lu-Lu Song, Zhi Liu

Lunch: 12:10 -14:00 Petroleum Hotel64 JingyeBeili(敬業北里 64 號), Jinzhou, China.

Plenary Talk I

Title: Smart Optimization Control System for
Energy-intensive Equipment

Tianyou Chai, Ph.D.

Professor

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 key way to solve these problems is to make the control systems of energy intensive equipment become CPS. CPS for energy intensive equipment is a smart optimal control system.

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

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

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

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

Prof. 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 170 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 Talk II

Title: Study of Stabilization and Tracking Control for Nonholonomic Systems with Velocity and Acceleration Constraints

Yuqiang Wu, Ph.D.

Professor

Qufu Normal University, China



ABSTRACT:

There are many nonholonomic and underactuated systems in practical engineering, wheeled mobile robots is a typical class of nonholonomic system; bridge cranes, inverted pendulums and surface vessels are underactuated systems. Since these two kinds of systems are respectively subject to the velocity and acceleration nonholonomic constraints, it is very difficult to directly apply the conventional nonlinear control methods in their control designs. Therefore, research on nonholonomic and underactuated systems is of great significance both in theory and practice. Here the considered systems include nonholonomic systems with the one-order velocity constraints and underactuated systems with the second-order acceleration constraints. The application examples include underactuated crane, surface vessel (USV). The stabilization and tracking control are studied for the aforementioned three classes of systems by using backstepping, cascade control method, differential-flatness-based approach, finite-time control technology, nonlinear time-varying method, etc.

Prof. Yuqiang Wu is with Qufu Normal University. He got the PHD degree from the South East University of China in 1994. And he is a visiting scholar in Central Queensland University of Australia and University of Texas at Dallas of America from 1996 to 1999. He is the vice chairman of the Association of Automation of Shandong Province, National model teacher, and the Shandong province Taishan scholar Professor.

His mainly research interesting is the nonlinear control theory and its applications, Including variable structure control, finite time sliding mode control, the control of uncertain nonholonomic systems, the control of underactuated systems.

Plenary Talk III

Title: Fuzzy Controllers are Universal
Controllers

Gang Feng, Ph.D.

Professor

City University of Hong Kong, Hong Kong, China



ABSTRACT:

This talk first gives a brief review on fuzzy control. It then discusses the universal fuzzy controller problem for continuous-time multi-input-multi-output general nonlinear systems based on a class of generalized dynamic fuzzy dynamic models. It is shown that this class of generalized dynamic fuzzy models can be used to approximate general nonlinear systems. By using their approximation capability, universal fuzzy controllers for general nonlinear systems are then provided. Finally, some remaining challenges in model based fuzzy control systems are also revealed

Gang Feng received the B.Eng and M.Eng. Degrees in Automatic Control from Nanjing Aeronautical Institute, China in 1982 and in 1984 respectively, and the Ph.D. degree in Electrical Engineering from the University of Melbourne, Australia in 1992.

Professor Feng was a Lecturer in Royal Melbourne Institute of Technology, 1991 and a Senior Lecturer/Lecturer, University of New South Wales, 1992-1999. He has been with City University of Hong Kong since 2000 where he is now a Chair Professor of Mechatronic Engineering. He was also a ChangJiang Chair Professor at Nanjing University of Science and Technology, awarded by Ministry of Education. He has received Alexander von Humboldt Fellowship, the IEEE Transactions on Fuzzy Systems Outstanding Paper Award, the Best Paper Award of IEEE International Conference on Neural Networks and Signal Processing and the Best Theoretical Paper Award in the Second World Congress on Intelligent Control and Automation. He is an author of one research monograph entitled “Analysis and Synthesis of Fuzzy Control Systems: A Model Based Approach”, and over 260 SCI indexed papers including over 100 in IEEE Transactions. His research interests include intelligent systems and control, networked control systems, and multi-agent systems and control.

Professor Feng is a fellow of IEEE. He has been the Associate Editor of IEEE Trans. Automatic Control, IEEE Trans. on Fuzzy Systems, Mechatronics, IEEE Trans. Systems, Man, & Cybernetics, Journal of Systems Science and Complexity, and Journal of Control Theory and Applications.

Plenary Talk IV

Title: Fuzzy Control turns 50: maturity?

Thierry Marie Guerra, Ph.D.

Professor

University of Valenciennes et du Hainaut-Cambrésis



ABSTRACT:

Fuzzy theory is at the heart of Computational Intelligence for 50 years now. Fuzzy control is almost as old as fuzzy sets themselves. Its popularity and acceptance have been, and partly remains, subject to controversy. This talk does not intend to enter the polemic but tries to give some thoughts traveling through the history of fuzzy control. Several overviews are available to the interested audience (Feng 2006, Precup & Helledorn 2011, Guerra et al. 2015) and for general history of fuzzy theory the Lotfi A. Zadeh's paper "Is there a need for fuzzy logic?" published in 2008.

The talk proposes a comeback through the last 5 decades of fuzzy control: from historical beginnings of fuzzy control with so-called Mamdani approaches (Mamdani 1977) to more recent developments based for example on Takagi-Sugeno (or quasi-LPV) models. The talk will be illustrated through various applications from the metro of Sendai (Yasunobu & Miyamoto 1985) to various domains including robotics, vehicles and so on; with a special focus on applications through time at LAMIH UMR CNRS 8201 in Valenciennes.

To give a hint of the potential of these approaches, data compiled for the Berkeley Initiative in Soft Computing (BISC, <http://www.cs.berkeley.edu/~zadeh/stimfl.html>) about patents related to fuzzy logic (therefore larger than control) give the following figures in 2014: number of fuzzy-logic-related patents issued and applied in WIPO (International): 50,999 (USA 22,000; China 25,454; European Union 3,268; Japan 7,100...). However, pioneering works – despite these success stories for applications – suffered from a lack of mathematical properties useful for analyzing closed-loop systems: stability, robustness and performances. Next steps issued from historical approaches can mainly be decomposed into two parts. First of all, most of the techniques used for nonlinear models can be applied to a fuzzy model, which can be seen as a particular case: feedback linearization, predictive control, adaptive control, control based on inverted models... Second approach which appeared also very fruitful was to take profit of the fuzzy structure of the models. Its beginnings correspond to the "Japanese" school (Takagi & Sugeno 1985, Tanaka & Wang 2001).

It is difficult to evaluate the real impact of fuzzy in control theory through all the literature. Nevertheless it exists, two main international journals are directly concerned with: Fuzzy Sets and Systems and IEEE Transactions on Fuzzy Systems, a Technical Committee "Computational Intelligence in Control" (<http://tc.ifac-control.org/3/2>)

from the International Federation of Automatic Control (IFAC) is also devoted to these approaches.

Thierry Marie Guerra was born in Mulhouse, France in 1963. He is currently full professor at the University of Valenciennes et du Hainaut-Cambrésis (UVHC), France. He received his PhD degree in automatic control from the UVHC in 1991 and the HDR in 1999. He is head of the Laboratory of Industrial and Human Automation, Mechanics and Computer Science (LAMIH CNRS UMR 8201) (141 researchers and staff, 145 PhD students and post-docs) <http://www.univ-valenciennes.fr/LAMIH/>. He is chair of the Technical Committee 3.2 “Computational Intelligence in Control” for IFAC (International Federation of Automatic Control), member of the IFAC TC 7.1 “Automotive Control”, Area Editor of the international journals: Fuzzy Sets & Systems, IEEE Transactions on Fuzzy Systems and IEEE Transactions on Vehicular Technology. His major research fields and topics of interest are, nonlinear control, LPV, quasi-LPV (Takagi-Sugeno) models control and observation, LMI constraints, Non quadratic Lyapunov functions... and applications to powertrain systems (IC engine, electrical motors, hybrid vehicles, fuel cells...) and disabled persons. Webpage information can be found at http://www.univ-valenciennes.fr/LAMIH/membres/guerra_thierry-marie and citation report at: <http://scholar.google.fr/citations?hl=fr&user=ThlBu5kAAAAJ>

Abstract

Saturday, August 27, 2016

Session SaR: 14:00-18:00

**Address: Petroleum Hotel 64
JingyeBeili, Jinzhou, China.**

Session SaR1-A: 14:00-15:40

[#60] A Kernel Logistic Neural Network based on Restricted Boltzmann Machine

**Qiu-Xia Lv, Dalian University of Technology
De-Gang Wang, Dalian University of Technology
Hong-Xing Li, Dalian University of Technology
Wen-Yan Song, Dongbei University of Finance and Economics
Hong-Li Lin, Dalian Medical University**

A multi-class classification technique which combines kernel logistic neural network (KLNN) and restricted Boltzmann machine (RBM), called KLNN-RBM, is designed. The principal component analysis (PCA) is carried out on the dimension reduction of the kernel function. The initial weights and thresholds of this model are obtained by RBM. Then, the maximum likelihood estimate with a ridge regularization term and a new stochastic gradient descent method with a scaling factor are used to optimize the parameters in order to realize the multi-class classification. Some numerical simulations illustrate the validity of the proposed method.

[#88] Random Feature based Multiple Kernel Clustering

**Jin Zhou, University of Jinan
Yu-Qi Pan, University of Jinan
Lin Wang, University of Jinan
C. L. Philip Chen, University of Macau**

The kernel clustering method is very helpful in non-linear data clustering. But its high computational complexity makes it unattainable to large datasets. In this paper, a new multi-kernel clustering algorithm based on the random Fourier feature is proposed to solve this issue, where the maximum-entropy method is applied to optimize the kernel weights. Experiment on synthetic non-linear dataset has shown the good performance of the proposed algorithm.

[#4] Edge Enhanced SIFT for Moving Object Detection

**Ting-Wei Chu, National Taiwan University of Science and Technology
Shun-Feng Su, National Taiwan University of Science and Technology
Ming-Chang Chen, National Taiwan University of Science and Technology
Sendren Sheng-Dong Xu, National Taiwan University of Science and Technology
Kao-Shing Hwang, National Sun Yat-Sen University**

This paper is to report our study on the moving object detection from surveillance images. For motion detection,

some existed methods are used to find specific features between images and then to define the moving speeds of objects. However, human-created features may be difficult to define and to acquire especially when the objects are unknown. In this paper, the scale-invariant feature transform (SIFT) method is adopted to define features for motion detection. In the image, SIFT can be used to catch the properties of scale and rotation invariant. Even if the foreground target is partially obscured and the image is taken in a different angle and distance, SIFT can still have nice matching performances. However, when applied in detecting moving objects, SIFT does not work well due to finding incorrect features in the match. In this study, an enhanced edge detection method is proposed for Laplace of Gaussian (LoG) based SIFT. From the simulation results, it is evident that our proposed method can find more feature matching in the video image.

[#18] Exponential Distributed Leader-Follower Consensus Formation Control of a Networked Fourth-Order Multi-Quadrotor System

**Ching-Chih Tsai, National Chung Hsing University
Chia-Wei Kuo, National Chung Hsing University**

This paper presents two exponential leader-follower consensus formation control approaches with collision and obstacle avoidance for a networked, homogenous quadrotors cooperatively flying at a fixed altitude. The dynamic behavior of each quadrotor is modelled by a fourth-order system model and the multi-quadrotor system is modeled by a directed graph which has a spanning tree with the root being the leader. By using the Lyapunov and sliding-mode control techniques, two exponential, distributed consensus formation control approaches are presented to accomplish consensus formation control. Simulations are conducted to show the effectiveness and merits of the proposed methods with Collision-free and obstacle-avoidance methods.

**[#9] Strong boundedness implies strong Markov property
Zhao-Jing Wu, Yantai University**

In the existing references, criteria on asymptotic stability are proved under assumption of strong Markov property of solution. Methods to verify strong Markov property generally rely on linear increasing condition. In this note, a strong Markov criterion is presented by replacing linear increasing condition with strong boundedness of solution.

[#44] Adaptive Fuzzy Fault Tolerant Control of Unmeasured States Nonlinear Systems Based on Fault Alarm

**Yong-Ming Li, Liaoning University of Technology
Shao-Cheng Tong, Liaoning University of Technology**

In this paper, an adaptive fuzzy fault tolerant output-feedback control design method is proposed for a class of nonlinear uncertain systems with actuator faults (bias and gain faults) and unmeasured states. In the design, fuzzy logic systems are used to identify the unknown uncertainties, and the hyperbolic tangent function is employed as the robust term to overcome the actuator faults. The threshold strategy about tracking error is constructed as system fault alarm. Based on the adaptive backstepping modular design method, a robust fuzzy adaptive

fault tolerant control approach is developed. The proposed fault tolerant controller can guarantee that all the signals in all subsystems are bounded, and also the tracking errors for each subsystem converge to a small neighborhood of zero. Finally, numerical results of practical examples are presented to further demonstrate the effectiveness of the proposed control strategy.

[#6] Observer-based fuzzy adaptive control for a class of MIMO nonlinear systems

Wu-Xi Shi, Tianjin Polytechnic University
Dong-Wei Wang, Tianjin Polytechnic University
Rui Luo, Tianjin Polytechnic University

This paper presents fuzzy adaptive control scheme for a class of uncertain multi-input and multi-output(MIMO) nonlinear systems with the external disturbances and unknown control direction. In this scheme, a state observer is designed to estimate the unmeasured state, and a fuzzy adaptive output feedback controller is developed. A Nussbaum gain function is incorporated in the controller to resolve the unknown control direction issue, and the parameter update laws are constructed by using fuzzy basis functions rather than its filtering. It is proved that all of the signals in the closed-loop systems are bounded and that the tracking errors converge asymptotically to zero. A simulation example is used to demonstrate the effectiveness of the proposed scheme.

[#41] UKF for Nonlinear Systems with Event-triggered Data Transmission and Packet Dropout

Li Li, Yanshan University
Dong-Dong Yu, Yanshan University
Hong-Jiu Yang, Yanshan University
Ce Yan, Yanshan University

In this paper, the event-triggered filtering problem is investigated for a class of nonlinear systems with event-triggered data transmission and packet dropout. The phenomenon of event-triggered data transmission occurs only when a specific event-triggered condition is satisfied, which reduces the number of measurement transmissions in a network with limited bandwidth. A random binary variable is introduced to model the arrivals of measurements. The purpose of this paper is to design an event-triggered unscented Kalman filter (EUKF) with packet dropout. An illustrative application example is given to show the performance of the proposed method.

Session SaR1-B: 14:00-15:40

[#93] Approximation learning methods of Harmonic Mappings in relation to Hardy Spaces

Zhu-Lin Liu, University of Macau
C.L. Phlip, Chen, University of Macau

We present a new Hardy space approach of Dirichlet type problem. This reduces to a simple extremal problem when considering Hardy space of upper-high complex plane. An efficient discrete algorithm is proposed with the help of reproducing kernel to the Tikhonov regularization. Moreover, from the energy minimization point of view, harmonic mappings describe the intrinsic mapping between different metric manifolds. Especially, for two planer region in Euclidean Space, the harmonic map, which is deeply connected with the harmonic function, always exists. The above properties imply that the harmonic mapping is a well-behaved mapping and it is capable to be applied in planer shape distortion and surface registration.

[#74] Comparison between genetic algorithm and differential evolution algorithm applied to one dimensional bin-packing problem

Shi-Yuan Han, University of Jinan
Xiao-Yu Wan, University of Jinan
Lin Wang, University of Jinan
Jin Zhou, University of Jinan
Xiao-Fang Zhong, Shandong Womens University

This paper discusses the one dimensional bin-packing problem (BPP) based on the genetic algorithm and differential evolution. First, the mathematical model for one bin-dimensional packing problem is established. Then, the detailed processes for one bin-dimensional packing problem are designed based on the genetic algorithm and differential evolution algorithms, and the difference performance between the designed algorithms are discussed. Finally, some simulation results are shown to prove the effectiveness of edsgned algorithms and verified the discussed conclusion.

[#76] Pupil location Method Based on Region projection

Kun-Peng Yang, University of Jinan
Ji-Wen Dong, University of Jinan
Heng-Jian Li, University of Jinan

Accurate pupil center location plays an important role in eye tracking systems. This paper proposes a method for precise pupil location based on region projection. It is used to detect a center of pupil for extraction of point of eyeball in the face image. The proposed method has four stages. Firstly the face image is detected and extracted. Secondly, minimizing location range is carried out in the already positioned face image so that the eye location is implemented in the future. Then, the region of the detection is narrowed down by applying the region projection. In the final stage, the precise center point of pupil is detected using the gravity method. Experimental results obtained by applying the proposed method on the human face image, demonstrate that the presented method has improved both the accuracy and speed of pupil location.

[#81] Three-dimensional Cement Image Registration Based on Multi-layer PSO and Mutual Information

Liang-Liang Zhang, University of Jinan
Bo Yang, University of Jinan
Lin Wang, University of Jinan
Xiu-Yang Zhao, University of Jinan
Jin Zhou, University of Jinan
Mei-Hui Li, University of Jinan
Ya-Min Han, University of Jinan

For the research of cement hydration, it is necessary to carry out the three-dimensional(3D) image registration of cement in order to obtain the dynamic change process of the 3D cement microstructure. The optimization of similarity measure is needed to match the intensity of registration. Due to the complex functions of these parameters, it is difficult to find the global optimal solution for local optimization techniques, which requires global optimization methods. The searching layers of the swarm are increased from two layers to multiple layers in the Multi-layer particle swarm optimization (MLPSO). The MLPSO improves the performance of the traditional particle swarm algorithm by this way. In this paper, it uses mutual information(MI) as the similarity measure of 3D image registration and uses the MLPSO to solve the spatial transformation parameters. The experiment indicates that the method shows a better result and improves the convergence speed.

[#82] Prediction of protein tertiary structural classes based on ensemble learning

Lu-Yao Wang, University of Jinan
Chun-Sun Duan, University of Jinan
Dong Wang, University of Jinan
Shi-Yuan Han, University of Jinan
Jin Zhou, University of Jinan

When human enter the post-genomic era, the prediction of protein structure plays an increasingly important role in bioinformatics. While the prediction of protein tertiary structural classes becomes a new hot research topic in it. In this paper, a novel feature extraction method is employed based on the predicted secondary structure sequence and the corresponding E-H sequence. Two hierarchical classification models are designed and the model which achieves better prediction accuracy is chosen. On the basis of the new hierarchical classification model, ensemble learning is employed to complete the experiments. To examine the performance of such method, 640 dataset, 25pdb dataset and 1189 dataset with low homology are chosen as the test dataset of protein tertiary structure. The 10-fold cross validation test is used to test and compare this method with other existing methods. The overall accuracies of our method are 5.57%, 4.53% and 2.16% higher on the three datasets, respectively.

[#84] Parallel Rational World based Privacy Preservation Mechanism for Group Privacy

Kun Zhang, University of Jinan
Qing-Bei Guo, University of Jinan
Lin Wang, University of Jinan
Shou -Ning Qu, University of Jinan

With the rapid development of social network and information technology, people enjoy the happy and convenient life the modern world brings. On the other hand, people suffer risk caused by privacy leakage. How to protect peoples' privacy in such an information society is a still a challenge and hot issue. It is difficult to find an excellent best of both worlds solution to protect people's sensitive information while providing people the convenient and appropriate services. Aiming at this issue, the group sensitive information is the focus of research in this paper. Parallel rational world based privacy preservation mechanism is proposed to make confuse with the true sensitive value or trend. Analysis and simulation demonstrate that the group privacy preservation mechanism is effective

[#79] S-KNN: an efficient approach for processing k-NN queries over moving objects

Rui-Zhi Han, University of Jinan
Hao Teng, University of Jinan
Dong Wang, University of Jinan
Shi-Yuan Han, University of Jinan
Jin Zhou, University of Jinan

Central to many applications involving moving objects is the task of processing k-nearest neighbor (k-NN) queries. Many existing approaches adapt different index structures and design various search algorithms to deal with this problem. In these works, tree-based indexes and grid index are mainly utilized to maintain a large volume of moving objects and improve the performance of the search algorithms. In fact, tree-based indexes and grid index have their own flaws for supporting processing k nearest neighbor queries over an ocean of moving objects. As to tree-based indexes, the continuous moving of objects will cause the nodes of the index structure frequently be split or merged, which certainly leads to high maintenance cost. Grid index structure is although used to support k-NN queries over moving objects, but the grid-index-based

approaches almost need an uncertain number of iterative calculations, which makes the performance of these approaches be not predictable. To address this problem, we present Vertical Horizontal Strip Index (VHSI), which can better adapt to k nearest neighbor queries over moving objects than existing index structures. Additionally, VHSI has vertical and horizontal strip indexes that make it be able to effectively handle different data distributions. Based on VHSI, we propose a search algorithm called S-KNN that can effectively process k-NN queries without iterations. Finally, we conduct experiments to fully evaluate the performance of our proposal.

[#86] Prediction of Share Price Trend Using FCM Neural Network Classifier

Shuang-Rong Liu, University of Jinan
Bo Yang, University of Jinan
Lin Wang, University of Jinan
Xiu-Yang Zhao, University of Jinan
Jin Zhou, University of Jinan
Ji-Feng Guo, University of Jinan

High-noise, chaos, non-linearity and instability are notable features of share price time series. Traditional economic model assumes that the change of share price is linear, but the assumption does not conform to reality. Therefore, the accuracy of prediction of traditional economic model is not satisfying. In this paper, considering these existed problems of traditional model, a novel method, Floating Centroids Method (FCM), is used to establish the share price trend model. FCM algorithm fits law of share price trend by finding the optimal neural network. Through the optimal neural network, share price data points are mapped into a new space which is called partition space. In the new space, same tendency of share price data points are as close as possible and different tendency points are as far as possible. Then, share price data points are clustered by K-means algorithm in partition space. Every cluster is classed. Lastly, the class of the cluster that share price point belongs to is taken as share price trend in the future. Based on experimental data, FCM algorithm has higher average accuracy and better generalization ability than comparative algorithms.

Session SaR1-C: 14:00-15:40

[#69] Clothes Classification Based on Deep Belief Network

Xue Lin, University of Jinan
Li-Zhi Peng, University of Jinan
Guang-Shun Wei, University of Jinan
Xiao-Fang Wang, University of Jinan
Xiu-Yang Zhao, University of Jinan

In this paper, faced with the diversity and difference of clothes, we propose a novel method combined deep belief network and softmax classifier to achieve the classification of clothes. First of all, we preprocess the angle and scaling of various styles of clothes images that are collected through web crawler, then we do something to convert the image into the corresponding input format. In addition, the DBN is trained layer-by-layer with the input of all image pixels and the top level of the network is a classification hyperplane. At last, we apply the DBN that has been trained completely to classify the strange clothes. Compared with traditional classifier softmax and deep structure deepid1, our algorithm has higher classification accuracy rate.

[#71]Zone-code Based Optimal Connecting Layer Scheme in Fog MMVE

Zhong-Tao Li, School of Information Science and Engineering University of Jinan

Kai Wang, School of Information Science and Engineering University of Jinan

Xiang-Yu Kong, School of Information Science and Engineering University of Jinan

Bo Zhang, School of Information Science and Engineering University of Jinan

With the increasing popularity of Massively Multiuser Virtual Environments (MMVE) and fast growth of fog computing, fog MMVE frees users from the requirement of hardware. In this paper, we propose a novel topology scheme for fog computing, which is based Content-Addressable Networks (CAN) and zone-code routing. The key to our approach is mapping servers in connecting layer in d-dimensional key space to a one-dimensional zone-code space. Then produce minimize the total path weight (or cost). By equipping each server with long links, we can also increase the hop span in zone-code space, and reduce path weight (or cost). This use of long links also increases routing flexibility and robustness against failures, as peers can automatically adapt their routing tables to cope with network changes

[#78]The Prediction of Cement Compressive Strength Based on Gray Level Images and Neural Network

Mei-Hui Li, University of Jinan

Bo Yang, University of Jinan

Lin Wang, University of Jinan

Yu Liu, Shenzhen Gangchuang Building Material Co., Ltd.

Xiu-Yang Zhao, University of Jinan

Jin Zhou, University of Jinan

Liang-Liang Zhang, University of Jinan

The prediction of cement compressive strength is a multi-variable and non-linear problem. In order to solve this problem preferably, a large amount of data should be collected. The testing of the cement strength takes a long time during hydration process. However, it is timesaving that using the gray level images of cement hydration process of different periods predicts cement strength. The images of the cement reflect the micro-structure of cement. Gray level histogram of an image shows the quantity of different phase, and gray level co-occurrence matrix shows the texture structure. Using the microstructure of cement to describe the macroscopic properties is feasible. Therefore, a novel method using features of cement gray level images and neural network to predict the cement compressive strength is proposed. The cement images are gotten by microtomography. The eigenvalues of gray level histogram and gray level co-occurrence matrix are seen as the input to train the neural network. The value of cement compressive strength is seen as the output. Comparing with the multiple linear regression method and gaussian process to predict the cement compressive strength, the neural network model shows a lower error through the experiment.

[#80] Ensemble of Flexible Neural Tree and Ordinary Differential Equations for Inferring Gene Regulatory Networks

Qing-Fei Meng, Jinan University

Dong Wang, Jinan University

Yue-hui Chen, Jinan University

Rui-Zhi Han, Jinan University

Jin Zhou, Jinan University

Accurate models play important roles in identifying the interactions among genes. In this study, the ensemble of the flexible neural tree (FNT) and system models expressed by the ordinary differential equations (ODEs) is proposed to further improve the accuracy of the prediction of gene regulatory networks (GRNs). In this paper, probabilistic incremental program evolution (PIPE) and particle swarm optimization

(PSO) are employed to evolve the architecture and the parameters of FNT and the ODEs, respectively. Finally, the experimental results show that the ensemble method of flexible neural tree model and ordinary differential equations can be more accurate for the prediction of gene expression time-series data compared with some earlier methods. The mean squared error (MSE) of gene expression time series forecasting converges to the small value, even at zero.

[#85] The Applied Research of the Electric Curtain Control System Based on the Fuzzy Increment PID Control Algorithm

Xi-Ye Feng, Qilu Normal University

Mei-Hui Xu, University of Jinan

The control system of the electric curtain is an unstable system with multi disturbance, great inertia and nonlinearity. The conventional PID control and the fuzzy control cannot achieve the desired control effect. In this paper, the fuzzy control is combined with the incremental PID control, and is applied to the electric curtain control system. Theoretical analysis and the results of simulation show that the system has a high control performance, fast response and no overshoot. The method is of small system regulating time and steady state error as compared with the conventional PID control, achieves intended purpose, and has the very high practical value.

[#87]A Fast Texture Synthesis using Gene Expression Programming

Ji-Feng Guo, University of Jinan,

Na Zhang, Information Department, China United Network Communications Co. Ltd. Shandong Branch

Lin Wang, University of Jinan

Bo Yang, Linyi University

Xiu-Yang Zhao, University of Jinan

Jin Zhou, University of Jinan

Shuang-Rong Liu, University of Jinan

In computer graphics, vision, and image processing, the texture synthesis occupies an important position. However, most of the existing methods are relatively inefficient. Thus, it is necessary to design a fast texture synthesis algorithm. This article describes an efficient algorithm for texture synthesis. The texture model of this algorithm is derived from the Markov random field. It uses Gene Expression Programming (GEP) to find the best function and the value of each pixel in the synthesized image determined by this function. In this way, this algorithm can avoid scanning all of the pixels, so as to improve the speed of texture synthesis. This algorithm is faster than the previous synthesis algorithm.

[#92] Consensus control for nonlinear multi-agent systems with packet dropouts and measurement noises

Chang-E Ren, University of Macau

C. L. Philip Chen, University of Macau

Long Chen, University of Macau

This paper discusses the consensus problem of discrete-time nonlinear multi-agent systems. In the multi-agent systems, the communications between agents are in a networked environment with noises and occasional packet dropouts. The main purpose of this paper is to design the distributed controller such that all the agents can reach the mean-square robust consensus when packet dropouts and interference noises occur, in addition, all the agents can reach average consensus when the communication environment is free from packet dropouts and interference noises. Two numerical examples are provided to illustrate the effectiveness of the designed controller.

[#94] Compressed auto-encoder building block for deep learning network

Qi-Ying Feng, University of Macau
Long Chen, University of Macau
C. L. Philip Chen, University of Macau

Deep learning algorithm has been widely used in many area which is one of the most important representation learning algorithms in the world. Deep learning network is stacked by the building blocks such as the restricted Boltzmann machine (rbm) and the auto-encoder, convolutional building block. After stacking the building blocks layers and layers, the improvement of the deep learning network would be notable. In this paper, we proposed a new deep learning building block that inspired by the auto-encoder. There are fewer layers and parameters of the compressed auto-encoder compared with the auto-encoder, and we put forward a bidirectional gradient decent method to update the parameters of this building block. As the experimental result shows that improves the performance of the auto-encoder in accuracy of the reconstruction data. It keeps declining the error while the results of rbm or the auto-encoder becomes saturation. And some analysis are given in this paper that the feature of the compressed auto-encoders trained by the proposed method.

Session SaR2-A: 16:00-18:00

[#27] Fuzzy Attitude Tracking Composite Control for Mars Entry Vehicles with Time-Varying Input Delay

Xiao-Feng Xu, Nanjing University of Information Science and Technology
Tao Li, Nanjing University of Information Science and Technology
Zhu-Xiang Dai, Nanjing University of Information Science and Technology
Dong Wang, University of Jinan

This paper focuses on the attitude tracking control problem of Mars entry vehicles (MEVs) with time-varying input delay. The rotational motion of MEVs system consists of slow subsystem and fast subsystem. The attitude dynamics are given by slow subsystem and angular velocity dynamics are given by fast subsystem. A T-S fuzzy modal is used to approximate the fast subsystem and a composite hierarchical control structure, which combining delays dependent h_c control with disturbance observer-based control (DOBC) is applied for the fast subsystem attitude tracking error system. Therefore, the disturbance is compensated accurately to reduce the influence of disturbance effects and delays dependent state controller is designed to reduce the effects of delay on attitude. Specially, a decomposition coefficient of delay integral inequality is introduced in the process of solving functional, which may further reduce the design algorithm conservatism. Finally, numerical simulations are used to verify the effectiveness of the proposed method.

[#37] Fault estimation and fault tolerant control for T-S fuzzy systems

Yue Wu, University of Jinan
Jiu-Xiang Dong, University of Jinan

This paper is concerned with the problems of fault estimation (FE) and fault tolerant control (FTC) for T-S fuzzy systems with unmeasurable premise variables, external disturbances, and actuator faults, simultaneously. First, Disturbance observer (DO) and FE observer are constructed, simultaneously. The merit of the proposed observers is that the observers have stable error dynamics, even if they are subjected to the structured uncertainties. Further, based on the

estimated information, a controller is designed to stabilize the closed-loop system and compensate the effect of the faults and the disturbances. An example is given to demonstrate the effectiveness of the proposed method.

[#57] Time-varying Output Constraint for DC Motor Control

Lei Ma, Liaoning University of Technology
Shu-Min Lu, Liaoning University of Technology
Ming-Zhe Gong, Liaoning University of Technology
Jie Chen, AHMS Inc.
Yan-Jun Liu, Liaoning University of Technology

This paper presents a control problem for a class of DC motor nonlinear systems with output constraints, and the constraints are in time-varying form. Based on the dynamics system of the DC motor, a nonlinear model of the system with modeling uncertainties is established. Then, an asymmetric time-varying Barrier Lyapunov Function (BLF) is proposed to guarantee the output to meet the constraints and the radial basis function neural networks (RBFNNs) are employed to approximate unknown function. By employing the backstepping method, the adaptive law based on DC motor nonlinear model is given. Then, all signals in the closed-loop system are proved to be semi-globally uniformly ultimately bounded, the output constraint is satisfied, as well as the tracking error converges to a bounded compact set.

[#55] Numerical Modeling of the Influences of the Duty Cycle on Plasma Immersion Ion Implantation

Yi Li, Liaoning University of Technology
Xiao-Dan Jing, Liaoning University of Technology
Jiu-Hui Li, Liaoning University of Technology

The low pressure non-steady diffusion fluid model and the sheath collision fluid model are built to describe the dynamic behaviors of multiple pulses sheath in the process of plasma immersion ion implantation (PIII) planar target. The influences of duty cycle are obtained by solving the fluid models numerically. It is found that plasma diffusion can accelerate the sheath expanding, and the sheath is thicker compared with the case without diffusion. In the pulse-off time, the plasma recovery process is quick initially, and gradually tends to the steady state. The main consequence of a shorter pulse-off time corresponding larger duty cycle is that an incomplete plasma recovery can be produced between the pulses. The maximal implanted ion current can be strongly decreased, but the average implanted ion current is increased, and is maximal for the optimum duty cycle 0.8. Therefore, the appropriate duty cycle is favorable to modification processing for practical application.

[#45] Nonlinear Control of the Electronic Throttle under Input Saturation

Rui Bai, Liaoning University of Technology
He-Bin Wang, Liaoning University of Technology
Guo Dong, Liaoning University of Technology

An electronic throttle is a dc-motor-driven valve that regulates the airflow inside the gasoline engines. Valve plate angle is regulated by controlling the motor voltage, and the motor voltage has the limit range. Nonlinear tracking control of electronic throttle with input saturation is proposed. An auxiliary system is designed to analyze the effect of input saturation, and state of auxiliary design system is utilized to develop the tracking control. Under the proposed tracking control strategy, stability of the closed-loop system is guaranteed via Lyapunov analysis.

[#77] MRF Parameter Estimation Based on Weighted Least Squares Fit Method

Jin-Yan Wu, University of Jinan
Bo Yang, University of Jinan, Linyi University
Lin Wang, University of Jinan
Kun Ma, University of Jinan
Xiu-Yang Zhao, University of Jinan
Jin Zhou, University of Jinan

In general, the Markov random field (MRF) model parameter estimation is the first step in the image modeling applications. The accuracy of the parameter estimation will have a direct impact on whether or not the application based on the model can get the right result. In this paper, it is proposed a new method called the weighted least square fit, and then used the method in the MRF model parameter estimation. The method is based on the least squares fit (LS) method, and do some improvements so as could solve the LS method is not accurate enough and noise sensitive these disadvantages. And this paper have established an evaluation system based on the Expectation Maximization theory to evaluate the accuracy of the results generated by the different methods. Experiments have proved that if choose the same equations that selected from the field and under the same calculation complexity condition, the results based on this paper's method have a higher accuracy than the original LS method.

[#51] Dynamic Surface Sliding Mode Algorithm Based on Approximation for Course-Keeping Control of Ship

Kai Zhang, Dalian Maritime University
Wen-Ming Qiao, Shandong Jiaotong University
Tie-Shan Li, Dalian Maritime University
Zi-Fu Li, Jimei University

In this paper, a novel dynamic surface sliding mode control(DSSMC) method is proposed for course-keeping control of ship in the presence of modeling errors. To ensure the robustness, the dynamic surface control(DSC) approach is modified by employing sliding mode control technique. The radial basis function neural network(RBFNN) approximation technique is used for approximating modeling errors, and then the minimum learning parameter(MLP) is used for reducing the computational burden. The controller guarantees that all the close-loop signals are uniform ultimate bounded (UUB) and that the tracking error converges to a small neighborhood of the desired trajectory. Finally, simulation studies are given to illustrate the performance of the proposed algorithm.

[#11] An improved adaptive stabilization control scheme for nonlinear systems with dynamic uncertainties and unknown gain directions

Huan-Qing Wang, Bohai University
Wei-Yi Qian, Bohai University
Yu-Feng Zhang, Bohai University

In this paper, an adaptive stabilization control approach is proposed for a class of strict-feedback nonlinear systems with unmodeled dynamics and unknown gain functions by using the fuzzy approximation. Fuzzy logical systems are used to estimate unknown nonlinearities and backstepping technique together with adaptive control are utilized to construct a state feedback controller. The proposed controller guarantees that all the signals in the closed-loop system are semi-globally uniform bounded in mean squares. Simulation results are used to show the effectiveness of the proposed control scheme.

Session SaR2-B: 16:00-18:00

[#83] Microblog Rumors Features and the Governance in Universities of Guangdong Province

Wo-Lin Ye, Beijing Normal University
Qin-Tao Yao, Beijing Normal University
Jun-Ying Guo, Beijing Normal University
Ying Jiang, Beijing Normal University

The rapid development of today's information age, university leaders and relevant departments should firmly grasp the initiative in ideological and political education, it is necessary to block or eliminate the adverse effects on the network microblogging platform in particular rumor, vigorously strengthen ideological and Universities microblogging rumor governance political education. How to examine the implementation of this project in University governance microblogging rumor, it conforms to the trend of the times the current network information development, will help improve voice network and lead the campus culture College, College microblogging rumor reduce the harm caused mass incidents, build a harmonious necessary initiatives on campus, should attach great importance to and vigorously promoted. The author of 132 universities and domestic provinces and cities in Guangdong Province as the starting point, through literature research, case analysis and other means to collect information College microblogging rumor, university events and social microblogging rumor, rumor events from different perspectives summarized. Spread rumors and social reasons Universities rumors. Comparison of existing coping mechanisms and measures rumor at home and abroad, a large number of literature search. Based on the above information and specific examples, the author puts forward microblogging rumor coping mechanisms general framework from the government level, college level, the social level.

[#14] Global State-Feedback Control for a Class of Upper-Triangular Stochastic Nonlinear Systems With Time-Delay in Input

Liang Liu, Nanjing University of Science and Technology
An-Liang Chen, Shanghai Information Technology College

This paper studies the global state-feedback stabilization problem for a class of upper-triangular stochastic nonlinear systems with time-delay in input. Based on the stochastic nonlinear time-delay stability theory, by adopting the homogeneous domination method and selecting an appropriate Lyapunov-Krasovskii functional, the global state-feedback controller is designed to ensure that the closed-loop system is globally asymptotically stable in probability. The effectiveness of the proposed design scheme is demonstrated by a simulation example.

[#89] Architecture Strategies and Data Models of Software as a Service: A Review

Hui-Xin Chen, Party School of the Shandong Provincial Committee of the CPC

There is no doubt that the cloud computing is changing the way our industry works. Software as a service (SaaS) is delivered as services over Internet, which has been incorporated into the strategy of all leading enterprise software companies to develop various multi-tenant applications. It is also changing the way we view data storage, software architecture, and IT infrastructure. In this paper, we have reviewed current state-of-art of cloud computing, including the challenges, characteristics, architecture strategies, and data models of Software as a Service.

[#30] Improved Adaptive Backstepping Sliding Mode SVC Controller Design for Multi-Machine Power System

Li-Ying Sun, Liaoning University of Technology
Yan Zhao, Liaoning University of Technology

For the two area interconnected power system with SVC, it is equivalent to the two machine system. A new stability controller for SVC which is designed to use the improved adaptive backstepping method and adaptive sliding mode control. The derivative of the virtual control is viewed as bounded uncertainty. In order to avoid the problem of "explosion of terms" of the backstepping method, the continuous sliding mode term is adopted to compensate the uncertainty. In this paper, the mathematical model of the system does not use the linearization method, so that the nonlinear of the system can be kept. The simulation results show that the controller can improve the transient stability of interconnected power system.

[#12] Fuzzy Observer of Discrete-Time Nonlinear Systems via An Efficient Maximum-Priority-Based Switching Mechanism

Xiang-Peng Xie, Nanjing University of Posts and Telecommunications

The technical issue of designing less conservative fuzzy observer for discrete-time nonlinear systems is studied by the aid of an efficient maximum-priority-based switching mechanism. More detailed knowledge for the underlying normalized fuzzy weighting functions can be brought into the main result and a simple but efficient maximum-priority-based switching mechanism is skillfully yielded. With an extension of the developed switching mechanism to fuzzy observer design, a class of switching-type fuzzy observer is proposed such that the estimation error system is ensured to be asymptotically stable while its conservatism is less than previous methods provided in related references. Furthermore, an illustrative example is presented in order to show the main benefit of this study.

[#20] Reduced-Order Observer and Adaptive Fuzzy-Based Dynamic Surface Control for Induction Motors with Iron Losses

Cheng Fu, Qingdao University
Yu-Mei Ma, Qingdao University
Jin-Peng Yu, Qingdao University
Quan-Wen Zhao, Qingdao University
Fa-Tao Shi, Qingdao University

In this paper, observer and adaptive fuzzy-based dynamic surface control is proposed for induction motors including iron losses systems with parametric uncertainly and immeasurable states. First, fuzzy logic systems are used to approximate the unknown and nonlinear functions. Next, an adaptive fuzzy reduced-order observer is developed to estimate the unmeasured states. The dynamic surface technique is used to overcome the problem of "explosion of complexity" inherent in the traditional backstepping design procedure by introducing low-pass filters. The proposed method guarantees that all signals in the closed-loop systems are bounded.

[#53] Research on the Auxiliary panoramic parking technology based on Fast image mosaic

Chun-Bao Huo, Liaoning University of Technology
Guang-Wen Men, Liaoning University of Technology
Li-Hui Zhao, Shanghai Insititute of Technology

The 360°panoramic auxiliary parking system is researched in this paper. Four fisheye cameras are installed around the car body. Zhang Zhengyou calibration method is used for fisheye camera. After distortion correction and overlooking transformation, four images are spliced into a panoramic aerial view. This paper focused on a simple and convenient fast image mosaic algorithm. Test results shows that the method proposed in this paper can generate 360°panoramic view for

the car body .It can meet the requirement of observation with time-sensitive. It can provide effective real-time traffic information for the driver as a basis for judgment in the parking process.

[#22] Chinese micro blogs multi-intensity sentiment classification method based on rough set theory

Zhou-Peng Ji, Haikou College of Economics
Fei-Fei Zhao, Haikou College of Economics
Xian-Jun Chen, Haikou College of Economics

Focus on solving the Chinese micro blogs sentiment classification issues, a sentiment classification method based on rough set theory has been proposed, rough set theory and sentiment analysis is applied to vector space to find optimal feature set by reducing attributes and get multi-intensity sentiment classification about the micro blogs. This approach decreases the dimension of vector space and improves the accuracy of classification effectively. Our experiment example shows the effectiveness of the proposed algorithm.

Session SaR2-C: 16:00-18:00

[#10] Sampled-Data Stability Criterion for T-S Fuzzy Systems With Time-Varying Delay

Zhen-Bin Du, Yantai University
Qiang Jia, Jiangsu University
Zhen-Kun Qin, Yantai University
Zi-Fang Qu, Shandong Institute of Business and Technology

In this paper, a novel approach to the sampled-data stability problem is presented for Takagi-Sugeno (T-S) fuzzy systems with time-varying delay. By employing the input delay approach and free-weighting matrix approach, a new stability criterion is suggested without ignoring any useful terms in the derivative of Lyapunov-Krasovskii functional, which is less conservative than other existing ones. Based on the stability criterion, we design the fuzzy sampled-data controller for the systems under consideration, which ensures that the closed-loop system is asymptotically stable. A computer simulated truck-trailer system is given to illustrate the effectiveness and superiority of fuzzy sampled-data control design.

[#23] Constrained optimal control problems of nonlinear systems based on improved Newton algorithms

Xiang Wu, Guizhou Normal University
Kan-Jian Zhang, Southeast University

In this paper, we consider a constrained optimal control problem of nonlinear systems. Because of the complexity of such constraints, it is difficult to solve this problem by standard optimization techniques. To overcome the difficulty, by a smoothing technique and a penalty function method, an improved Newton algorithm is proposed for solving this problem. Convergence results indicate that the proposed algorithm is globally convergent with quadratic rate. Finally, numerical examples show that our method is effective compared to existing algorithms.

[#36] Output Regulation for heterogeneous second-order linear multi-agent systems

Guo-Da Tian, Northeastern University
Hua-Gang Zhang, Northeastern University
Jing-Ge Wang, Northeastern University
Hong-Jing Liang, Northeastern University

In this paper, we discuss the output regulation problem of a class of linear second-order systems. At first, we propose a control protocol utilizing the information of agents themselves

and their neighbours. Then we present a sufficient and necessary criterion for judging the stability of multi-agent systems. In addition, we analyze the conditions that need to be satisfied for agents to track the output of the exosystem. In the end, examples and simulations are provided to demonstrate the effectiveness of our theory.

[#35] Non-fragile State Estimation for Discrete Neural Networks

Ya-Jing Yu, Northeast Petroleum University
Hong-Li Dong, Northeast Petroleum University
Feng -Cai Huo, Northeast Petroleum University
Chao-Hai Kang Northeast Petroleum University
Jia-Hui Li, Northeast Petroleum University

In this paper, the problem of designing a non-fragile state estimator for a class of discrete-time neural networks with time-delays is investigated. The network output is of a general type that contains both linear and nonlinear parts. The additive variation of the estimator gain is taken into account that reflects the possible implementation error of the neuron state estimator. A state estimator is designed such that the estimation performance is non-fragile against the gain variations. By using the Lyapunov stability theory, sufficient conditions are presented to guarantee the existence of the desired non-fragile state estimators. The explicit expression of the desired estimators is given in terms of the solution to a linear matrix inequality. The usefulness and applicability of the proposed design method are illustrated by a numerical example.

[#19] Decentralized Adaptive Neural Network Dynamic Surface Control Design for Multi-machine Excitation Systems

Xiu-Yu Zhang, Northeast Dianli University
Shi-Lei Hu, Northeast Dianli University

In this paper, a decentralized neural networks (NNs) based robust adaptive dynamic surface control scheme is proposed for the multi-machine excitation system. NNs are employed to both approximate the unknown nonlinear dynamics of the subsystems and compensate for the unknown nonlinear interactions. The main advantages of the proposed scheme are 1) by introducing the error transformed function, the tracking error of the power angle can be kept in the prescribed performance curve, therefore, the transient performance of the tracking error is guaranteed; 2) by using the neural network, the structure of the control system and the interactions between the different excitation subsystem can be totally unknown; 3) by estimating the norm of the NNs's weighted vector instead of the weighted vector itself, the computational burden is greatly reduced, leading to the control scheme is more suitable for real time control. It is proved that all the signals in the multi-machine excitation system are semi-globally uniformly ultimately bounded. Simulation results show the validity of the proposed scheme.

[#70] On the Image Enhancement histogram Processing

Jin-Wen Yang , Liaoning University of Technology
Wei-He Zhong, Liaoning University of Technology
Zheng Miao, Liaoning University of Technology

With the using of Image processing widely .Image enhancement technology has become a hot research field of image processing recently, it can improve the quality of images. This article mainly introduces two aspects, namely, histogram equalization processing and provision of enhanced methods .Meanwhile, compared the pre-processing with post-processing, the relative formulas and standard digital images have been shown in this paper. The experimental results have

shown that the histogram equalization and specifications can improve the contrasted effect. According to the algorithm of histogram equalization and specifications, intensive gray distribution of the original image has become more sparser, so the image processing visual effects and its contrast can be improved.

[#29] Adaptive fuzzy fault accommodation of uncertain complex dynamical networks with nonlinear couplings

Xiao-Jian Li, Northeastern University
Chong-Xiao Shi, Northeastern University
Guang-Hong Yang, Northeastern University

This paper is concerned with the problem of adaptive fuzzy fault accommodation of a class of complex dynamical networks (CDNs) with nonlinear couplings. A fuzzy logical system-based adaptive fault accommodation controller is designed to achieve the synchronization. Moreover, the rigorous convergence analysis of synchronization errors is analyzed by using a convex combination technique and an important graph theory result. Finally, the simulation on a Chua's circuit network is provided to validate the effectiveness of the theoretical results.

[#24] Group Recommendation in Social Tagging Systems by Consistent Utilization of Items and Tags Information

Xiao-Fang Wang, University of Jinan
Xiu-Yang Zhao, University of Jinan
Jin Zhou, University of Jinan
Ming Xu, University of Jinan

Group Recommendation has been actively researched for a long period of time. Especially in recent years, with the explosive growth of the group in social tagging systems, group recommendation has even been a critical technology to help users digest the large amount of online group information. However, as far as we know, many previous works on group recommendation only used either users-groups binary relations or users-tags-groups ternary relations, but rarely exploited items information in the recommendation framework. To tackle this problem, we proposed a novel method named 4-order tensor reduction orthogonal iteration algorithm in this paper, which can recommend groups to users based on the consistent fusion of the items and tags information that exist in social tagging system. In particular, we formulated it as a latent semantic analysis problem, which can be efficiently solved by the Higher Order Singular Value Decomposition (HOSVD) and Higher Order Orthogonal Iteration (HOOI). Experiments on a real world dataset crawled from Flickr.com showed that our proposed method outperformed the methods only based on users-groups binary relations or userstags-groups ternary relations.

Saturday, August 28, 2016

Session SuR: 10:10-12:10

**Address: Petroleum Hotel 64
JingyeBeili, Jinzhou, China.**

Session SuR-A: 10:10-12:10

**[#73] The seismic performance simulation analysis and research about light steel portal frame joint,
Jun Zheng, Liaoning University of Technology
Xiao-Dong Zhang, Liaoning University of Technology
Jian-Wei Xue, Liaoning University of Technology**

In this paper, the static load and dynamic load of light steel portal frame are simulated and analyzed by ABAQUS. The influences of these three factors on the mechanical behavior of the joint are considered, including the shape of the opening, whether the end plate of the joint provided with the stiffening ribs, end plate placement. On the one hand we simulate the influences of these three factors on the stress of beam flange, column flange stress under static loading; on the other hand, we simulate the influences of these three factors on the skeleton curve under the low cyclic loading test and the ultimate bearing capacity of each cellular node is further understood. The above simulation analysis has certain practical significance.

**[#32] Image-Based Visual Servoing Control for Robot Manipulator with Actuator Backlash
Fu-Jie Wang, Guangdong University of Technology
Lu-Lu Song, Guangdong University of Technology
Zhi Liu, Guangdong University of Technology**

This paper presents an adaptive visual servoing controller for robot manipulator under uncalibrated eye-to-hand configuration with unknown actuator backlash. Most existing control approaches to visual servoing manipulator system ignore actuator backlash constraint, which is inevitable in mechanical robot and will significantly affect the dynamic performance. To eliminate the deleterious effect of the unknown actuator backlash, a smooth adaptive inverse is proposed to compensate the backlash effect. Based on the visual servoing system, a novel adaptive algorithm is developed to estimate the unknown backlash parameters. Moreover, an adaptive image-based visual servoing controller is constructed to guarantee the global stability of closed-loop system and the boundary of parameters. The stability of the dynamic system and asymptotic convergence of the image error are proved by Lyapunov method. Simulation results validate the effectiveness of the proposed controller.

**[#43] Guaranteed Cost Control of Interval Type-2 T-S Fuzzy Systems with Time-Varying Delays
Jia-Hui Wang, Bohai University
De-Yin Yao, Bohai University
Zi-Ran Chen, Bohai University
Hak-Keung Lam, King's College London
Hong-Yi, Li, Bohai University**

This paper deals with the H_2 guaranteed cost fuzzy control schemes for nonlinear systems with time-varying delays and exogenous disturbances. General interval type-2 (IT2) Takagi-Sugeno (T-S) fuzzy models are employed to represent the nonlinear systems. The corresponding H_2 guaranteed cost function and H_∞ performance index are established for the

represented time-delay systems. Sufficient conditions for the existence of H_2 guaranteed cost fuzzy controller (and the controller with H_∞ performance index constraints) are constructed by using the methods of linear matrix inequality and S-procedure. The desired fuzzy controllers guarantee the resulting closedloop system to be asymptotically stable with desired optimal guaranteed cost performance and H_∞ performance. Finally, an illustrative example is provided to verify the advantages and effectiveness of the proposed control schemes.

**[#56] A Hybrid Modified DEA Efficient Evaluation Method in Electric Power Enterprises,
Zhi-Guang Hu, Guangdong Power Grid Corporation
Jing-Jing Yang, Guangdong Power Grid Corporation
Shuai-Wei Wang, Zhejiang University
Qin-Min Yang, Zhejiang University**

With the increasingly fierce market competition, efficient evaluation plays a more and more important role in the development of many enterprises. Conducting efficient and inefficient analysis in major enterprises can help each enterprise grasp the changing trends of future development, and better formulate the gap between the production frontier and itself, thus can better know how to make up for the deficiency and be competitive. Data envelopment analysis (DEA) is often utilized to assess the efficiency and attain an envelopment curve. However, the traditional DEA methods have some shortages in dealing with desirable outputs and undesirable outputs. Besides, its time-consuming to solve lots of constraints when new data come. To overcome the insufficiency and complexity, this paper aims to provide an effective solution by modifying DEA methods and integrating data mining algorithm. By this combination, a simple effective method is proposed to evaluate the efficiency of each enterprise, which is subsequently helpful to transform unsupervised learning problem into supervised learning problem at the same time. Finally, the hybrid method has been conducted in electric power enterprises with the evaluation of raw data from different perspective. Two frequently-used classification algorithms have been employed to illustrate the feasibility of the proposed approach.

**[#63] Adaptive NN Tracking Control for a Class of Nonstrict-feedback Stochastic Nonlinear Systems
Zheng Si, Dalian Maritime University
Tie-Shan Li, Dalian Maritime University
Zi-Fu Li, Jimei University**

The problem of adaptive neural networks control for a class of nonstrict-feedback stochastic nonlinear system is considered in this paper. The design difficulty caused by the nonstrict-feedback structure is overcome by using the variable separation technique. An adaptive neural network tracking control algorithm is proposed by combining the approximation capability of the neural network with the adaptive backstepping technique. It is shown that the proposed controller guarantees that all the signals in the closed-loop system are bounded in probability. Numerical Simulation example is used to illustrate the effectiveness of the proposed approach.

**[#26] Predictor-based Consensus Control of Uncertain Nonlinear Strict-feedback Systems
Wei Wang, Liaoning University of Technology
Yang Yu, Liaoning University of Technology**

In this paper, a predictor-based output consensus control scheme is proposed for uncertain nonlinear strictfeedback systems with a leader under directed graphs. Fuzzy logic systems are utilized to approximate the unknown uncertainties of the followers. By introducing predictors in the control

design, an adaptive fuzzy consensus control is developed by dynamic surface control technique. The predictor errors are employed to update the adaptive laws of the fuzzy logic systems, which can achieve fast learning without high-frequency signals in control inputs. By Lyapunov stability theory, it is shown that the output consensus can be achieved with tracking errors converging to a neighborhood of the origin. Simulation results are presented to demonstrate the effectiveness of the proposed control approach.

[#8] State-feedback Stabilization for a Class of Nonholonomic Systems with Unmodelled Dynamics
Yan Zhao, Shandong Jianzhu University
Chun-Xiao Wang, Shandong Jianzhu University
Jiang-Bo Yu, Shandong Jianzhu University

In this note, we address the problem of state-feedback stabilization control for a class of nonholonomic systems with disturbed virtual control coefficients and unmodelled dynamics. The control coefficients are unknown time-varying distance functions, and the unmodelled dynamics are assumed to be input-to-state practically stable (ISpS). Combined with the small gain theorem and the backstepping method, we propose a recursive controller design procedure. In addition, a switching control strategy is constructed in order to get around the smooth stabilization burden for nonholonomic control systems. It is shown that the proposed methodology solves the global stabilization control for such class of general systems. A simulation example is provided to illustrate its efficacy.

[#90] Research on network evolution model based on computer virus transmission mechanism
Hui-Xin Chen, Party School of the Shandong Provincial Committee of the CPC
Xiao-Dong Wang, Party School of the Shandong Provincial Committee of the CPC

Since the beginning of the new century, together with the rapid development of Internet technology, computer virus is increasing quickly, so relying solely on anti-virus software has been unable to completely eliminate viruses. Therefore, according to the analysis of its dissemination mechanism on the Internet, and the study of the evolution model, we can find out the effective prevention countermeasures against computer virus.

Session SuR-B: 10:10-12:10

[#21] State quantized feedback control of continuous-time multi-agent system
Fang Wang, Shandong University of Science and Technology
Yu-Mei Sun, Shandong University of Science and Technology
Bing Chen, Qing-dao University
Hong-Hong Wang, Qing-dao University

In this paper, the quantized consensus problem of continuous-time multi-agent systems is discussed. The protocol design takes fully into account the state quantization feed-back of the neighbor agents in transmission over a limited-communication channel. A fixed quantization level is firstly considered, at this stage, by constructing distributed input quantized protocol and designing two nested invariant regions, all states of the multi-agent system starting in the bigger region approach the smaller one. To guarantee further convergence, then the dynamic state quantization is considered. By dynamically adjusting quantization levels of the quantizer in real time, the sizes of the nested invariant regions gradually become smaller. In this case, a hybrid quantized feedback control strategy is

developed. It is shown that for a connected network, the multi-agent system achieves the quantized consensus asymptotically under the proposed distributed controllers.

[#39] Globally Stable Adaptive Cooperative Path Following Controller Design for Multiple AUVs
Hao Wang, Shenyang Institute of Automation
Kai-Zhou Liu, Shenyang Institute of Automation
Shuo Li, Shenyang Institute of Automation

This paper addresses the problem of cooperative path following for multiple autonomous underwater vehicles (AUVs) with uncertain nonlinear dynamics. Nonlinear path following controllers are developed to ensure that individual AUV meets the desired convergence of the position tracking errors to a small neighborhood of the origin. The coordination task is solved by reaching synchronization on a suitably defined coordination state. The key features of the proposed scheme are that: first, the dynamic surface control (DSC) technique avoids the calculation of derivatives of virtual control signals, so that a simplified cooperative path following controller is proposed; second, a smoothly switching function is presented, and then a neural network (NN) based energy-efficient controller is obtained; third, the algorithm ensures that all the signals in the closed-loop system are globally uniformly ultimately bounded (GUUB). Simulation results validate the performance of the proposed strategy.

[#31] Research on Control Method and Controller Design for Micro Quadrotor Aircraft
Jin-Liang Zhao, Liaoning University of Technology
Jian Zhang, Liaoning University of Technology

The control algorithm of quadrotor aircraft control system is studied in the paper. The parameter tuning of the Auto Disturbance Rejection Controller (ADRC) is improved by using the fuzzy optimization algorithm. And Fuzzy parameter optimization Active Disturbance Rejection Controller (FADRC) is designed for controlling the established mathematical model of quadrotor aircraft. The control performance of the FADRC controller is simulated and compared with the PID control method in MATLAB. The simulation results show that the control algorithm has better performance.

[#52] Maximum Power Point Tracking Control of Solar Power Generation Systems
Shun Zhang, Liaoning University of Technology
Tie-Chao Wang, Liaoning University of Technology

This paper has proposed maximum power point tracking (MPPT) control for solar power generation systems. The Takagi-Sugeno (T-S) fuzzy control with actuator saturation approach is employed in this paper. By further exploring the properties of the time derivatives of normalized fuzzy weighting functions and by introducing more slack matrix variables, the conservatism of LMI-based stability conditions for T-S fuzzy systems is reduced. Finally, the numerical simulation and experimental results are provided to show the control performance.

[#42] An SDN-Based Fault-Tolerant Routing Protocol with One Wormhole Routing Technique
Jichiang Tsai, National Chung Hsing University
Yi-Qiao Zhang, National Chung Hsing University
Jih-Chung Deng, National Chung Hsing University

A mesh network, which enjoys high connectivity, is very fragile to destroying events. These events will destroy some parts of the network and affect the network performance for a long time. Therefore, devising fault-tolerant routing

algorithms for mesh networks is significantly important. In this paper, we introduce a Software-Defined Networking-based (SDN-based) fault-tolerant routing algorithm for a mesh network according to one existing wormhole routing technique because the concepts of SDN-based routing introduced recently and early wormhole routing are similar. Particularly, unlike the latter, we need not to assume that states of all nodes are known in advance. Instead, via the centralized management of the SDN controller, we propose a procedure to find the states of all nodes in flight. Moreover, with the management of OpenFlow flow tables, the implementation complexity of the routing algorithm can be simplified. Finally, we perform some simulation experiments to demonstrate the fault-tolerant capability of our SDN-based routing protocol.

[#75] An Overview of Dynamic Data Mining
Jing-Xin Du, Liaoning University of Technology
Jun Zhou, Liaoning University of Technology
Chang Li, Liaoning University of Technology
Lin Yang, Liaoning University of Technology

With the advent of the era of big data, the dynamic characteristic of data performance is more outstanding. People on the data of "freshness" require increasingly higher, and the traditional static database which is based on data mining has not satisfied the demand of real-time. In modern world, the data generated constantly in the various fields, such as sensor networks, finance, Web logs, and data communications and other fields, which has generated a lot of dynamic data. Dynamic data mining is a way to find hidden knowledge approach of dynamic data approach. For the dynamic data, the paper reviews the processing methods of dynamic mining which includes the treatment stream data mining, distributed processing framework and approach incremental mining in now days. It introduces the main ideas of the various treatment methods, specific methods and related features.

[#34] Fuzzy Control of Spacecraft Attitude Maneuver by Delta Operator Approach
Ce Yan, Yanshan University
Yang Xu, Yanshan University
Hong-Jiu Yang, Yanshan University
Ji-Yong Lu, Yanshan University

This paper focuses on the spacecraft attitude control based on fuzzy control system and delta operator approach. The spacecraft attitude control model is transformed into a T-S fuzzy delta operator system with appropriate fuzzy rules. The stability of the fuzzy delta operator system is investigated by Lyapunov function. A sufficient condition is given for stability of the fuzzy delta operator system. Then a fuzzy controller is designed. Lastly, an example of spacecraft attitude control is given to show the advantages and effectiveness of the proposed results.

[#13] Adaptive Fuzzy Trajectory Tracking Control of Unmanned Surface Vehicles with Unknown Dynamics
Ke Feng, Dalian Maritime University
Ning Wang, Dalian Maritime University
Dan Liu, Dalian Maritime University
Meng Joo Er, Nanyang Technological University

In this paper, an adaptive fuzzy logic control scheme with backstepping for tracking unmanned surface vehicles (USV) in the framework of uncertain strict-feedback nonlinear system with unknown dynamics and external disturbances is proposed. Fuzzy logic system is used for approximating the nonlinear function including unknown dynamics and external disturbances, and the proposed controller does not need a priori explicit knowledge about USV dynamics. By virtue of

Lyapunov synthesis and backstepping technique, an indirect adaptive fuzzy logic controller is derived. The design can guarantee the ultimate uniform boundedness (UUB) of all signals in the closed-loop system. A set of simulations are carried out to verify the effectiveness of the proposed controller.

Session SuR-C: 10:10-12:10

[#3] H_∞ fuzzy filtering design by applying non-quadratic Lyapunov function
Li-Wen Hu, Nanchang HangKong University
Li-Kui Wang, Nanchang HangKong University

This paper is about H_∞ fuzzy filtering design for nonlinear systems presented as T-S model. First, the time derivatives of the membership functions are discussed and some linear matrices inequalities (LMIs) are obtained to bound it. Then, a new non-quadratic Lyapunov function, which has the diagonal form, is designed to get some LMIs to design the filtering. In the end, a numerical example is given to show the effectiveness of the proposed approach.

[#15] Adaptive Control for Mobile Manipulators with Affine Constraints
Wei Sun, Liaocheng University
Jian-Wei Xia, Liaocheng University

The problem of adaptive motion/force tracking has been further investigated for a class of mobile manipulators under the holonomic and affine constraints with the presence of uncertainties. A new adaptive controller is proposed to ensure that the states of closed-loop system asymptotically track desired trajectories while the constraint force remains bounded by tuning design parameters.

[#33] Fuzzy Tracking Control of Uncertain Nonlinear Systems With Time-Varying Actuator Failures
Guan-Yu Lai, Guangdong University of Technology
Lu-Lu Song, Guangdong University of Technology

In controlling uncertain nonlinear systems, compensation for the time-varying actuator failures/faults based on adaptive approach is of both theoretical and practical importance. However, so far, there is still very limited result available in addressing such a problem. In this paper, we address this issue by proposing a new fuzzy control scheme which is established from the techniques of projection adaptation design, backstepping iteration, and optimized fuzzy adaptation. It is proved that all the closed-loop signals are ensured bounded and the tracking error is controlled into an adjustable neighborhood around zero.

[#62] Scene image classification method based on Alex-Net model
Jing Sun, Liaoning University of Technology
Xi-Biao Cai, Liaoning University of Technology
Fu-Ming Sun, Liaoning University of Technology
Jian-Guo Zhang, Liaoning University of Technology

Deep convolutional neural network (DCNN) is a powerful method of learning image features with more discriminative and has been studied deeply and applied widely in the field of computer vision and pattern recognition. In order to further explore the superior performance of DCNN and improve the accuracy of the scene image classification, this paper presents a novel algorithm of scene classification, which fully learning the deep characteristics of the images based on the classical Alex-Net model and support vector machine. In the first place, we use the Alex-Net model learning scene image features and

extract the last layer with 4096 neurons of the Alex-Net model as the image features in this method; Then, we use the Lib-SVM training model for scene image classification and compare with classification method based on the regression model; Finally, we carried out the experiments on two common datasets in this paper. The experimental results have shown that DCNN can extract the image features effectively. Meanwhile, the trained scene model also has stronger generalization performance and achieves the state-of-the-art classification accuracy.

[#91] Influence of different mixing methods on the axial compressive strength of basalt fiber recycled concrete

Rui-Jin Guo, Liaoning University of Technology

Zhong Bi, Liaoning University of Technology

Fu Wang, Liaoning University of Technology

Fiber reinforced concrete as a kind of complex material of composite reinforced, which has received wide attention in the material field and engineering. In this experiment, the volume of basalt fiber were 0,0.1%, 0.15%, 0.20% ,in this cases of, two kinds of different ways of curing fiber influenced axial compressive strength of basalt fiber recycled concrete blocks that were cured through normal temperature and high temperature. The concrete blocks have two types, the first one was maintained 7d, the second one was maintained 28d at normal temperature. The high temperature included 200 °C、400 °C、600 °C. Experimental results show that axial compressive strength of the cement paste wrapped fiber was superior to that mode of which fiber is added directly, but with the change of the fiber content, curing time and temperature, compared with the direct incorporation, the range of which indirect incorporation improved the strength was different from it. Along with the increase of fiber volume, the difference of the two kinds of incorporation mode increased more, and the gap increased with the increase of temperature firstly and then decreased when the fiber content reached the maximum of 0.20%. The way of cement paste wrapped fiber which increased early strength more than that of 28d. Finally, the range of which indirect incorporation improved the strength reached the maximum when fiber volume content was 0.2% and temperature was 400 °C.

[#7] Adaptive Neural DSC for Switched Pure-Feedback Nonlinear Time-Delay Systems

Tian Qin, Bohai University

Xiao-Dong Fan, Bohai University

Ben Niu, Dalian University of Technology

In this paper, the problem of robust stabilization is investigated for a class of uncertain switched pure feedback nonlinear systems with unknown time-delay functions and perturbed uncertainties. In the controller design process, the so-called continuous packaged functions are firstly introduced to remove unknown nonlinear terms caused by perturbed uncertainties and unknown time-delay functions, and the additional first-order low-pass filter is applied to overcome the issue of “explosion of complexity”. The function separation technique, the Lyapunov-Krasovskii functionals and the hyperbolic tangent functions are then used to deal with the design difficulties from unknown time-delay functions. In addition, it is shown that all signals in the closed-loop system are semi-globally uniform ultimate boundedness.

[#40] Asymptotic Fuzzy-approximation based Control of MIMO Systems with Unknown Input Nonlinearities and Control Direction

Ci Chen, Guangdong University of Technology

Lu-Lu Song, Guangdong University of Technology

Zhi Liu, Guangdong University of Technology

This paper investigates a fuzzy asymptotic control for MIMO systems with unknown identical control directions, input nonlinearities and external disturbances. Control difficulties from input nonlinearities and their control signs in MIMO systems are simultaneously tackled with the help of a newly constructed Nussbaum theorem. Benefiting from this theorem, unmodelled bounded system dynamics and universal approximation errors are also handled without constructing extra robust terms. Hence, both the control simplicity and control robustness are obtained within the frame of the developed Nussbaum tool. Furthermore, under the semiglobally uniformly ultimately bounded condition, the proposed fuzzy control scheme has succeeded in extending the bounded result to the asymptotic convergence. Finally, a simulation example is carried out to show the proposed approach effectiveness.

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