

第二十六届中国控制会议
The 26th Chinese Control Conference

程序册
Final Program

主办单位

中国自动化学会控制理论专业委员会

承办单位

中南大学，湖南省自动化学会

Sponsoring Organizations

Technical Committee on Control Theory, Chinese Association of Automation
Central South University, Hunan Automation Association

2007年7月26-31日， 中国 张家界
July 26-31, 2007, Zhangjiajie, China

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欢迎辞 (Welcome Address)

第 26 届中国控制会议(CCC'07)将于 2007 年 7 月 26 至 31 日在中国湖南著名旅游城市张家界举行。我们谨代表程序委员会诚挚地欢迎您参加此次盛会。

作为系统与控制领域的一个重要的学术交流活动，中国控制会议已成功举办了 25 届，会议的议题涵盖了几乎所有系统与理论的主要分支。它为该领域的研究人员、工程师及研究生们提供了一个讨论和分享新成果、新进展的舞台。

今年中国控制会议收到稿件 1572 篇，经认真审稿，论文集收录 874 篇，达到一个新的记录。程序委员会将一如既往，努力把中国控制会议办成一个在控制科学与技术领域高水平的国际会议。

CCC'07 得到若干国际组织的协办，有 IEEE 控制系统分会，日本 SICE 学会，韩国 ICASE 学会及香港工程师学会控制自动化与仪表分部等。自 2005 年起，CCC 论文集由 ISTEP 收录。自 2006 年起 CCC 论文集进入 IEEE 会议出版程序(Conference Publication Program)及 IEEE Explore。

第 26 届中国控制会议组委会将尽全力为与会者服务，所有的准备工作已全部就绪。我们相信，2007 年的 CCC 将成为一个成功的、富有成果的和值得记忆的会议。

张家界的山水享誉中外，我们欢迎您的到来！

On behalf of the Program Committee, we cordially invite you to participate in the Twenty-Sixth Chinese Control Conference (CCC'07), which will be held in Zhangjiajie during July 26-31, 2007.

As an important annual academic venue for technical and informative exchange in systems and control, the Chinese Control Conference has been successfully organized 25 times. The scope of the conference is quite broad, covering almost all of the major branches in the field of systems and control. The conference will certainly provide an excellent opportunity for researchers, engineers, and students to share their experiences and discuss latest innovative developments in the field. In this year, CCC received 1572 submissions and 874 of them have been included in the proceedings through a peer review procedure. This is a new record for CCC. The Program Committee has been trying their best to make the CCC'07 a high level international conference in control science and technology.

The CCC'07 is technically co-sponsored by several international organizations, such as, the IEEE Control System Society, the Society of ICE (SICE) of Japan, and the ICASE of Korea. Since 2005 the proceedings of CCC have been indexed by ISTEP (Index to Scientific & Technical Proceedings), and since 2006 the conference has been included into the IEEE CPP (IEEE Conference Publications Program) and IEEE Explore.

The Organizing Committee of the Twenty-Sixth Chinese Control Conference has been working hard to provide best service to all participants, and the preparation work is going smoothly. We have strong confidence in making the CCC'07 a very successful, memorable and fruitful conference.

Zhangjiajie is a beautiful vacationland in central China, famous for its mountains and rivers and friendly and honest Tujia minority residents. Accompanying the fast growing economy in China, Zhangjiajie is Leaping forward day by day. Nowadays, it attracts millions of tourists each year.

In addition to the academic activities, the Organizing Committee has also prepared several sightseeing programs. We welcome you and wish you an enjoyable stay in Zhangjiajie !



Cheng Daizhan



Gui Weihua

Chairs, Program Committee
Twenty-Sixth Chinese Control Conference

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The 26th Chinese Control Conference

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大会报告 (Plenary Lectures)

Plenary Lecture 1

Friday, July 27, 9:45~10:45
Taihe International Conference Hall

Brian D. O. Anderson

The Australian National University, Canberra, ACT 2600, Australia

Information Architecture and Control Design for Rigid Formations

Chair: Chen Hanfu (Chinese Academy of Sciences)

Abstract: Formations of robots, underwater vehicles and autonomous airborne vehicles are progressively being deployed to tackle problems of surveillance, bush fire control, and the like. Much formation behavior mimics the behavior of formations of living organisms, such as birds and fish. This paper reviews a number of concepts and results relevant to the design of control schemes and information architectures to maintain the shape of a formation of autonomous agents. The task of providing satisfactory sensing, communication and control architectures within a formation of autonomous agents is emphasized and elaborated in the paper. The paper provides a set of technical tools for characterizing and designing information architectures, which largely rest on graph theoretic considerations, as well as a control scheme exemplifying a class of decentralized controllers for maintaining the shape of a formation. (with Changbin Yu and Baris Fidan)



Brian D. O. Anderson took his undergraduate degrees in Mathematics and Electrical Engineering at Sydney University, and his doctoral degree in Electrical Engineering at Stanford University.

He worked in industry in the United States and at Stanford University before serving as Professor of Electrical Engineering at the University of Newcastle, Australia from 1967 through 1981. At that time, he took up a post as Professor and Head of the Department of Systems Engineering at the Australian National University in Canberra, where he was Director of the Research School of Information Sciences and Engineering from 1994 to 2002. For approximately one year to May 2003, he was the inaugural CEO of the newly formed National ICT Australia, established by the Australian Government through the Department of Communications, Information Technology and the Arts and the Australian Research Council under the Information and Communication Technologies Centre of Excellence program. From May 2003 to September 2006, he served as Chief Scientist of NICTA. He has held many visiting appointments in the United States, Europe and Asia, including the University of California, Berkeley, Stanford University, Swiss Federal Institute of Technology and Tokyo Institute of Technology.

Professor Anderson has served as a member of a number of government bodies, including the Australian Science and Technology Council and the Prime Minister's Science, Engineering and Innovation Council. From its initial public listing until 2005, he was also a member for ten years of the Board of Cochlear Limited, the world's major supplier of cochlear implants. He is a Fellow of the Australian Academy of Science and Academy of Technological Sciences and Engineering, the Institute of Electrical and Electronic Engineers, and an Honorary Fellow of the Institution of Engineers, Australia. In 1989, he became a Fellow of the Royal Society, London, and in 2002 a Foreign Associate of the US National Academy of Engineering. He holds honorary doctorates of the Catholic University of Louvain in Belgium, the Swiss Federal Institute of Technology, and the Universities of Sydney, Melbourne, New South Wales and Newcastle. He was appointed an Officer of the Order of Australia in 1993.

He was President of the International Federation of Automatic Control for the triennium 1990 to 1993, and served as President of the Australian Academy of Science for four years from 1998 to 2002.

His research interests have included many contributions in the area of circuits, signal processing and control, and currently his work focuses on distributed control of multiagent systems, sensor network localization, adaptive and nonlinear control.

Plenary Lecture 2

Friday, July 27, 11:00~12:00
Taihe International Conference Hall

Wu Jiarui

Institute of Biochemistry and Cell Biology, Shanghai Institutes for Biological Sciences, Chinese Academy of Sciences
Department of Systems Biology, University of Science and Technology of China

Systems Biology and Complex Disease

Chair: Wu Min (Central South University)

Abstract: Systems biology is a newly born discipline in life science in 21st century. It is also a new interdisciplinary frontier based mainly on the experimental biology, “omics”, computer science and mathematics. Technology of systems biology includes the platforms of “omics” such as genomics-platform and proteomics-platform as well as tools on computing and modeling. Moreover, the key feature for the systems biology is “Integration”. On one hand, it is the integration between small science (such as molecular biology and cell biology) and big science (omics). On the other hand, it is the integration between “wet” experiments and “dry” experiments. The power of systems biology is to analyze the complex biological systems and the complex diseases. It is well known that the complex diseases such as cancer and diabetes are the main killers to the human being. The causes of the initiation and development of the complex diseases involve genetic factors, environment factors and the interaction of these two kinds of factors. Furthermore, more and more studies have shown that the gene and protein networks play important roles for the mechanisms of the complex diseases. Therefore, it is clear that the classical experimental biology that focuses on single gene or protein is not enough to reveal the molecular mechanisms of complex diseases, whereas the methodology and technique of system biology are very fit to study such problems.



Wu Jiarui graduated in Dept. of Biology of Zhongshan University in Guangzhou in 1982, received a master degree from Institute of Genetics of Chinese Academy of Sciences in Beijing in 1985 and a doctor degree from Swiss Federal Institute of Technology in Zurich in 1994. He was a postdoctoral fellow in Health Science Center of State University of New York from 1994-1997. Since then, he become a professor in Shanghai Institute of Biochemistry in Chinese Academy of Sciences in Shanghai. Now he is a vice-president of Shanghai Institutes for Biological Sciences, Chinese Academy of Sciences; the director of Department of Systems Biology, University of Science and Technology of China; and a vice-president of the Chinese Society of Biochemistry and Molecular Biology. Dr. Wu has been working on the area of the intracellular regulation network of cell proliferation, apoptosis and differentiation. Recently he put more efforts to promote the development

of Systems Biology in China. In addition, he was awarded as a chief scientist in a 973 project “Mechanism of Type 2 Diabetes Progression” in 2006. So far, he has published more than 40 research papers in international scientific journals, such as Science, Nature Genetics, EMBO J., and Mol. Cell. Biol. etc.

Plenary Lecture 3

Saturday, July 28, 8:30~9:30
Taihe International Conference Hall

Wook Hyun Kwon

School of Electrical Engr. & Computer Science, Seoul Nat'l Univ., Seoul, 151-742, Korea

From infinite horizon to receding horizon for controls, estimations, and optimizations

Chair: Guo Lei (Chinese Academy of Sciences)

Abstract: This paper introduces some recent developments on the receding horizon scheme. We deal with mathematical models such as state space models of continuous variable systems and controlled Markov chains (CMC) of discrete event systems (DES). For given mathematical models, common design objectives and performance indices are introduced. The advantages of the receding horizon scheme are discussed. In this paper, receding horizon schemes are introduced for both minimization and maximization criteria. In the case of state space models, we first start from a general nonlinear system and move to a linear system. Specially, we introduce the state feedback and the output feedback receding horizon controls. A linear time delay and I/O systems are also discussed for applicability of the receding horizon scheme. As an application to a discrete event system, we introduce receding horizon policies for the average reward criterion and the two person zero sum game of controlled Markov chains. The differences between the receding horizon performance criteria and the infinite horizon ones are represented in terms of the horizon size.



Wook Hyun Kwon received B.S. and M.S. degrees in electrical engineering from Seoul National University in 1966 and 1972, respectively, and a Ph D. degree from Brown University in 1975.

He was a research associate at Brown University (1975-1976), an adjunct assistant professor at the University of Iowa (1976-1977). He has been with Seoul National University since 1977, where he is currently a professor of School of Electrical Engineering and Computer Science. He was a visiting assistant professor at Stanford University (1981-1982)

Dr. Kwon has published about 120 international journal papers and approximately 240 international conference papers, mostly in the areas of predictive controls, time-delayed system, FIR filtering, and real-time computer applications for automation. He authored a graduate text book, "Receding Horizon

Control: Model Predictive Control for State Models" appeared in July, 2005 by Springer.

He received the National Academy of Sciences Award in 1997. He became a Fellow of the National Academy of Engineering of Korea (NAEK) in 1995 and a Fellow of the Korean Academy of Sciences and Technology (KAST) in 1996. He became a Fellow of IEEE in 1999 and a Fellow of TWAS (The Academy of Sciences for the Developing World) in 2001. He received the Brown University Engineering Alumni Medal (BEAM) award for outstanding achievements in 2003.

He was President of the Institute of Control, Automation and Systems Engineers (ICASE) of Korea in 1999, President of the Korean Institute of Electrical Engineers (KIEE) in 2001, and Vice-President of NAEK in 2002-2006. He was Chair of the Seoul National University Senate in 2005. He is now serving the International the Federation of Automatic Control (IFAC) as President since July, 2005 and the Korean Academy of Sciences and Technology (KAST) as Vice-President since 2007.

Plenary Lecture 4

Saturday, July 28, 9:30~10:30
Taihe International Conference Hall

Theodore E. Djaferis

Electrical and Computer Engineering, University of Massachusetts Amherst, MA 01003

Systems and Control Impact in a Changing World

Chair: Lihua Xie (Nanyang Technological University)

Abstract: The later half of the twentieth century can be characterized as a golden age for systems and control. A tremendous research effort led to the discovery of new knowledge that had a dramatic impact on the solution of many challenging engineering problems. We now face a new century and a new set of engineering problems many that lie at the boundaries of established fields. At the same time many technological innovations are constantly changing the landscape. This creates challenges as well as opportunities for systems and control research. The new century and global realities also create a new set of issues for engineering education. In the educational arena many questions are being raised as to how engineering education should be shaped in both structure and content to better address the needs of the 21st century. Of course research and education are inextricably connected as past research developments shape the current engineering educational system and educational systems are in many ways crafted to facilitate research. It is a fact that systems and control educators have historically played a fundamental role in engineering education and we are now poised to take a leadership role in shaping it for the future. I believe that the systems and control community has an opportunity to have a much greater impact on research and education in the 21st century. In this talk I discuss these issues from my personal perspective drawing from my experiences over the last thirty years.



Theodore E. Djaferis received the B.S. degree from the University of Massachusetts Amherst in 1974, and the M.S., E.E. and Ph.D. degrees from the Massachusetts Institute of Technology in 1977, 1978 and 1979 respectively. In 1979 he joined the Electrical and Computer Engineering Department of the University of Massachusetts at Amherst where he is currently a full professor and the Associate Dean of the College of Engineering. He is the author or co-author of more than one hundred technical publications in the area of systems and control and the author of the research monograph, *Robust Control Design: A Polynomial Approach*, published by Kluwer Academic Publishers in 1995. He is a co-editor of the research volume, *System Theory: Modeling Analysis and Control*, also published by Kluwer in 1999. He is also the author of a textbook for first-year engineering students with the title, *Automatic Control: The Power of Feedback*, published by PWS in 1998 (revised printing by

Brooks/Cole in 1999). He is a three-time recipient of the Eta Kappa Nu Outstanding Professor Teaching Award in his Department, the recipient of a College of Engineering Outstanding Advisor Service Award in 1991 and the College Outstanding Teaching Award in 2001. He is a member of Eta Kappa Nu and Tau Beta Pi and a Fellow of the IEEE. He has been heavily involved in IEEE Control Systems Society professional activities and currently serves as President of the Society.

Plenary Lecture 5

Saturday, July 28, 10:45~11:45
Taihe International Conference Hall

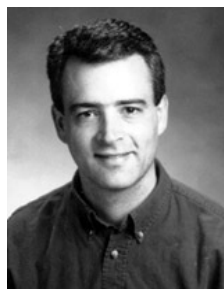
Andrew R. Teel

Center for Control, Dynamical Systems, and Computation, Department of Electrical and Computer Engineering
University of California, Santa Barbara, CA 93106-9560, USA

Hybrid Systems: stability and control

Chair: Zhongping Jiang (Polytechnic University)

Abstract: Modeling issues for hybrid dynamical systems are discussed and fundamental stability analysis tools are summarized. These tools are useful for the development of hybrid control algorithms. (with Chaohong Cai, Rafal Goebel, Ricardo G. Sanfelice)



Andrew R. Teel received his A.B. degree in Engineering Sciences from Dartmouth College in Hanover, New Hampshire, in 1987, and his M.S. and Ph.D. degrees in Electrical Engineering from the University of California, Berkeley, in 1989 and 1992, respectively. After receiving his Ph.D., Dr. Teel was a postdoctoral fellow at the Ecole des Mines de Paris in Fontainebleau, France. In September of 1992 he joined the faculty of the Electrical Engineering Department at the University of Minnesota where he was an assistant professor until September of 1997. In 1997, Dr. Teel joined the faculty of the Electrical and Computer Engineering Department at the University of California, Santa Barbara, where he is currently a professor. Professor Teel has received NSF Research Initiation and CAREER Awards, the 1998 IEEE Leon K. Kirchmayer Prize Paper Award, the 1998 George S. Axelby Outstanding Paper Award, and was the recipient of the first SIAM Control and

Systems Theory Prize in 1998. He was also the recipient of the 1999 Donald P. Eckman Award and the 2001 O. Hugo Schuck Best Paper Award, both given by the American Automatic Control Council. He is a Fellow of the IEEE.

Plenary Lecture 6

Sunday, July 29, 13:30~14:30
Taihe International Conference Hall

Tielong Shen

Department of Mechanical Engineering, Sophia University, Tokyo, Japan 102-8554

Analysis and Control of Discontinuous Dynamical Systems

Chair: Li Shaoyuan (Shanghai Jiao Tong University)

Abstract: Discontinuity in dynamical system is caused by natural phenomenon or control actions engineered by control design such static friction, contacting collision, switching and variable structure control et al. The dynamical systems with the discontinuities are usually described by the differential equations with discontinuous right hand side. That is, the vector field defining the dynamical system may be a function which is discontinuous on the state or the time. For this kind of systems, to establish an analysis and synthesis framework, the most fundamental issue we must face is the notation of solution, and then the uniqueness and convergence. This talk will focus on these fundamental issues and on extending the basic results to control design. First, a brief review of the analysis of discontinuous dynamical systems will be addressed, and then the Filippov-framework for stability analysis of discontinuous systems will be surveyed shortly. Base on the fundamental results, two control design issues will be addressed. Finally, some challenging problems in control of mechanical systems and automotive powertrain systems with the discontinuous dynamical system theory will be introduced with physical background.



Tielong Shen received the Ph.D. degree in Mechanical Engineering from Sophia University, Tokyo, Japan. From April 1992, he has been a faculty member of the Chair of Control Engineering in Department of Mechanical Engineering, Sophia University, where he currently serves as Associate Professor. Since 1996, he also served concurrently Professor of Yanshan University, Harbin Institute of Technology and “Luoji Xuezhe” Chair Professor of Wuhan University, China. His research interests include control theory and application in mechanical systems, power systems and automotive powertrain. In these area, he has authored/co-authored more 100 journal papers and 8 textbooks in Japanese, English and Chinese, respectively. From 1997, he has been serving as Chief Editor in Control Technique, Vice Chief Editor in Control Theory for the Transaction of SICE, Japan, and served as Guest Editor for International Journal on Robust and Nonlinear Control, during 2002-2003. Currently, he is Associate Editor for the IEEE Control System Society Conference Editorial Board, and is serving as Associate Editor of Journal of Control Theory and Applications, Guest Editor for Asian Journal of Control for special issue on New Trend in Automotive Powertrain Systems, and the Regional Editor Asia-Pacific for International Journal of Modeling, Identification and Control. He is now also serving as a member of the GB of Control Society of SICE, Chair of the Committee of SICE on Advanced Powertrain Control Theory, Member of Chinese Automation Society, and a member of the IEEE Technical Committee on Automotive Control.

大会专题研讨会（Plenary Panel Discussion）

会议时间：2007 年 7 月 29 日 14:30~16:30

Time: July 29 14:30~16:30, 2007

地点：泰和国际会议厅

Place: Taihe International Conference Hall

展望控制与自动化的未来

我们生活在一个活跃的信息时代，新思维、新发现和新技术日新月异。信息技术、纳米技术和生物工程的进展改变着我们的生活。我们有充分的理由相信，21 世纪的科学技术将进一步充实我们对世界的理解和改善我们的生活条件。在此，我们不禁反问自己

- 控制科学将对 21 世纪的科学技术做何贡献？
- 什么是控制科学面临的基本问题？
- 控制与自动化影响社会信息化进程的最关键因素是什么？
- 作为控制专业的学生或研究人员，我们怎样才能在未来做得更好？

我们诚邀您同我们一起探讨上述问题，期盼听到您对我们的事业——控制与自动化——未来的高见。

研讨会主席：黄捷（香港中文大学，IEEE Fellow）

协主席：姜钟平（Polytechnic University）

主要发言人：曹希仁（香港科技大学，IEEE Fellow）

陈本美（国立新加坡大学，IEEE Fellow）

陈翰馥（中国科学院，中国科学院院士，第三世界科学院院士，IEEE Fellow）

段广仁（哈尔滨工业大学，国家杰出青年基金获得者）

郭雷（中国科学院，中国科学院院士，第三世界科学院院士，IEEE Fellow）

林宗利（University of Virginia，IEEE Fellow）

Outlook of Control and Automation

We are living in an exciting information-rich age. New ideas, new discoveries and new technological inventions pop up on a daily basis. Advances in information technology, nanotechnology and biotechnology have led to the betterment of human beings. We have plenty of reasons to believe that 21st century Science and Technology will continue to advance our knowledge about Nature's truths and bring many societal benefits. Naturally, we ask ourselves the following questions:

- How can Control Science contribute to 21st century science and technology?
- What are the fundamental problems in Controls that need to be addressed now?
- What are the important key issues in Control and Automation that will have a direct impact on the transformation of this information age?
- What can we do, either as a control student or as a control researcher, to make a real difference in the future?

We invite you to join us in the search for the answers to these questions, and more importantly, we look forward to hearing your views about the future of our field of Control and Automation.

Chair: Jie Huang (The Chinese University of Hong Kong, IEEE Fellow)

Co-chair: Zhongping Jiang (Polytechnic Univ.)

Panelists: Xiren Cao (The Hong Kong University of Science and Technology, IEEE Fellow)

Benmei Chen (National University of Singapore, IEEE Fellow)

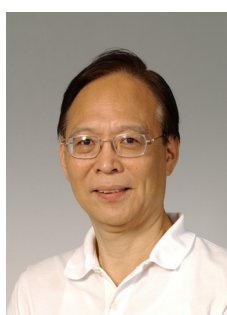
Chen Hanfu (Chinese Academy of Sciences, Member of Chinese Academy of Sciences, Fellow of the Academy of Sciences for the Developing World, IEEE Fellow)

Duan Guangren (Harbin Institute of Technology, winner of the National Science Fund for Distinguished Young Scholars)

Guo Lei (Chinese Academy of Sciences, Member of Chinese Academy of Sciences, Fellow of the Academy of Sciences for the Developing World, IEEE Fellow)

Zongli Lin (University of Virginia, IEEE Fellow)

研讨会主讲人 (Panelists of Plenary Panel Discussion)



Xi-Ren Cao received the M.S. and Ph.D. degrees from Harvard University, in 1981 and 1984, respectively, where he was a research fellow from 1984 to 1986. He then worked as consultant engineer/engineering manager at Digital Equipment Corporation, U.S.A, until October 1993. Then he joined the Hong Kong University of Science and Technology (HKUST), where he is currently chair professor, director of the Research Center for Networking.

Dr. Cao owns three patents in data- and tele- communications and published three books in the area of discrete event dynamic systems. He received the Outstanding Transactions Paper Award from the IEEE Control System Society in 1987 and the Outstanding Publication Award from the Institution of Management Science in 1990. He is a Fellow of IEEE, Chairman of IEEE Fellow Evaluation Committee of IEEE Control System Society, Editor-in-Chief of Discrete Event Dynamic

Systems: Theory and Applications, Associate Editor at Large of IEEE Transactions of Automatic Control, and he is on Board of Governors of IEEE Control Systems Society and on the Technical Board of IFAC. His current research areas include discrete event dynamic systems, stochastic learning and optimization, performance analysis of communication systems, and signal processing.



Ben M. Chen (S'89–M'92–SM'00–F'07), born in Fuqing, Fujian, China, in 1963, received his B.S. degree in computer science and mathematics from Xiamen University, China, in 1983, M.S. degree in electrical engineering from Gonzaga University, Spokane, in 1988, and Ph.D. degree in electrical and computer engineering from Washington State University, Pullman, in 1991.

He was a software engineer in the South-China Computer Corporation, Guangzhou, China, from 1983 to 1986. From 1992 to 1993, he was an Assistant Professor in Department of Electrical Engineering, State University of New York at Stony Brook. Since 1993, he has been with the Department of Electrical and Computer Engineering, National University of Singapore, where he is currently a Professor. His current research interests are in robust control, systems theory, and the development of UAV helicopter systems.

He is a Fellow of IEEE and is the author/coauthor of seven research monographs including and Robust and H Control (New York: Springer, 2000); Linear Systems Theory: A Structural Decomposition Approach (Boston: Birkhäuser, 2004); and Hard Disk Drive Servo Systems (New York: Springer, 1st Edn 2002, 2nd Edn 2006). He was an Associate Editor for Asian Journal of Control. Dr. Chen was an Associate Editor for the IEEE Transactions on Automatic Control. He is currently serving as a member of international advisory board of Kuwait Journal of Science & Engineering and an Associate Editor of Automatica, Control & Intelligent Systems, Systems & Control Letters, and Journal of Control Science and Engineering.



陈翰馥毕业于苏联列宁格勒大学。现任中科院数学与系统科学研究院系统科学研究所研究员。1993年当选为中科院院士，1996年当选为 IEEE Fellow，2005年当选为第三世界科学院院士，2006年当选为 IFAC Fellow。他的研究领域包括随机系统的辨识、适应控制、随机逼近和优化及其对系统控制、信号处理等领域的应用。发表期刊论文 170 余篇，专著 7 本。

他曾任中国自动化学会理事长（1993-2002）、中国数学会常务理事（1993-1999）。在国际自动控制联合会（IFAC）中任执委（2002-2005），技术局成员（1993-2002）及“系统与信号”协调委员会主席（1993-1999），并任第十四届 IFAC 世界大会（1999，北京）的国际程序委员会（IPC）主席。



段广仁教授，男，1962年4月5日生人。1989年获哈尔滨工业大学博士学位。1989年10月进入哈尔滨工业大学机械工程学科博士后流动站，1991年8月出站，同年11月破格晋升为教授。1997年1月至1998年3月于英国 Hull 大学电子工程系做访问教授，之后于 Sheffield 大学电子电气工程系访问。1999年10月至2002年9月间于英国 Belfast 女王大学工作。

现为哈尔滨工业大学博士生导师，导航、制导与控制学科长江学者特聘教授、哈尔滨工业大学控制理论与制导技术研究中心主任、IEE Fellow、IEEE 高级会员、教育部科技委学部委员、教育部长江学者优秀创新团队学术带头人、国家 863 计划航空航天领域专家组成员、中国自动化学会控制理论专业委员会委员、Int. J. of Control, Automation and Systems、Int. J. of Automation and Computing、J. of Control Theory and Applications、Nonlinear Dynamics and System Theory 编委、《信息与控制》和《航天控制》编委，《哈尔滨工业大学学报》英文版编委和《哈尔滨工业大学学报》中文版主编。

曾任美国数学学会(AMS)会员、美国《数学评论》评论员，是教育部跨世纪人才基金获得者、国家杰出青年基金获得者和第四届中国青年科技奖获得者。首批入选“百千万人才工程”，于1996年被评为黑龙江省优秀中青年专家和航天工业总公司跨世纪学术与科技带头人，2006年被评为黑龙江省全省优秀博士后并享受国防科工委系统政府特殊津贴。

在 IEEE 汇刊、IEE 期刊、Automatica、Int. J. Control 等国内外重要刊物及学术会议上发表论文 400 余篇，其中英文刊物论文 100 余篇，国际会议论文 150 余篇。被三大检索（SCI、IE、ISTP）收录论文 240 余篇。自 1990 年以来主持完成了国家杰出人才基金课题、国家教委跨世纪人才基金课题、国家自然科学基金面上课题、航天工业总公司预研课题等 17 项课题的研究工作。目前他正在负责两项国家自然科学基金面上课题、一项国家自然科学基金重点项目子课题、一项总装武器装备预研基金重点项目、一项黑龙江省自然科学基金重点项目和若干项中国人民解放军总装备部、第二炮兵装备部和航天集团的国防科研课题的研制工作。曾获第十一届中国图书奖、国家优秀科技图书二等奖、第四届中国青年科技奖等多项奖励。另获教育部自然科学奖一等奖一项（第一名）、黑龙江省自然科学奖一等奖一项（第一名）、航天工业总公司科技进步二等奖一项（第一名）、国家教育部科技进步二等奖两项（第一名）、黑龙江省高校自然科学一等奖一项（第一名）。



GUO Lei is currently professor and president of the Academy of Mathematics and Systems Science, Chinese Academy of Sciences (CAS). He was born in Shandong Province, received the B.S. degree in mathematics from Shandong University in 1982, and the Ph.D. degree in control theory from CAS in 1987. He was a postdoctoral fellow at the Australian National University (1987-1989), and has been a professor of the Institute of Systems Science, CAS, since 1992.

Dr. Guo is the recipient of a number of prizes and honors including the Chinese National Natural Science Prizes in 1987 and 1997. He is a Fellow of the IEEE, Member of the Chinese Academy of Sciences, Fellow of the Third World Academy of Sciences, Fellow of the International Federation of Automatic Control (IFAC), and Foreign Member of the Royal Swedish Academy of Engineering Sciences (IVA). He currently serves as a Council Member of IFAC, a Member of the Chinese National Award Committee on Science and Technology, a Vice-President of the Chinese Association of Automation, the Chinese Mathematical Society, and the Chinese Society for Industry and Applied Mathematics.

He has worked on problems in adaptive control, system identification, time-series analysis, adaptive signal processing, and controllability of nonlinear systems. His current research interests include the capability and limitations of feedback, multi-agent systems, complex adaptive systems, and quantum control systems.



Zongli Lin (林宗利) received his B.S. degree in mathematics and computer science from Xiamen University, Xiamen, China, in 1983, his Master of Engineering degree in automatic control from Chinese Academy of Space Technology, Beijing, China, in 1989, and his Ph.D. degree in electrical and computer engineering from Washington State University, Pullman, Washington, in 1994. He is currently a professor with the Charles L. Brown Department of Electrical and Computer Engineering at University of Virginia. He is also a Cheung Kong Chair Professor (Visiting) with the Department of Automation at Shanghai Jiao Tong University, Shanghai, China.

A Fellow of IEEE, Professor Lin's research interests include nonlinear control, robust control, and their applications. He has published several papers and authored/co-authored three books. He is the recipient of a 1999 US Office of Naval Research Young Investigator Award and a 2005 Outstanding Young Investigator Award (Class B: Overseas Collaboration) from the National Natural Science Foundation of China.

Professor Lin was an Associate Editor of the *IEEE Transactions on Automatic Control* from 2001 to 2003 and an Associate Editor on the CSS Conference Editorial Board from 1994 to 2000. He has also served on the program committees of many IEEE sponsored conferences, including the *IEEE Conference on Decision and Control* and the *American Control Conference*. He was the Finance Chair of the 2004 American Control Conference. He is currently the Corresponding Editor for Conference Activities of the *IEEE Control Systems Magazine*, an Editor of the *IEEE/ASME Transactions on Mechatronics*, and an Associate Editor of *Automatica*. He is also a member of the IEEE Control Systems Society's Technical Committee on Nonlinear Systems and Control and heads its Working Group on Control with Constraints.

重要信息 (Important Information)

- 会议时间: 2007 年 7 月 26 日-7 月 31 日
Time: July 26-July 31, 2007
- 会议地点: 湖南省张家界市武陵源国际度假酒店
Venue: Best Western Premier Zhangjiajie (Hotel), Zhangjiajie City, Hunan Province
- 会议日程: 7 月 27-29 日学术报告, 30-31 日考察交流, 7 月 31 日晚离会
Agenda: July 27-29: Academic lectures and discussion, July 30-31: Academic visits and tours

注册 (Registration):

- 报到时间: 7 月 26 日 8:00-22:00
7 月 27 日 9:00-10:00, 14:30-15:30
Registration Time: July 26, 8:00 -22:00; July 27, 9:00 -10:00, 14:30-15:30
- 报到地点: 武陵源国际度假酒店大堂, 其他时间: 会务组(武陵源国际度假酒店内)
Registration Desk: Lobby, Best Western Premier Zhangjiajie
(Remark: Out of Registration Time, please go to the Conference Administrative Office (CAO)
(Within the Hotel). CAO Room Number will be announced on site.)

组委会联系方式 (Contacting the Organizing Committee):

联系人: 刘明 (0731) 8876677, 13974970079; 戴朝晖 (0731) 8830700, 13707310396

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Contacting Persons: Liu Ming, Phone: 86-731- 8876677 (O), 13974970079 (M)

Dai Zhaohui, Phone: 86-731-8830700 (O), 13707310396 (M)

Fax: 86-731- 8876677, or 86-731- 8830700

E-mail: ccc07@mail.csu.edu.cn.

Information service: x-info@csu.edu.cn, infob@csu.edu.cn

CCC'07 网址 (Web of CCC'07): <http://sise.csu.edu.cn/ccc07/>

中国控制会议论文管理系统网址:

(Web of Chinese Control Conference Paper Management System): <http://cms.amss.ac.cn/>

中国自动化学会控制理论专业委员会网址:

(Web of Technical Committee on Control Theory, Chinese Association of Automation): <http://tcct.amss.ac.cn/>

中国自动化学会控制理论专业委员会 Email:

(Email of Technical Committee on Control Theory, Chinese Association of Automation): tcct@iss.ac.cn

交通和宾馆位置（Transportation and Hotel Location）



交通：

1. 7月26日早上7:00—晚上12:00 接站

- ✓ 张家界机场、火车站——武陵源国际度假酒店
- ✓ 约每1个小时安排一趟车

2. 其他时间自行前往

- ✓ 张家界机场或火车站 → 张家界市汽车站→乘坐张家界至武陵源方向的公交车（从机场或火车站至武陵源分别为40和48公里），在武陵源国际度假酒店站下车（公交车费用10元/人，每10分钟发车一趟）
- ✓ 的士线路费用（火车站或机场）约120~150元人民币

Information for Transportation

1. On July 26, the conference will provide free transportation service from Zhjiajie Train Station/Airport (Dayong Hehua Airport) to Best Western Premier Zhangjiajie (Conference Venue).
Time: July 26, 7:00 am – 12:00 pm (mid-night). Frequency: one bus/ hour.
2. For other time arrivers the following ways are available:
 - ✓ **Bus:**
 - Step 1. Zhangjiajie Train Station/Airport (Dayong Hehua Airport) → Zhangjiajie Bus Station;
 - Step 2. Taking the route from Zhangjiajie to Wulingyuan, getting off at the stop: Best Western Premier Zhangjiajie (RMB 10/person, one bus per 10 minutes).
 - ✓ **Taxi:** Train Station/Airport → Best Western Premier Zhangjiajie (RMB 120-150)

The distances between Zhjiajie Train Station/Airport and Best Western Premier Zhangjiajie are about 40 kilometers and 48 kilometers, respectively.

口头报告与张贴报告要求 (Instruction for Oral and Poster Presentations)

口头报告(Oral Presentation) :

- 每篇论文报告时间为 20 分钟 (包含讨论);
Oral Presentation Time: 20minutes (including discussion)
- 请报告人在分组报告开始前 10 分钟到分组主席处报到并将报告文件拷入计算机;
Each speaker is Required to meet his/her session chairs in the corresponding session rooms 10 minutes before the session starts and copies the PPT file to the computer
- 会议提供计算机 (装有 Microsoft Windows 和 Microsoft PowerPoint) 及投影设备。
Each session room is equipped with a projector and a PC (with Microsoft Windows and Microsoft PowerPoint). Please make sure that your files are compatible and readable with our operation system by using commonly used fonts and symbols

张贴报告(Poster Presentation) :

- 会议为每篇张贴论文提供一块标准展板 (宽 0.9m, 高度 1.5m)。张贴论文要求内容简洁, 字迹清晰, 版面可进行一定的艺术加工。字迹至少应在 1 米外清晰可见。张贴论文可用双面胶或透明胶粘贴到展板上, 届时会有工作人员为代表提供张贴所需工具并协助代表张贴;
The Conference will provide an exhibition board (width 0.9 m, height 1.5 m) for each poster paper. The boards will be arranged in order of the paper in the final program. Tape and other materials will be provided on site, and volunteer-assistants will give necessary help. Posters are required to be condensed and attractive. The characters should be large enough so that they are visible from 1 meter apart.
- 本届会议设立“中国控制会议张贴论文奖”, 具体条例请见控制理论专业委员会网站: <http://tcct.amss.ac.cn>, <http://cms.amss.ac.cn>;
At the 26th Conference “CCC Poster Award” has been established. Detailed principle for the Award can be found at TCCT website: <http://tcct.amss.ac.cn>, <http://cms.amss.ac.cn>;
- 论文张贴期间, 论文作者应在自己所贴论文前向前来观看的代表介绍, 交流。届时, 评奖委员会的成员会前来观看张贴论文。未在指定时间地点张贴论文, 或未在自己所贴论文前与大家交流者视为缺席会议 (No Show)。
During your poster session, the author should stay by your poster paper to explain and discuss your paper with visiting colleagues. The members of the Evaluation Committee of CCC Poster Award will also be there to inspect poster papers. The authors, who do not poster their papers at their poster sessions and/or do not stay by their papers, will be considered as No Show.

会议程序总览 (Program at a Glance)

	July 27 (Friday)	July 28 (Saturday)	July 29 (Sunday)
Registration	8:30-9:30 开幕式 Opening Ceremony 大会报告 1 Plenary Lecture 1 茶歇 Tea Break 大会报告 2 Plenary Lecture 2	8:30-9:30 大会报告 3 Plenary Lecture 3 大会报告 4 Plenary Lecture 4 茶歇 Tea Break 大会报告 5 Plenary Lecture 5	8:30-10:30 口头报告 SuA01-SuA11 茶歇 Tea Break 口头报告 SuA01-SuA11 Oral Sessions SuB1-SuB11
	11:00-12:00 Plenary Lecture 2	10:30-10:45 茶歇 Tea Break 10:45-11:45 大会报告 5 Plenary Lecture 5	10:45-12:25 Oral Sessions SuB1-SuB11
July 26 8:00 am-22:00 pm July 27 9:00 am-10:00 am 14:30 pm-15:30 pm 武陵源国际酒店大堂 Lobby, Best Western Premier Zhangjiajie 其它时间: 会务组 Other Time: Conference Administrative Office (CAO)	12:00~13:00 Lunch*	12:30~13:30 Lunch*	12:30~13:30 Lunch*
	13:30-15:30 口头报告 FrA01-FrA11 Oral Sessions FrA01-FrA11 茶歇 Tea Break 15:30-15:45 口头报告 FrB01-FrB11 Oral Sessions FrB01-FrB11 15:45-17:45 张帖报告 PFrA Poster Session PFrA 茶歇 Tea Break 16:00-16:30 张帖报告 PFrB Poster Session PFrB 16:30-18:00	13:30-15:30 口头报告 SaA01-TuA11 Oral Sessions SaA01-TuA11 茶歇 Tea Break 15:30-15:45 口头报告 SaB01-SaB11 Oral Sessions SaB01-SaB11 15:45-17:45 张帖报告 PSaA Poster Session PSaA 茶歇 Tea Break 16:00-16:30 张帖报告 PSaB Poster Session PSaB 16:30-18:00	13:30-14:30 大会报告 6 Plenary Lecture 6 大会专题研讨会 Plenary panel discussion 14:30-16:30 茶歇 Tea Break 16:30-16:45 闭幕式 Closing Ceremony 16:45-17:30
	18:00 Dinner*	19:00 《芙蓉直奖》评奖委员会会议 CCC'07 第四会议室 20:00 张帖论文奖评奖委员会会议 CCC'07 第五会议室	19:30 Banquet*
19:30 控制理论专业委员会 会议 CCC'07 第四会议室			

* 中餐、晚餐及宴会均在泰和盛世中餐厅
Lunch, Dinner, Banquet are served at Tai He Shengshi Chinese restaurant

Timetable for CCC'07 Technical Program

July 27, Friday

Time	Meeting Room 1	Meeting Room 2	Meeting Room 3	Meeting Room 4	Meeting Room 5
13:30-15:30 FrA01~FrA11	FrA01 “关肇直奖”入围论文 报告 Guan Zhao-Zhi Award Final list	FrA02 Invited Session: Advances in Iterative Learning Control	FrA03 生物与生态系统 Bio & Ecological Systems	FrA04 分布参数系统 Distributed Parameter Systems	FrA05 最优控制与优化(1) Optimal Control and Optimization (1)
	Meeting Room 7	Meeting Room 8	Meeting Room 9	Meeting Room 10	Meeting Room 11
	FrA07 非线性系统及其控制 (1) Nonlinear System and Control (1)	FrA08 控制设计方法(1) Control Design (1)	FrA09 模式识别 Pattern Recognition	FrA10 通讯网络系统(1) Communication Network Systems (1)	FrA11 建模、辨识与信号 处理(1) Modeling, Identification and Signal Processing (1)

15:30~15:45 Break

Time	Meeting Room 1	Meeting Room 2	Meeting Room 3	Meeting Room 4	Meeting Room 5
15:45-17:45 FrB01~FrB11	FrB01* Invited Session: Complex Systems: Analysis and Control I	FrB02 Invited Session: 登月飞行控制 Lunar Lander	FrB03 系统理论与控制 理论(1) System Theory and Control Theory (1)	FrB04 复杂性与复杂系统 理论(1) Complexity and Complex System Theory (1)	FrB05 最优控制与优化(2) Optimal Control and Optimization (2)
	Meeting Room 7	Meeting Room 8	Meeting Room 9	Meeting Room 10	Meeting Room 11
	FrB07 非线性系统及其 控制(2) Nonlinear System and Control (2)	FrB08 控制设计方法 (2) Control Design (2)	FrB09 运动控制 Motion Control	FrB10 通讯网络系统(2) Communication Network Systems (2)	FrB11 建模、辨识与信号 处理(2) Modeling, Identification and Signal Processing (2)

Time	Poster Hall
14:30-16:00	Poster Session PFrA
	16:00~16:30 Break
16:30-18:00	Poster Session PFrB

July 28, Saturday

Time	Meeting Room 1	Meeting Room 2	Meeting Room 3	Meeting Room 4	Meeting Room 5	Meeting Room 6
13:30-15:30 SaA01~SaA11	SaA01* Invited Session: Complex Systems: Analysis and Control II	SaA02 Invited Session Design and Analysis of Networked Control Systems	SaA03 系统理论与控制理论(2) System Theory and Control Theory (2)	SaA04 复杂性与复杂系统理论(2) Complexity and Complex System Theory (2)	SaA05 最优控制与优化(3) Optimal Control and Optimization (3)	SaA06 模糊系统与模糊控制(1) Fuzzy System and Fuzzy Control (1)
	Meeting Room 7	Meeting Room 8	Meeting Room 9	Meeting Room 10	Meeting Room 11	
	SaA07 非线性系统及其控制(3) Nonlinear System and Control (3)	SaA08 控制设计方法(3) Control System Design (3)	SaA09 智能机器人(1) Intelligent Robot (1)	SaA10 信息处理系统(1) Information Processing System (1)	SaA11 建模、辨识与信号处理(3) Modeling, Identification and Signal Processing (3)	

15:30~15:45 Break

Time	Meeting Room 1	Meeting Room 2	Meeting Room 3	Meeting Room 4	Meeting Room 5	Meeting Room 6
15:45-17:45 SaB01~SaB11	SaB01* Invited Session: Recent Advances in Control of Automotive Systems	SaB02 Invited Session: Quantum Control and Quantum Information	SaB03 系统理论与控制理论(3) System Theory and Control Theory (3)	SaB04 鲁棒与 H_∞ 控制(1) Robust and H_∞ Control (1)	SaB05 最优控制与优化(4) Optimal Control and Optimization (4)	SaB06 模糊系统与模糊控制(2) Fuzzy System and Fuzzy Control (2)
	Meeting Room 7	Meeting Room 8	Meeting Room 9	Meeting Room 10	Meeting Room 11	
	SaB07 非线性系统及其控制(4) Nonlinear System and Control (4)	SaB08 工业系统(1) Industrial Systems (1)	SaB09 智能机器人(2) Intelligent Robot (2)	SaB10 信息处理系统(2) Information Processing Systems (2)	SaB11 建模、辨识与信号处理(4) Modeling, Identification and Signal Processing (4)	

Time	Poster Hall
14:30-16:00	Poster Session PSaA
	16:00~16:30 Break
16:30-18:00	Poster Session PSaB

July 29, Sunday

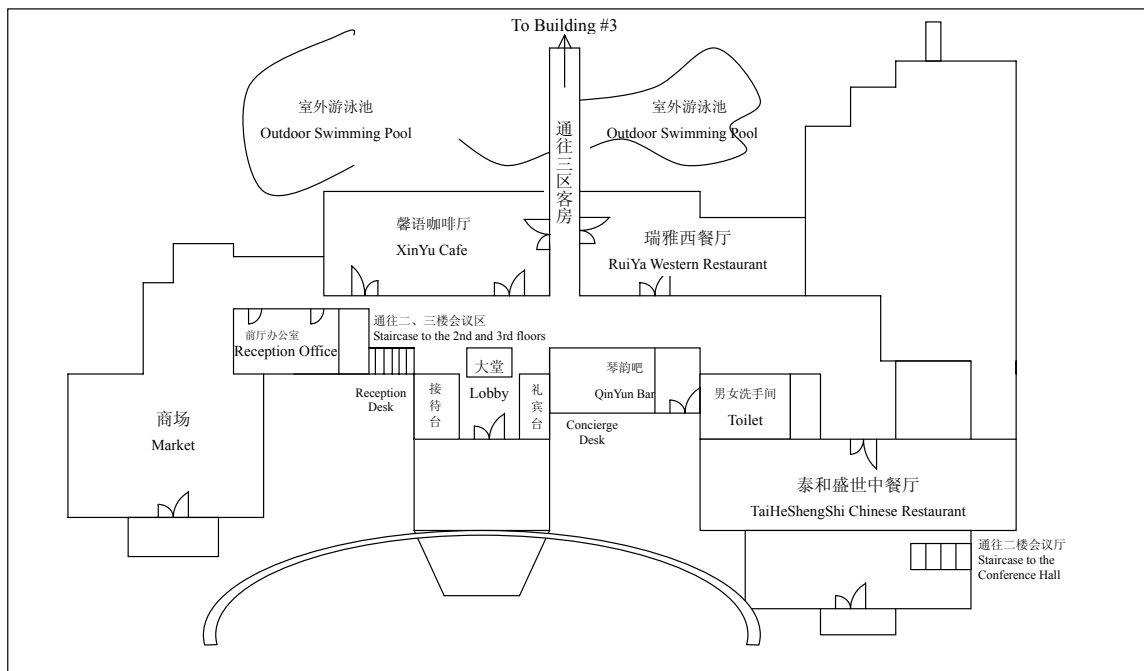
Time	Meeting Room 1	Meeting Room 2	Meeting Room 3	Meeting Room 4	Meeting Room 5
8:30-10:30	SuA01* Invited Session: Advanced Control Theory and Applications I	SuA02 Invited Session: 认知模式识别 Cognitive Pattern Recognition	SuA03 系统理论与控制 理论(4) System Theory and Control Theory (4)	SuA04 鲁棒与 H_∞ 控制(2) Robust and H_∞ Control (2)	SuA05 自适应控制与学习 控制(1) Adaptive Control and Learning Control (1)
SuA01~SuA12	Meeting Room 7	Meeting Room 8	Meeting Room 9	Meeting Room 10	Meeting Room 11
	SuA07 非线性系统及其 控制(5) Nonlinear System and Control (5)	SuA08 工业系统(2) Industrial Systems (2)	SuA09 智能机器人(3) Intelligent Robot (3)	SuA10 故障诊断(1) Fault Diagnosis (1)	SuA11 建模、辨识与信号处 理(5) Modeling, Identification and Signal Processing (5)

10:30~10:45 Break

Time	Meeting Room 1	Meeting Room 2	Meeting Room 3	Meeting Room 4	Meeting Room 5
10:45-12:45	SuB01* Invited Session: Advanced Control Theory and Applications II	SuB02 稳定性与镇定 Stability and Stabilization	SuB03 系统理论与控制 理论(5) System Theory and Control Theory (5)	SuB04 鲁棒与 H_∞ 控制(3) Robust and H_∞ Control(3)	SuB05 自适应控制与学习 控制(2) Adaptive Control and Learning Control (2)
SuB01~SuB12	Meeting Room 7	Meeting Room 8	Meeting Room 9	Meeting Room 10	Meeting Room 11
	SuB07* 非线性系统及其 控制(6) Nonlinear System and Control (6)	SuB08 混杂系统与 DEDS Hybrid Systems and DEDS	SuB09 神经网络 Neural Networks	SuB10 故障诊断(2) Fault Diagnosis (2)	SuB11 随机系统 Stochastic Systems

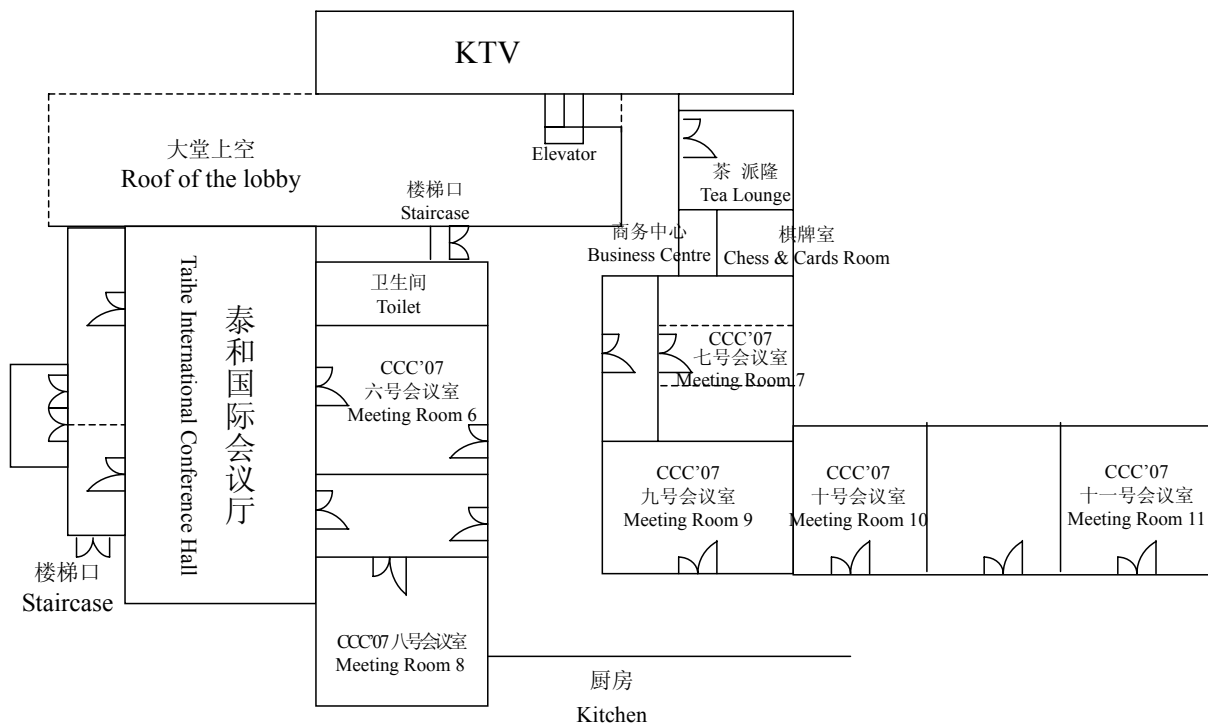
NOTE:

1. There are 11 meeting rooms and 1 exhibition hall prepared for the technical program.
2. Papers in English sessions, marked with *, will be presented in English.



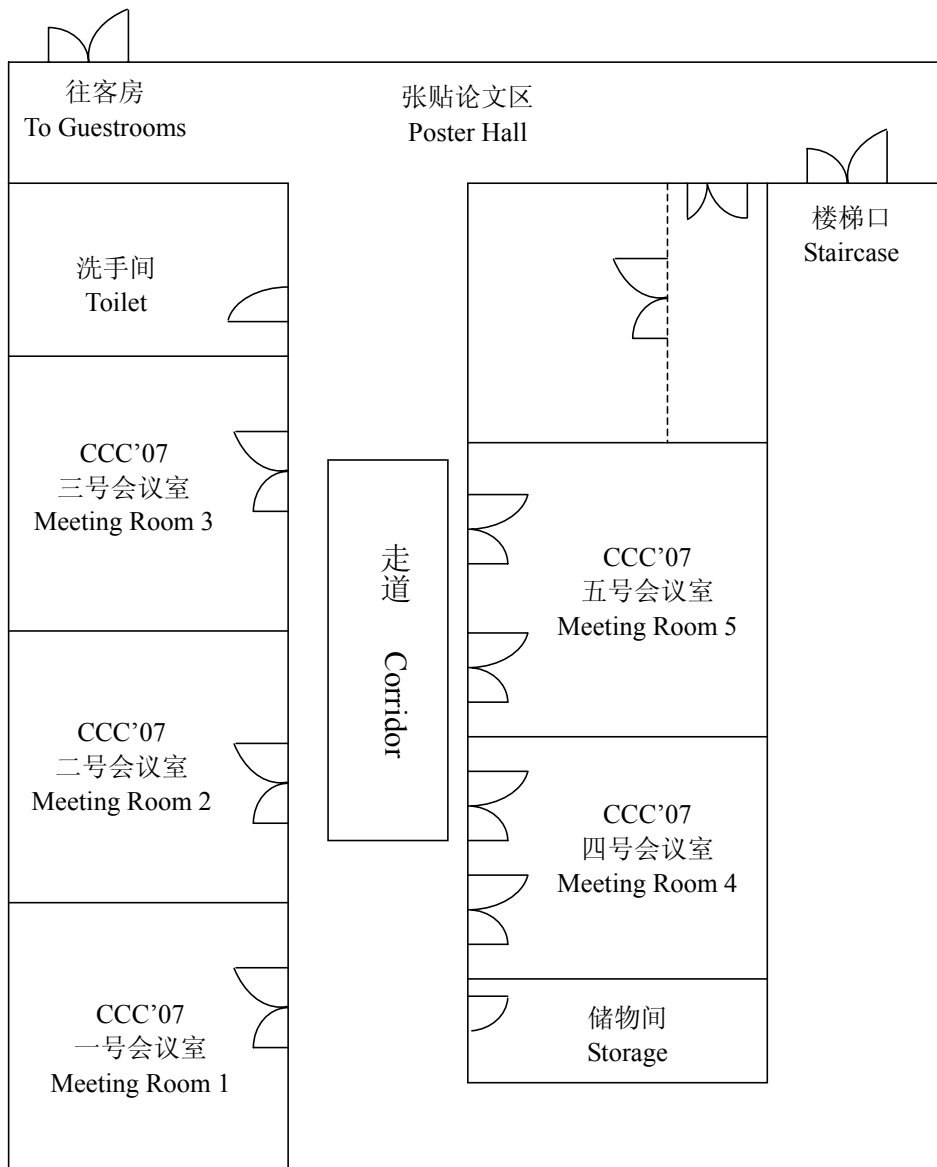
一区一楼平面图

The first floor, Building #1



一区二楼会议区域平面图

Conference area on the 2nd floor of Building #1, Best Western Premier Zhangjiajie



一区三楼会议区域平面图

Conference area on the 3rd floor of Building # 1,
Best Western Premier Zhangjiajie

关肇直奖条例 (Rules for the "Guan Zhao-Zhi Award")

关肇直教授是中国科学院院士、国内外知名的数学家和控制理论专家。他一生致力于数学、控制科学和系统科学的研究和发展，作出了重要的贡献。为了缅怀和纪念关肇直教授，推动我国控制科学的发展，特设立《关肇直奖》。奖励基金由国内外单位和个人捐赠，由关肇直奖基金委员会管理。

《关肇直奖》的授奖对象为中国自动化学会控制理论专业委员会举办的中国控制会议的投稿论文，论文第一作者年龄不超过四十周岁，所有作者都不是《关肇直奖》评奖委员会委员，论文所述工作未正式发表。《关肇直奖》每年评定一次，每次获奖名额不多于两篇，必要时可由评奖委员会决定是否增设《关肇直奖》提名奖，但名额也不超过两篇。凡申请《关肇直奖》的论文，需在投稿时注明，并附第一作者的工作证（或学生证、身份证）复印件。论文首先要通过会议审稿，然后由评奖委员会邀请有关专家作书面评审，确定入选论文。入选论文应由年龄不超过四十周岁的作者在中国控制会议上宣读，由评奖委员会根据论文质量及宣读水平，评出获奖论文，在会议闭幕式上宣布评选结果并授奖。

《关肇直奖》评奖委员会由《关肇直奖》基金委员会聘请国内外知名控制理论及应用专家组成，负责组织论文的评审与颁奖。当参加本次会议的委员不足全体委员的三分之二时，评奖委员会主任和专业委员会主任协商，聘请参加会议的知名专家增补为本次会议评奖委员。

《关肇直奖》基金委员会由中国自动化学会控制理论专业委员会领导，下设主任一至二人，副主任一至二人，委员若干人，负责基金的筹集和管理，以及决定其它有关事项。

本条例的解释权和修改权属于《关肇直奖》基金委员会。

Professor Guan Zhao-Zhi (Kwan Chao-Chih) was an academician of Chinese Academy of Sciences, a world wide famous mathematician and expert on control theory. He dedicated his whole life to the research and development of mathematics, systems and control science, and made significant contribution in these areas. To memorize and honor Professor Guan Zhao-Zhi and to enhance the development of control theory in China, the Guan Zhao-Zhi Award was established in 1994.

Papers satisfying the following conditions are qualified for applying the Guan Zhao-Zhi Award. 1) The paper is submitted to the annual Chinese Control Conference (CCC); 2) The first author of the paper is under 40 years old; 3) The results of the papers are original, not published elsewhere. Applying the Guan Zhao-Zhi Award should be properly claimed and a copy (e-version) of the ID Card of the first Author should be attached when the paper is submitted.

Papers applying for the Guan Zhao-Zhi Award should first pass the review process as regular submissions. Then the passed papers will go through a special re-review process. Based on the re-review evaluations EV decides the Final List of a small number of candidate papers. The candidate papers entering the Final List have to be presented at CCC by the first authors. According to the papers' qualities and their presentations, EV decides the Winner(s) of Guan Zhao-Zhi Award.

The Guan Zhao-Zhi Award is issued to no more than two papers at each CCC, and the winners are awarded at the closing ceremony of CCC. In case of necessity, EV may decide whether to add Guan Zhao-Zhi Nomination Award for at most two papers.

The Guan Zhao-Zhi Award is supported by the Guan Zhao-Zhi Fund, which is donated by organizations and individuals in and out of China. The Fund Committee, belonging to the Technical Committee on Control Theory (TCCT), Chinese Association of Automation (CAA), is responsible for fund raising, management, and other issues related to the Award.

The Evaluation Committee (EV) of Guan Zhao-Zhi Award is assigned by the Guan Zhao-Zhi Fund Committee, and is composed of well-recognized experts in systems and control. In case less than two thirds of EV members attend the CCC, some other experts may be invited by chair of EV to serve as EV members for the year.

The right of explanation and modification of this document belongs to the Guan Zhao-Zhi Fund Committee.

关肇直奖评奖委员会

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张贴论文奖条例 (Rules for the Poster Award)

随着中国控制会议的规模日益增大，张贴论文成为会议的重要学术交流方式之一。为了使张贴论文更加活跃和丰富，特设立“中国控制会议张贴论文奖”。奖金由中国自动化学会控制理论专业委员会提供。“中国控制会议张贴论文奖”的授奖对象为当年已接受并在中国控制会议上张贴的论文，论文所述工作未正式发表。“中国控制会议张贴论文奖”评奖委员会由中国自动化学会控制理论专业委员会聘请国内外专家组成，根据论文的水平 and 版面表述形式等综合因素进行评审与颁奖。授奖名额为每届中国控制会议不多于两篇。

本条例的解释权和修改权属于中国自动化学会控制理论专业委员会。

Accompanying the flourish of the Chinese Control Conference (CCC), the poster presentation becomes one of the important ways for academic exchange. To encourage the poster presentation at CCC, the “Chinese Control Conference Poster Award” is created starting from the 25th CCC.

The fund of the Award is provided by the Technical Committee on Control Theory (TCCT), Chinese Association of Automation. The candidates of the CCC Poster Award are all authors of the poster papers that have been accepted and poster-presented at the current CCC and with contents not been published elsewhere before.

The Evaluation Committee of the CCC Poster Award is organized by TCCT via inviting outstanding scholars. The evaluating criteria consist of academic level and quality of exhibition. No more than two poster papers are awarded annually.

The TCCT holds the authority to explain the rules of this Award.

第二届中国控制会议张贴论文奖评奖委员会

主任：吴宏鑫

副主任：吴敏 张纪峰

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薛安克 俞立 楚天广 周彤 胥布工

Technical Program

July 27, 2007

FrA01	13:30-15:30	Meeting Room 1
申请《关肇直奖》入围论文报告 Guan Zhao-Zhi Award Final List		
Chair: 郑大钟		清华大学

FrA01-1	13:30-14:00
<i>Eigenstructure Assignment in Second-order Linear Systems: A Parametric Design Method</i> , pp.2-9~2-13	
Wang Guo-sheng	Acad. of Armored Force Engineering
Liang Bing	Harbin Inst. of Tech.
Lv Qiang	Acad. of Armored Force Engineering
Duan Guangren	Harbin Inst. of Tech.

FrA01-2	14:00-14:30
<i>Kalman Filtering in the Presence of State Space Equality Constraints</i> , pp.2-107~2-113	
Gupta Nachi	Univ. of Oxford

FrA01-3	14:30-15:00
<i>Output Feedback Stabilization for Discrete-time Systems with a Time-varying Delay</i> , pp.3-64~3-70	
He Yong	Central South Univ.
Wu Min	Central South Univ.
Liu Guoping	Univ. of Glamorgan
She Jin-Hua	Tokyo Univ. of Tech.

FrA01-4	15:00-15:30
<i>An Iterative Learning Control with Alignment Initial Condition for a Class of Nonlinear Systems</i> , pp.2-502~2-507	
YANG Zaiyue	The Univ. of Hong Kong
Chan C. W.	The Univ. of Hong Kong

FrA02	13:30-15:30	Meeting Room 2
Invited Session: Advances in Iterative Learning Control		
Chair: SUN Mingxuan		Zhejiang Univ. of Tech.
Co-Chair: Zhou Keliang		Southeast Univ.

FrA02-1	13:30-13:50
<i>Convergence Analysis in the Sense of Lebesgue-p Norm for Open-Closed-Loop Iterative Learning Control</i> , pp.6-511~6-514	
Ruan Xiaoe	Xi'an Jiaotong Univ.
Chen Fengmin	Xi'an Jiaotong Univ.
Wang Jianguo	Xi'an Univ. of Architecture & Tech.

FrA02-2	13:50-14:10
<i>Hybrid Adaptive Iterative Learning Control of Non-uniform Trajectory Tracking for Nonlinear Time-delay Systems</i> , pp.6-515~6-519	
Li Junmin	Xidian Univ.
Li Xinmin	Xi'an Sci. & Tech. Univ.
Xing Keyi	Xi'an Jiaotong Univ.

FrA02-3	14:10-14:30
<i>Iterative Learning Identification and Control of Discrete Time-varying Systems</i> , pp.6-520~6-524	
SUN Mingxuan	Zhejiang Univ. of Tech.
He Xiongxiang	Zhejiang Univ. of Tech.

FrA02-4	14:30-14:50
<i>Dual-mode Structure Repetitive Control</i> , pp.6-525~6-529	
Zhou Keliang	Southeast Univ.
Wang Danwei	Nanyang Technological Univ.
Zhang Bin	Nanyang Technological Univ.
Wang Yigang	Nanyang Technological Univ.

FrA02-5	14:50-15:10
基于二自由度控制的鲁棒迭代学习控制设计 <i>Robust Iterative Learning Control Design Based on Two Degree of Freedom Control</i> , pp.6-530~6-534	
刘山	浙江大学
林坚	浙江大学

FrA02-6	15:10-15:30
<i>Iterative Learning Control for the Singular Systems with Delay</i> , pp.6-535~6-538	
Tian Senping	South China Univ. of Tech.
He Gang	South China Univ. of Tech.
Zhou Lun	Xuchang Univ.

FrA03	13:30-15:30	Meeting Room 3
生物与生态系统 Bio & Ecological Systems		
Chair: Zhou Tong		Tsinghua Univ.
Co-Chair: Wu Yi		The Pennsylvania State Univ. Erie

FrA03-1	13:30-13:50
<i>Physiological Control of Rotary Left Ventricular Assist Device</i> , pp.6-469~6-474	
Wu Yi	The Pennsylvania State Univ. Erie

FrA03-2	13:50-14:10
<i>Multi-Target Identification in Intracellular Regulation Networks</i> , pp.6-112~6-116	
Zhou Tong	Tsinghua Univ.
Li Shao	Tsinghua Univ.

FrA03-3	14:10-14:30
<i>Synchronization Control of Hodgkin-Huxley Neurons Exposed to Sinusoidal Electric Field</i> , pp.6-117~6-121	
Zhou Si-Si	Tianjin Univ.
Wang Jiang	Tianjin Univ.
Che Yan-Qiu	Tianjin Univ.
Deng Bin	Tianjin Univ.

FrA03-4	14:30-14:50
<i>Ghostbuster 模型的混沌分析与控制 Chaos Analysis and Control of the Ghostbuster Model</i> , pp.6-122~6-126	
邓斌	天津大学
王江	天津大学
陈立松	天津大学

FrA03-5	14:50-15:10
<i>Fire Patterns of HH Neuron under External Sinusoidal ELF Stimulus</i> , pp.6-127~6-131	
Han Chun-Xiao	Tianjin Univ.
Wang Jiang	Tianjin Univ.
Li Hui-Yan	Tianjin Univ. of Tech. & Automation

FrA03-6	15:10-15:30
仿人智能控制策略的研究 <i>Control Strategy of Human-Like Intelligent Control</i> , pp.2-54~2-58	
王培进	烟台大学
慕志强	烟台大学
马文明	烟台大学

FrA04	13:30-15:30	Meeting Room 4
分布参数系统 Distributed Parameter Systems		
Chair: Yan Ningning		Chinese Acad. of Sci.
Co-Chair: Zhang Zhifei		Chinese Acad. of Sci.

- FrA04-1** **13:30-13:50**
Boundary Element Method for Boundary Control Problems, pp.2-621~2-625
 Yan Ningning Chinese Acad. of Sci.
- FrA04-2** **13:50-14:10**
Global Smooth Solutions for Quasilinear Wave Equation with Locally Internal Damping, pp.2-626~2-629
 Zhang Zhifei Chinese Acad. of Sci.
 Yao Pengfei Chinese Acad. of Sci.
- FrA04-3** **14:10-14:30**
Model Predictive Control of a Powder Coating Curing Process: an Application of the MPC@CB Software, pp.2-630~2-634
 Abid Kamel Univ. Claude Bernard Lyon 1, CNRS
 Dufour Pascal Univ. Claude Bernard Lyon 1, CNRS
 Bombard Isabelle Univ. Claude Bernard Lyon 1, CNRS
 Laurent Pierre Univ. Claude Bernard Lyon 1, CNRS
- FrA04-4** **14:30-14:50**
 树形网络 Timoshenko 梁系统的镇定
Stabilization of Tree-shaped Network of Timoshenko Beams, pp.2-640~2-645
 韩忠杰 天津大学
 许跟起 天津大学
- FrA04-5** **14:50-15:10**
Asymptotic Stability of Software Systems with Rejuvenation Policy, pp.2-646~2-650
 XU Houbao Beijing Inst. of Tech.
 Wang Jun-Min Beijing Inst. of Tech.
- FrA04-6** **15:10-15:30**
 发展方程的周期能控性
Periodic Controllability of Evolution Equations, pp.2-651~2-655
 李洪恒 四川大学
 张旭 中国科学院
- FrA05** 13:30-15:30 Meeting Room 5
 最优控制与优化 (1)
Optimal Control and Optimization (1)
 Chair: 何德峰 中国科学技术大学
 Co-Chair: 毛建军 安徽大学
- FrA05-1** **13:30-13:50**
 区域稳定的有效非线性预测控制
Effective Nonlinear Predictive Control with Regional Stability, pp.3-365~3-369
 何德峰 中国科学技术大学
 季海波 中国科学技术大学
 陈作贤 中国科学技术大学
 郑涛 中国科学技术大学
- FrA05-2** **13:50-14:10**
 基于商空间理论的商分形模型
The Model of Quotient Fractal Based on the Theory of Quotient Space, pp.4-222~4-227
 毛建军 安徽大学
 张铃 安徽大学
 郑婷婷 安徽大学
 吴涛 安徽大学
- FrA05-3** **14:10-14:30**
Decentralized Control of Linear Systems Based on the New Viewpoint of Cooperative Control, pp.3-360~3-364
 Tang Wenyan Central South Univ.
 Nian Xiaohong Central South Univ.
 Cao Li Central South Univ.
- FrA05-4** **14:30-14:50**
Fast Modular Multivariable Nonlinear Model Predictive Controller, pp.3-415~3-419
 Zheng Tao Univ. of Sci. & Tech. of China
 Wu Gang Univ. of Sci. & Tech. of China
 Ling Qing Michigan Technological Univ.
 Chen Wei Univ. of Sci. & Tech. of China
 HE DeFeng Univ. of Sci. & Tech. of China
- FrA05-5** **14:50-15:10**
 基于 Multi-agent 的地铁列车智能控制集成框架
The Integrated Intelligent Control Framework of Subway Train Based-on Multi-agent, pp.3-395~3-398
 路飞 山东大学
 宋沐民 山东大学
 田国会 山东大学
 李晓磊 山东大学
- FrA05-6** **15:10-15:30**
 免疫连续蚁群算法
Immunized Continuous Ant Colony Algorithm, pp.5-705~5-709
 高玮 武汉工业学院
- FrA07** 13:30-15:30 Meeting Room 7
 非线性系统及其控制 (1)
Nonlinear System and Control (1)
 Chair: Ji Guojun Xiamen Univ.
 Co-Chair: 李树荣 中国石油大学
- FrA07-1** **13:30-13:50**
 永磁同步电动机系统的有限时间跟踪控制
Finite Time Tracking Controller Design of the Permanent-Magnet Synchronous Motor, pp.4-13~4-16
 武玉强 曲阜师范大学
 马新 曲阜师范大学
 宗广灯 曲阜师范大学
- FrA07-2** **13:50-14:10**
Comparisons of Two Sufficient Conditions for Chaos Synchronization, pp.2-235~2-240
 Cai Jianping Zhongshan Univ.
 Wang Jiagen South China Univ. of Tech.
 Wu Xiaofeng South China Univ. of Tech.
 Chen Shuhui Zhongshan Univ.
- FrA07-3** **14:10-14:30**
 一类带有不确定性的时滞系统的鲁棒控制器设计
Robust Controller Design for a Class of Time Delay Systems with Uncertainty, pp.2-245~2-249
 李树荣 中国石油大学
 杨青 中国石油大学
 薛秀莉 中国石油大学
- FrA07-4** **14:30-14:50**
Synchronization of Lur'e Networks with Time Delay, pp.2-312~2-315
 Xu Shiyun Peking Univ.
 Yang Ying Peking Univ.
 Huang Lin Peking Univ.
- FrA07-5** **14:50-15:10**
The Passive Energy Tracking Control Law of the Compass Bipedal Robot, pp.2-457~2-462
 Liu Zhenze Jilin Univ.
 Zhang Peijie Jilin Univ.
 Tian Yantao Jilin Univ.
 Zhou Changjiu Advanced Robotics & Intelligent Control Centre (ARICC)
- FrA07-6** **15:10-15:30**
 基于扩展卡尔曼滤波的板球系统摩擦力估计
Friction Estimation of Ball and Plate System Based on Extended Kalman Filter, pp.2-375~2-379
 张雪菲 吉林大学

田彦涛 王红睿 丁 策		吉林大学 吉林大学 吉林大学	周芳芳 樊晓平	中南大学 中南大学
FrA08	13:30-15:30	Meeting Room 8	FrA09-3	14:10-14:30
控制设计方法 (1) Control Design (1)			候选字静态生成技术及其在两级 LDA 汉字识别中的应用 <i>A Static Candidates Generation Technique and Its Application in Two-stage LDA Chinese Character Recognition</i> , pp.4-571~4-575	
Chair: Fei Shumin Co-Chair: 阮久宏		Southeast Univ. 山东交通学院	刘志斌 金连文	华南理工大学 华南理工大学
FrA08-1	13:30-13:50		FrA09-4	14:30-14:50
<i>Design of Tiltrotor Flight Control System Using Optical Control</i> , pp.4-687~4-691			抗剪切鲁棒水印的自适应多址嵌入与提取算法 <i>Resisting Cropping Robust Adaptive Watermarking Embedding and Extracting Algorithm Based on Multi-address</i> , pp.4-614~4-617	
Fan Yong hua Yang Jun		Northwestern Polytechnical Univ. Northwestern Polytechnical Univ.	顾巧论 高铁杠 陈增强	上海交通大学 南开大学 南开大学
FrA08-2	13:50-14:10		FrA09-5	14:50-15:10
一类不确定系统可靠跟踪控制器设计 <i>Reliable Tracking Control for a Class of Uncertain Systems</i> , pp.4-696~4-698			基于最优全局仿射变换的分级汉字字库的设计及实现 <i>Hierarchical Chinese Character Database Based on Global Affine Transformation</i> , pp.4-584~4-588	
申 涛 王孝红 景绍洪		济南大学 济南大学 济南大学	俎小娜 金连文	华南理工大学 华南理工大学
FrA08-3	14:10-14:30		FrA09-6	15:10-15:30
<i>Override and Model Predictive Control of Particle Size and Feed Rate in Grinding Process</i> , pp.4-704~4-708			基于细胞神经网的道路图像快速分割算法 <i>A Fast Road Image Segmentation Algorithm Based on Cellular Neural Networks</i> , pp.4-114~4-116	
Chen Xisong Zhai Junyong Li Qi Fei Shumin		Southeast Univ. Southeast Univ. Southeast Univ. Southeast Univ.	徐国保 尹怡欣 殷 路 郝彦爽 周美娟	广东海洋大学 北京科技大学 北京科技大学 北京科技大学 广东海洋大学
FrA08-4	14:30-14:50		FrA10	13:30-15:30
一种新的智能控制器设计方法及其在船舶航向控制中的应用 <i>A New Method of Intelligent Controller Design and Its Application in Ship Course Control</i> , pp.4-709~4-714			通讯网络系统 (1) Communication Network Systems (1)	Meeting Room 10
阮久宏 李贻斌		山东交通学院 山东大学	Chair: Yu Li Co-Chair: 梁新荣	Zhejiang Univ. of Tech. 五邑大学
FrA08-5	14:50-15:10		FrA10-1	13:30-13:50
多工作点加速度计组件高精度鲁棒温度控制 <i>High Precision Robust Temperature Control for an Accelerometer Unit High Precision Robust Temperature Control for an Accelerometer Unit with Multi-operating Conditions</i> , pp.4-715~4-719			无线传感器网络的滚动时域状态估计方法 <i>Moving Horizon State Estimation for Wireless Sensor Networks</i> , pp.5-571~5-575	
余 瑶 钟宜生		清华大学 清华大学	骆吉安 柴 利	杭州电子科技大学 杭州电子科技大学
FrA08-6	15:10-15:30		FrA10-2	13:50-14:10
<i>Development of Intelligent Monitor-system Based on Agent</i> , pp.4-639~4-642			人工免疫控制器在高速公路匝道控制中的应用 <i>Application of Artificial Immune Controller to Freeway Ramp Metering</i> , pp.6-41~6-44	
Xu Dahua		Nanjing Agricultural Univ.	梁新荣 韦彦秀	五邑大学 五邑大学
FrA09	13:30-15:30	Meeting Room 9	FrA10-3	14:10-14:30
模式识别 Pattern Recognition			SCTP 流量的混沌控制研究 <i>On SCTP Traffic Chaotic Control</i> , pp.5-603~5-606	
Chair: 陈增强 Co-Chair: 金连文		南开大学 华南理工大学	刘润杰 申金媛 穆维新	郑州大学 郑州大学 郑州大学
FrA09-1	13:30-13:50		FrA10-4	14:30-14:50
一种新的快速矫正倾斜车牌图像的算法 <i>A New Fast Algorithm to Rectify Tilt Image of Vehicle License Plates</i> , pp.4-485~4-488			<i>A Novel Management Method Based on SNMP</i> , pp.5-619~5-621	
叶 青 朱亮红 朱素红 李 学		长沙理工大学 长沙理工大学 南昌工程学院 长沙理工大学	Cheng Chuanqing Wang Li	Wuhan Univ. of Tech. & Sci. Wuhan Univ.
FrA09-2	13:50-14:10		FrA10-5	14:50-15:10
基于边界设计高斯型传递函数 <i>Gaussian Transfer Function Based on Boundary</i> , pp.4-521~4-525			<i>Modelling and Control of Networked Control Systems with Random Packet Losses</i> , pp.5-695~5-699	
赵 颖		中南大学	Zhang Wen'an	Zhejiang Univ. of Tech.

Yu Li Song Hongbo	Zhejiang Univ. of Tech. Zhejiang Univ. of Tech.		
FrA10-6	15:10-15:30		
VHF 空地数据链通信协议架构及转换流程研究 <i>On VHF Air-Ground Datalink Communication Protocols Framework and Transformation Flow</i> , pp.5-626~5-629			
耿宏 张晓瑜 陈玖圣 董健康	中国民航大学 中国民航大学 中国民航大学 中国民航大学		
FrA11	13:30-15:30	Meeting Room 11	
建模、辨识与信号处理 (1) Modeling, Identification and Signal Processing (1)			
Chair: 奚宏生	中国科学技术大学		
Co-Chair: 阳春华	中南大学		
FrA11-1	13:30-13:50		
基于陷波器的自适应直接复频率估计算法 <i>Adaptive Notch Filter Based Algorithm for Direct Complex Frequency Estimation</i> , pp.3-145~3-147			
杨坚 奚宏生	中国科学技术大学 中国科学技术大学		
FrA11-2	13:50-14:10		
一种基于输出概率密度函数的动态系统参数辨识方法 <i>A New Method of Parameters Identification of Dynamic Systems Using Output Probability Density Function</i> , pp.3-108~3-111			
刘太元 贾建芳 王宏 岳红	中国科学院 中国科学院 中国科学院 中国科学院		
FrA11-3	14:10-14:30		
一种新的里程计刻度因子在线辨识算法 <i>A New Online-Identification Algorithm for Odometer's Scale Factor</i> , pp.3-115~3-119			
张红良 吴文启 胡小平	国防科技大学 国防科技大学 国防科技大学		
FrA11-4	14:30-14:50		
自校正观测融合 Kalman 预报器 <i>Self-tuning Measurement Fusion Kalman Predictor</i> , pp.3-124~3-129			
贾文静 高媛 邓自立	黑龙江大学 黑龙江大学 黑龙江大学		
FrA11-5	14:50-15:10		
一种基于微粒群优化算法的 T-S 模型参数辨识方法 <i>Parameter Identification of T-S Fuzzy Models Based on Particle Swarm Optimization Algorithms</i> , pp.4-442~4-445			
丁园 高晓智 黄显林 尹航	哈尔滨工业大学 赫尔辛基工业大学 哈尔滨工业大学 哈尔滨工业大学		
FrA11-6	15:10-15:30		
基于核偏最小二乘的简约最小二乘支持向量机及其应用研究 <i>Reduced Least Squares Support Vector Based on Kernel Partial Least Squares and Its Application Research</i> , pp.3-207~3-211			
宋海鹰 桂卫华 阳春华	中南大学 中南大学 中南大学		
FrB01	15:45-17:45	Meeting Room 1	
Invited Session: Complex Systems: Analysis and Control (I)			
Chair: Jiang Zhong-Ping	Polytechnic Univ. of New York		
Co-Chair: Hu Xiaoming	Royal Inst. of Tech.		
FrB01-1	15:45-16:05		
<i>Reaching Agreement in Finite Time via Continuous Local State Feedback</i> , pp.6-711~6-715			
Xiao Feng Wang Long		Peking Univ. Peking Univ.	
FrB01-2	16:05-16:25		
<i>Sampled-Data Based Average Consensus Control for Networks of Continuous-Time Integrator Agents with Measurement Noises</i> , pp.6-716~6-720			
Li Tao Zhang Ji-Feng		Chinese Acad. of Sci. Chinese Acad. of Sci.	
FrB01-3	16:25-16:45		
<i>Decentralized Discrete-Time Consensus Algorithms for Multi-agent Systems</i> , pp.6-721~6-725			
Li Qin Jiang Zhong-Ping		Polytechnic Univ. Polytechnic Univ. of New York	
FrB01-4	16:45-17:05		
<i>Consensus of Multi-agent System with Diverse Communication Delays</i> , pp.6-726~6-730			
Liu Chenglin Tian Yuping		Southeast Univ. Southeast Univ.	
FrB01-5	17:05-17:25		
<i>Integration and Implementation of a Low-cost and Vision-based UAV Tracking System</i> , pp.6-731~6-736			
Lin Feng Chen Ben M. Lum Kai Yew		National Univ. of Singapore National Univ. of Singapore National Univ. of Singapore	
FrB01-6	17:25-17:45		
<i>Robust Consensus of Multi-agent Systems with Noise</i> , pp.6-737~6-741			
Wang Lin Liu Zhi-Xin Guo Lei		Chinese Acad. of Sci. Chinese Acad. of Sci. Chinese Acad. of Sci.	
FrB02	15:45-17:45	Meeting Room 2	
Invited Session: 登月飞行控制 Invited Session: Lunar Lander			
Chair: 段广仁		哈尔滨工业大学	
Co-Chair: 刘兴隆		哈尔滨工业大学	
FrB02-1	15:45-16:05		
应用非线性规划求解月球探测器软着陆最优控制问题 <i>Applying Nonlinear Programming to Solve Optimal Control Problem of Lunar Probe Soft Landing</i> , pp.6-485~6-487			
单永正 段广仁		哈尔滨工业大学 哈尔滨工业大学	
FrB02-2	16:05-16:25		
<i>A Lunar Terrain Reconstruction Method Using Long Base-line Stereo Vision</i> , pp.6-488~6-492			
Jie Ming Huang Xianlin		Harbin Inst. of Tech. Harbin Inst. of Tech.	
FrB02-3	16:25-16:45		
<i>A Novel Algorithm Reducing All-sky Star Pattern Recognition's Delay Time</i> , pp.6-493~6-496			
Hu Haidong Huang Xianlin		Harbin Inst. of Tech. Harbin Inst. of Tech.	
FrB02-4	16:45-17:05		
再入体变质心动力学建模与仿真分析 <i>Dynamics Modeling and Simulation for Moving-mass Reentry Vehicle</i> , pp.6-497~6-501			
李瑞康 荆武兴 高长生		哈尔滨工业大学 哈尔滨工业大学 哈尔滨工业大学	

FrB02-5 **17:05-17:25**
 适用于大气层外拦截器的近最优中制导律
A Near Optimal Midcourse Guidance Law for Exoatmospheric Interceptor, pp.6-502~6-506

郑立伟 哈尔滨工业大学
 荆武兴 哈尔滨工业大学

FrB02-6 **17:25-17:45**
 Optimal Guidance Law Design for Reentry Vehicle Using Virtual Displacement Concept, pp.6-507~6-510

Gao Chang-sheng Harbin Inst. of Tech.
 Jing Wuxing Harbin Inst. of Tech.
 Li Chaoyong Harbin Inst. of Tech.

FrB03 15:45-17:45 Meeting Room 3
 系统理论与控制理论 (1)
 System Theory and Control Theory (1)

Chair: 耿志勇 北京大学
 Co-Chair: 张承慧 山东大学

FrB03-1 **15:45-16:05**
 Solution of Singularity Problem in Motion Control of Acrobats, pp.2-523~2-527

LAI Xuzhi Central South Univ.
 She Jin-Hua Tokyo Univ. of Tech.
 Wu Min Central South Univ.
 Yang Simon X. Univ. of Guelph

FrB03-2 **16:05-16:25**
 基于状态反馈的关联 Lurie 控制系统参数绝对稳定性
Parametric Absolute Stability of Interconnected Lurie Systems Based on State Feedback, pp.2-730~2-734

陈宁 中南大学
 桂卫华 中南大学
 刘碧玉 中南大学

FrB03-3 **16:25-16:45**
 Stability of Polynomial Systems via Polynomial Lyapunov Functions, pp.2-528~2-532

Qi Hongsheng Chinese Acad. of Sci.
 Cheng Daizhan Chinese Acad. of Sci.

FrB03-4 **16:45-17:05**
 具有静态非线性互联结构的分布式异构系统的稳定性
Stability of Distributed Heterogenous Systems with Static Nonlinear Interconnections, pp.5-239~5-243

耿志勇 北京大学

FrB03-5 **17:05-17:25**
 A Study of Dependence in the Patellar-Tendon-Reflex on Tapping Locations, pp.6-328~6-331

Jiang Yan Univ. of Tsukuba
 Mamizuka Naotaka Univ. of Tsukuba
 Hori Noriyuki Univ. of Tsukuba
 Ochiai Naoyuki Univ. of Tsukuba

FrB03-6 **17:25-17:45**
 基于 LQR 的磁悬浮系统的变结构控制
Variable Structure Control of A Maglev System Based on Linear Quadratic Regulator, pp.2-367~2-370

张承慧 山东大学
 孙晓明 山东大学
 刘睿 山东大学
 刘志军 山东大学

FrB04 15:45-17:45 Meeting Room 4
 复杂性与复杂系统理论 (1)
 Complexity and Complex System Theory (1)

Chair: 王龙 北京大学
 Co-Chair: Jia Yingmin Beihang Univ.

FrB04-1 **15:45-16:05**
 群体行为与自组织合作
Collective Behaviors and Self-organizing Cooperation, pp.2-553~2-557

王龙 北京大学
 伏锋 北京大学
 陈小杰 北京大学
 楚天广 北京大学
 谢广明 北京大学

FrB04-2 **16:05-16:25**
 Distributed Consensus Control for Second-Order Agents with Fixed Topology and Time-Delay, pp.2-577~2-581

Lin Peng Beihang Univ.
 Jia Yingmin Beihang Univ.
 Du Junping Beijing Univ. of Posts & Telecommunications
 Yuan Shiyong Henan Polytechnic Univ.

FrB04-3 **16:25-16:45**
 连续碳酸化分解过程智能控制系统
An Intelligent Control System for Continual Carbonation Decomposition Process, pp.2-582~2-586

胡志坤 中南大学
 桂卫华 中南大学
 阳春华 中南大学
 张作良 中南大学
 王晓丽 中南大学

FrB04-4 **16:45-17:05**
 元胞自动机及其在兵力推演中的建模与仿真
Cellular Automata and Their Applications in Combat Modeling & Simulation, pp.2-587~2-591

邓方 北京理工大学
 陈杰 北京理工大学
 陈文颖 北京理工大学
 朱琳 北京理工大学

FrB04-5 **17:05-17:25**
 Derivative Feedback Control for Singular Systems, pp.2-592~2-595

Ren JunChao Northeastern Univ.
 Zhang Qingling Northeastern Univ.
 Zhang XueFeng Northeastern Univ.

FrB04-6 **17:25-17:45**
 基于文氏电桥的超混沌保密通信及其 DSP 实现
Hyperchaotic Secrete Communication Based on Wien-Bridge Circuit and Its DSP Realization, pp.6-404~6-408

禹思敏 广东工业大学
 吕金虎 中国科学院

FrB05 15:45-17:45 Meeting Room 5
 最优控制与优化 (2)
 Optimal Control and Optimization (2)

Chair: Liu Bin Australian National Univ.
 Co-Chair: Ji Tianyao The Univ. of Liverpool

FrB05-1 **15:45-16:05**
 Optimal Robust Control for Uncertain Impulsive Systems, pp.3-381~3-385

Liu Bin Australian National Univ.
 Hill David J. Australian National Univ.

FrB05-2 **16:05-16:25**
 基于博弈论的传感器网络能量平衡路由
Game Theoretic Energy Balance Routing in Wireless Sensor Networks, pp.3-420~3-424

曾加 清华大学
 慕春棣 清华大学
 胡建斌 北京大学

FrB05-3 <i>Multi-resolution Morphological Operators for Electrocardiogram Signal Analysis</i> , pp.3-425~3-429 Ji Tianyao Lu Zhen Wu Q. H.	16:25-16:45 The Univ. of Liverpool Univ. of Liverpool The Univ. of Liverpool	FrB07-6 电力系统一般非线性综合切换励磁控制 <i>Nonlinear Co-ordinated Switching Excitation Control of Power Systems</i> , pp.2-439~2-443 刘艳红 李春文 汤洪海	17:25-17:45 郑州大学 清华大学 清华大学
FrB05-4 <i>Using Good Nodes Set Principle to Evolution Strategy for Constrained Optimization</i> , pp.5-722~5-726 Xiao Chixin Cai Zi-xing	16:45-17:05 Central South Univ. Central South Univ.	FrB08 控制设计方法 (2) Control Design (2) Chair: 卢子广 Co-Chair: 向 婕	15:45-17:45 Meeting Room 8 广西大学 中南大学
FrB05-5 分布式测控网络系统的多线程技术实现方法 <i>Implement Method of Multithreading Technique for Distributive Monitor and Control Network System</i> , pp.3-441~3-445 刘载文 段长明 许继平	17:05-17:25 北京工商大学 北京工商大学 北京工商大学	FrB08-1 一种基于数学构造的矩阵变换器调制策略 <i>A Matrix Converter Modulation Based on Mathematical Construction</i> , pp.4-726~4-729 粟 梅 余 岳 孙 尧 桂卫华	15:45-16:05 中南大学 中南大学 中南大学 中南大学
FrB05-6 <i>On All Sets of Optimal Controls for a Control System with State Feedback</i> , pp.2-170~2-174 Jimenez Serrano Eleazar Araki Kejiro Kusakabe Shigeru	17:25-17:45 Kyushu Univ. Kyushu Univ. Kyushu Univ.	FrB08-2 采用异步发电机和 PWM 整流器的 42 伏汽车发电系统的一种电压控制策略及分析模型 <i>A Voltage Control Strategy and Analytic Models for a 42-V Automotive Power Generation System with Induction Generator and PWM Rectifier</i> , pp.4-740~4-743 卢子广 谭 峙	16:05-16:25 广西大学 广西大学
FrB07 非线性系统及其控制 (2) Nonlinear System and Control (2) Chair: Duan Zhisheng Co-Chair: 王印松	15:45-17:45 Meeting Room 7 Peking Univ. 华北电力大学	FrB08-3 面向综合生产指标优化的烧结过程智能集成控制设计 <i>Intelligent Integrated Optimization Control Design of Comprehensive Production Indices for Sintering Process</i> , pp.4-750~4-754 向 婕 吴 敏	16:25-16:45 中南大学 中南大学
FrB07-1 五自由度无轴承异步电机的 α 阶逆系统解耦控制 <i>Decoupling Control of the 5 Degree-of-Freedom Bearingless Induction Motor Based on α-th Order Inverse System Method</i> , pp.2-262~2-266 刘贤兴 董 磊 范文进 孙宇新	15:45-16:05 江苏大学 江苏大学 江苏大学 江苏大学	FrB08-4 多操纵面飞机控制分配的非线性闭环迭代结构 <i>The Nonlinear Iterative Closed Loop Configuration of Control Allocation for Aircraft with Multiple Control Effectors</i> , pp.4-755~4-757 杨凌宇 钟友武 申功璋	16:45-17:05 北京航空航天大学 北京航空航天大学 北京航空航天大学
FrB07-2 高速公路匝道单神经元自适应 PID 控制器 <i>Self-adaptation PID Ramp Controller in Freeway Based on Single Neuron</i> , pp.2-254~2-257 韦彦秀 梁新荣	16:05-16:25 五邑大学 五邑大学	FrB08-5 超声速巡航导弹的纵向通道控制系统设计 <i>The Pitch Channel Slide Control System Design for Supersonic Cruise Missile</i> , pp.4-36~4-40 陈 洁 潘长鹏 顾文锦	17:05-17:25 山东烟台海军航空工程学院 山东烟台海军航空工程学院 山东烟台海军航空工程学院
FrB07-3 <i>Output Feedback Asymptotic Stabilization of Nonholonomic Systems with Strong Nonlinear Drifts</i> , pp.2-274~2-278 Wu Yuqiang Zong Guangdeng	16:25-16:45 Qufu Normal Univ. Qufu Normal Univ.	FrB08-6 入侵检测系统性能评估中实验环境的仿真 <i>Design and Realization of Evaluation Environment in the Performance Analysis of Intrusion Detection System</i> , pp.6-303~6-306 廖桂平 喻 飞 沈 岳 张林峰 徐 成	17:25-17:45 湖南农业大学 江苏省计算机信息处理技术重点实验室 湖南农业大学 湖南农业大学 湖南大学
FrB07-4 基于自适应“反步”法的火电厂单元机组协调控制 <i>Boiler-turbine Coordinated Control of Power Plant Based on the Adaptive Backstepping Method</i> , pp.2-279~2-282 王印松 田瑞丽 吕丽霞	16:45-17:05 华北电力大学 华北电力大学 华北电力大学	FrB09 运动控制 Motion Control Chair: 李世华 Co-Chair: Dong Ling Fang	15:45-17:45 Meeting Room 9 东南大学 Concordia Univ.
FrB07-5 <i>Global Synchronization of Complex Lur'e Networks</i> , pp.2-304~2-308 Li Zhongkui Duan Zhisheng Huang Lin	17:05-17:25 Peking Univ. Peking Univ. Peking Univ.		

FrB09-1 巨型水压机液压位置保持系统迭代控制的仿真研究 <i>Simulating of Hydraulic Holding System of Large-Scale Forging Press Based on Iterative Learning Control</i> , pp.5-23~5-26	15:45-16:05	吴敏 贾维嘉 张历卓	中南大学 香港城市大学 香港城市大学
FrB09-2 H_∞ Adaptive Variable Universe Fuzzy Control for Autonomous Vehicles, pp.5-82~5-86	16:05-16:25	FrB10-4 基于 MATLAB 的车载 CAN 网络模拟技术 <i>Simulation Technique of In-vehicle CAN Network Based on MATLAB</i> , pp.5-661~5-665	16:45-17:05
Chen Li-Song Wang Jiang Li Nuo	Tianjin Univ. Tianjin Univ. Tianjin Univ.	徐小娟 刘志远	哈尔滨工业大学 哈尔滨工业大学
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Dong Ling Fang Khorasani Khashayar	Concordia Univ. Concordia Univ.	贾允毅 胥布工 王世华 刘步春	华南理工大学 华南理工大学 华南理工大学 北京邮电大学
FrB09-4 永磁同步电机的二阶自抗扰控制算法 <i>A Two-order Active Disturbance Rejection Control Algorithm for Permanent Magnetic Synchronous Motor</i> , pp.5-68~5-71	16:45-17:05	FrB10-6 <i>Design of History Database for Networked Control Systems</i> , pp.5-292~5-296	17:25-17:45
刘志刚 李世华	东南大学 东南大学	Zhu Youzhi Peng Peng Zheng Geng	Inst. of Automation, Chinese Acad. of Sci. Inst. of Electronics, Chinese Acad. of Sci. Inst. of Automation, Chinese Acad. of Sci.
FrB09-5 永磁同步电动机非线性负载的神经网络自适应控制 <i>The Neural Network Adaptive Control for the Nonlinear Load of the Permanant Magnet Synchronous Motor</i> , pp.5-72~5-76	17:05-17:25	FrB11 15:45-17:25 建模、辨识与信号处理 (2) Modeling, Identification and Signal Processing (2)	Meeting Room 11
李诺 王江 张荣华	天津大学 天津大学 天津大学	Chair: Zhao Wen-Xiao Co-Chair: 徐辰华	Chinese Acad. of Sci. 中南大学
FrB09-6 交叉耦合控制在目标稳定跟踪平台中的应用 <i>Cross-Coupled Control for Three-Axis Turntable Target Tracking System</i> , pp.5-77~5-81	17:25-17:45	FrB11-1 广义随机系统观测融合 Kalman 滤波器 <i>Measurement Fusion Kalman Filters for Descriptor Stochastic Systems</i> , pp.2-775~2-778	15:45-16:05
刘治钢 王军政 赵江波	北京理工大学 北京理工大学 北京理工大学	石莹	黑龙江大学
FrB10 15:45-17:45 Meeting Room 10 通讯网络系统 (2) Communication Network Systems (2)		FrB11-2 基于优化相空间重构的多变量混沌时间序列预测 <i>Prediction of Multivariate Chaotic Time Series Based on Optimized Phase Space Reconstruction</i> , pp.3-169~3-173	16:05-16:25
Chair: 胥布工 Co-Chair: Zhu Youzhi	华南理工大学 Chinese Acad. of Sci.	王一颀 韩敏	大连理工大学 大连理工大学
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Lu Quan Qiu Junping	Wuhan Univ. Wuhan Univ.	白锦花 马静 孙书利	黑龙江大学 黑龙江大学 黑龙江大学
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熊永华	中南大学	Zhao Wen-Xiao	Chinese Acad. of Sci.
Poster Session PFrA July 27, 14:30-16:00			
Chair: 张纪峰 Co-Chair: 郁文生 Co-Chair: 薛安克		中国科学院 中国科学院 杭州电子科技大学	

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Gao Zhifeng Hebei Univ. of Sci. & Tech.
Shi Peng Univ. of Glamorgan
Yang Hongjiu Hebei Univ. of Sci. & Tech.

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彭辉 中南大学
梁亮 中南大学

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范多旺 兰州交通大学

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- Chair: 林宗利 Univ. of Virginia
Co-Chair: 田玉平 东南大学
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Separator-based Design of Robust Reliable Tacking Controller, pp.3-630~3-634

欧阳高翔 北京控制工程研究所
倪茂林 北京控制工程研究所

PFRB-18

Time Delay Force Control for Vehicle Active Suspension System, pp.3-640~3-645

XUAN DONG JI Chonnam National Univ.
Kim Jin wan Chonnam National Univ.
Nan Yang hai Chonnam National Univ.
Kim Young Bae Chonnam National Univ.

PFRB-19

一类非仿射非线性系统的 H_∞ 控制

H_∞ Control of a Class of Non-affine Nonlinear System, pp.3-646~3-650

黄洪艺 厦门大学
彭侠夫 厦门大学

PFRB-20

一类时滞大系统的分散自适应输出反馈控制

Decentralized Adaptive Output Feedback Control for a Class of Time Delay Large-scale Systems, pp.3-712~3-715

许建强 上海应用技术学院
陈树中 华东师范大学

PFRB-21

基于自适应评价设计的一种控制算法

A Control Algorithm Base on Adaptive Critic Designs, pp.3-716~3-719

林小峰 广西大学
叶伟宝 广西大学
宋春宁 广西大学
宋绍剑 广西大学

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Liu Xiaohua Univ. of Ludong

PFRB-23

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洪昭斌 福州大学
陈力 福州大学

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Iterative Learning Control for Time-delay Systems with Initial Rectifying Action, pp.3-777~3-781

夏椒波 浙江工业大学
何熊熊 浙江工业大学
孙明轩 浙江工业大学

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基于变结构神经模糊控制的 ASVG 控制器的研究

Design of ASVG Controller Based on Variable Structure Neural Network Fuzzy Control, pp.3-782~3-785

洪镇南 南华大学
盛义发 南华大学
李祖林 湖南工学院
阳武娇 南华大学

PFRB-26

一类非线性系统的周期学习控制

Periodic Learning Control for a Class of Nonlinear Systems, pp.3-796~3-800

陈陆安 浙江工业大学
孙明轩 浙江工业大学
何熊熊 浙江工业大学

PFrB-27

An Adaptive Tracking Method for Non-holonomic Wheeled Mobile Robots, pp.3-801~3-805

Yue Liyong South China Univ. of Tech.
XIE WEI South China Univ. of Tech.

PFrB-28

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于双和 大连海事大学
赵永生 大连海事大学

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Lou Xuyang Southern Yangtze Univ.
Cui Baotong Southern Yangtze Univ.

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Hu Ying Dalian Maritime Univ.
Huang Jin Dalian Maritime Univ.

PFrB-31

New Exponential Stability Criterion for Delayed Cellular Neural Networks, pp.4-100~4-103

Liu Xinge Central South Univ.
Ou Xiaobo Central South Univ.
Tang Meilan Central South Univ.

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王 华 南京工业大学
黄筱调 南京工业大学
何 晋 云南民族大学

PFrB-33

Wavelet Neural Network Disturbance Observer-based Adaptive Robust Tracking Control for Servo System, pp.4-149~4-155

Wang Hongyan Acad. of Armored Force Engineering
WANG Qinglin Beijing Inst. of Tech.
Qiao Jihong Beijing Tech. & Business Univ.
Xia Yuhui Acad. of Armored Force Engineering

PFrB-34

New Results for Globally Asymptotic Stability and Instability of Recurrent Neural Networks, pp.4-162~4-166

Zhang Yutian Wuhan Univ. of Sci. & Tech.
Luo Qi Nanjing Univ. of Information Sci. & Tech.

PFrB-35

Novel Stability Analysis of High-order Cohen-Grossberg Neural Networks with Time-varying Delays, pp.4-176~4-180

Ji Yan Southern Yangtze Univ.
Cui Baotong Southern Yangtze Univ.

PFrB-36

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杜延春 山东大学
李贻斌 山东大学
王桂月 山东经济学院

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Huang Weili Hebei Univ. of Engineering

Huang Weijian

Hebei Univ. of Engineering

Liu Lin

Beijing Univ. of Aeronautics & Astronautics

PFrB-38

Power Quality Disturbances Detection and Classification Using Complex Wavelet Transformation and Artificial Neural Network, pp.4-208~4-212

Liu Hua Hebei Univ. of Engineering
Wang Yuguo Hebei Univ. of Engineering
Zhao Wei Hebei Univ. of Engineering

PFrB-39

Adaptive NN Control of a Class of Nonlinear Systems with Unknown Control Direction, pp.4-213~4-216

Zhao Zhuwei Nanjing Univ. of Information Sci. & Tech.
Huang Shengjie Nanjing Univ. of Sci. & Tech.
Luo Qi Nanjing Univ. of Information Sci. & Tech.

PFrB-40

序列最小优化算法在电力系统短期负荷预测中的应用
The Application of Sequential Minimal Optimization Algorithm in Short-term Load Forecasting, pp.6-314~6-317

周 倩 华北电力大学
翟永杰 华北电力大学
韩 璞 华北电力大学

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Real-time Digital Simulation of Control System with LabVIEW Simulation Interface Toolkit, pp.6-318~6-322

Xiang Xuejun China Three Gorges Univ.
Xia Ping China Three Gorges Univ.
Yang Sheng China Three Gorges Univ.
LIU Ping China Three Gorges Univ.

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An Improved Fourth-order PDE for Noise Removal with Dissipation Reduction, pp.6-332~6-334

Ji Jing Inst. of Automation, Chinese Acad. of Sci.
Yang Kehu Inst. of Automation, Chinese Acad. of Sci.
Guo Jianjun HPI Innovation (Beijing) Co., Ltd
Yu Wensheng Chinese Acad. of Sci.

PFrB-43

微分代数系统的无源性在励磁系统中的应用
Passivity for Differential-algebraic Systems with Application to Excitation System, pp.6-335~6-337

张秀华 东北大学
张庆灵 东北大学理学院

PFrB-44

学习者情绪空间定义及应用
The Research of Emotion Cognition Model and Its Application, pp.6-356~6-361

解迎刚 北京科技大学
王志良 北京科技大学

PFrB-45

A New Control Approach of Output Probability Density Functions for Dynamic Stochastic Systems Using Parzen Window Estimate, pp.6-362~6-367

Yang Chengzhi Kunming Univ. of Sci. & Tech.

PFrB-46

The Application of Soft-Sensor Technology in Measuring Water Boiling Point, pp.6-372~6-376

Chen Baojun Dalian JiaoTong Univ.
Zhong Chongquan Dalian Univ. of Tech.
Yang Suying Dalian Univ. of Tech.
Yan Ming Dalian Univ. of Tech.

PFrB-47

基于 ASP.NET 和 OPC 技术的远程监控系统的研究与实现

On Remote Monitor and Control Based on OPC and ASP.NET,

pp.6-384~6-387

张烈平

桂林工学院

敖茂尧

桂林工学院

张云生

昆明理工大学

PFrB-48

用例驱动的角色访问控制安全授权设计与研究

Use Case-Driven Role Based Access Control Security Authorization, pp.6-392~6-394

林 鹏

中南大学

任胜兵

中南大学

蒋 平

中南大学

Mahammed Jalloh

Central South Univ.

PFrB-49

无轴承永磁薄片电机试验平台及驱动系统设计

The Design of Experiment Platform and Driving System for Bearingless Permanent Slice Motors, pp.6-395~6-399

朱 通

江苏大学

朱焜秋

江苏大学

孙永波

江苏大学

郝晓红

江苏大学

PFrB-50

Autonomous Construction of Reliable Multi-agent Systems, pp.6-449~6-451

Zhang Libin

South-Central Univ. for Nationalities

Zhu Qianyu

South-Central Univ. for Nationalities

Wang Wei

Tongji Univ.

PFrB-51

A Design of Vision-based Location Control System for Steel Rolling Mill, pp.6-452~6-455

Chen Wei

Wuhan Univ. of Sci. & Tech.

Fang KangLing

Wuhan Univ. of Sci. & Tech.

Liu Xinhai

Wuhan Univ. of Sci. & Tech.

PFrB-52

Improvement of Vehicle Handling and Stability by Integrated Control of Four Wheel Steering and Direct Yaw Moment, pp.4-730~4-735

Wu Jianyong

Shanghai Jiaotong Univ.

Tang Houjun

Shanghai Jiaotong Univ.

Li Shaoyuan

Shanghai Jiaotong Univ.

Fang Wan

Shanghai Jiaotong Univ.

July 28, 2007

SaA01 13:30-15:30 Meeting Room 1
Invited Session: Complex Systems: Analysis and Control (II)

Chair: Hu Xiaoming Royal Inst. of Tech.
Co-Chair: Jiang Zhong-Ping Polytechnic Univ. of New York

SaA01-1 13:30-13:50

Non-smooth Agent-based Dynamics of Strategic Bidding with Linear Supply Function, pp.6-742~6-746

Xue Ancheng Chinese Acad. of Sci.
Hong Yiguang Chinese Acad. of Sci.

SaA01-2 13:50-14:10

Parameter-Dependent Robust H_∞ Model Reduction for Discrete-Time Switched Polytopic Linear Systems, pp.6-747~6-751

Qiu Jianbin USTC & CityU Joint Advanced Research Center
Feng Gang City Univ. of Hong Kong
Yang Jie Univ. of Sci. & Tech. of China

SaA01-3 14:10-14:30

Observer Based Leader-Following Formation Control Using On-board Sensor Information, pp.6-752~6-755

Gustavi Tove Royal Inst. of Tech.
Hu Xiaoming Royal Inst. of Tech.

SaA01-4 14:30-14:50

Stabilization of Power Systems by Switched Controllers, pp.6-756~6-760

Li Zhengguo Inst. for Infocomm Research, Singapore
Yang Guang-Hong Northeastern Univ.
Wen Changyun Nanyang Technological Univ.
Xie Wenxiang Seagate

SaA01-5 14:50-15:10

Consensus of Multi-agent Systems with Higher Order Dynamics, pp.6-761~6-765

Wang Jinhuan Chinese Acad. of Sci.
Cheng Daizhan Chinese Acad. of Sci.

SaA01-6 15:10-15:30

Complex Hybrid Systems: Stability Analysis for Omega Limit Sets, pp.6-766~6-769

Cai Chaohong Univ. of California, Santa Barbara
Goebel Rafal -
Sanfelice Ricardo Univ. of California, Santa Barbara
Teel Andrew Univ. of California

SaA02 13:30-15:30 Meeting Room 2

Invited Session: Design and Analysis of Networked Control Systems

Chair: Liu Guoping Univ. of Glamorgan
Co-Chair: Xia Yuanqing Beijing Inst. of Tech.

SaA02-1 13:30-13:50

Networked Control Systems with Different Control Inputs, pp.6-539~6-543

Xia Yuanqing Beijing Inst. of Tech.
Chen Jie Beijing Inst. of Tech.
Zhou Lin Beijing Inst. of Tech.

SaA02-2 13:50-14:10

Improved Stabilization Method for Networked Control Systems, pp.6-544~6-548

Wu Min Central South Univ.
He Yong Central South Univ.

SaA02-3 14:10-14:30

Design and Simulation of Fuel Cell Networked Predictive Fuzzy Control Systems, pp.6-549~6-554

Tong Shiwen Chinese Acad. of Sci.
Liu Guoping Univ. of Glamorgan

SaA02-4 14:30-14:50

System Architecture Design of Supervisory Software for Networked Control Systems, pp.6-555~6-560

Zhu Youzhi Inst. of Automation, Chinese Acad. of Sci.
Zheng Geng Inst. of Automation, Chinese Acad. of Sci.
Liu Guoping Univ. of Glamorgan

SaA02-5 14:50-15:10

网络化控制系统及其在火控系统中的应用研究
Networked Control System and Its Application in Fire Control System, pp.6-561~6-564

陈晨 北京理工大学
陈杰 北京理工大学
张娟 北京理工大学

SaA02-6 15:10-15:30

Design and Implementation of Networked Predictive Control Over Wireless IP Networks, pp.6-565~6-570

Dong Zhe Chinese Acad. of Sci.
Liu Guoping Univ. of Glamorgan
Tao Yuegang Chinese Acad. of Sci.

SaA03 13:30-15:30 Meeting Room 3

系统理论与控制理论 (2)
System Theory and Control Theory (2)

Chair: Guo Yuqian Nanyang Technological Univ.
Co-Chair: 康宇 中国科学院

SaA03-1 13:30-13:50

线性系统可区分性的一些性质
Properties of the Distinguishability of Linear Systems, pp.2-721~2-723

楼红卫 复旦大学

SaA03-2 13:50-14:10

一类二维 Markov 跳跃非线性时滞系统的镇定控制
Stabilization Control for a Class of Two-Dimensional Markovian Jumping Nonlinear Systems with Time-delays, pp.2-702~2-706

赵平 中国科学院
康宇 中国科学院

SaA03-3 14:10-14:30

Mid-frequency Disturbance Rejection of HDD Systems, pp.4-56~4-60

Guo Yuqian Nanyang Technological Univ.
Wang Youyi Nanyang Technological Univ.
Xie Lihua Nanyang Technological Univ.

SaA03-4 14:30-14:50

Complete Parametric Approach for Output Regulation Problems of Matrix Second-Order Systems via Full Information Feedback, pp.2-195~2-199

Teng Yu Harbin Inst. of Tech.
Wei Yi-Yin China Aerospace Sci. & Industry Corp.
Duan Guang-ren Harbin Inst. of Tech.

SaA03-5 14:50-15:10

Optimization of Semi-Markov Switching State-space Control Processes for Network Communication Systems, pp.2-707~2-711

Jiang Qi Univ. of Sci. & Tech. of China
Xi Hongsheng Univ. of Sci. & Tech. of China
Yin Baoqun Univ. of Sci. & Tech. of China

SaA03-6 15:10-15:30

变参数时滞互联大系统的鲁棒跟踪控制
Robust Tracking of Interconnected Systems with Uncertainties and Delays, pp.2-745~2-747

倪茂林 北京控制工程研究所
李果 北京控制工程研究所

SaA04	13:30-15:30	Meeting Room 4
复杂性 & 复杂系统理论 (2) Complexity and Complex System Theory (2)		
Chair: 陈增强		南开大学
Co-Chair: 楚天广		北京大学
SaA04-1	13:30-13:50	
基于势函数的具有多 LEADER 的多智能体系统的运动控制 <i>Movement Control of Multi-Agent System with Multiple Leader Based on Potential Function</i> , pp.2-616~2-619		
王 莉		南开大学
陈增强		南开大学
刘忠信		南开大学
袁著祉		南开大学
SaA04-2	13:50-14:10	
Aggregation and Pattern Formation of Multi-Agent Systems, pp.2-606~2-610		
Chen Zhifu		Peking Univ.
Chu Tianguang		Peking Univ.
SaA04-3	14:10-14:30	
群体动力学与协调控制 <i>Swarm Dynamics and Coordinated Control</i> , pp.2-611~2-615		
楚天广		北京大学
陈志福		北京大学
王 龙		北京大学
谢广明		北京大学
SaA04-4	14:30-14:50	
A New Method to Enhance the Network Synchronizability, pp.6-377~6-380		
Dai Kun		Shanghai Jiaotong Univ.
Wang Xiaofan		Shanghai Jiaotong Univ.
Li Xiang		Shanghai Jiaotong Univ.
SaA04-5	14:50-15:10	
Hopf Bifurcation Analysis in the Lorenz-type System, pp.2-601~2-605		
Yang Qigui		South China Univ. of Tech.
Liu Mengying		South China Univ. of Tech.
SaA04-6	15:10-15:30	
一种改进的基于群体的增量学习算法 <i>An Improved Population-Based Incremental Learning Algorithm</i> , pp.5-741~5-744		
张庆彬		燕山大学
吴惕华		燕山大学
刘 波		燕山大学
SaA05	13:30-15:30	Meeting Room 5
最优控制与优化 (3) Optimal Control and Optimization (3)		
Chair: 曹卫华		中南大学
Co-Chair: 张 荣		重庆大学
SaA05-1	13:30-13:50	
Optimal Stopping Time and Pricing of Exotic Option, pp.3-456~3-459		
Yang Bing		Shandong Univ. at Weihai
SaA05-2	13:50-14:10	
Multi-objective Optimization of Reactive Power Dispatch Using a Bacterial Swarming Algorithm, pp.3-460~3-464		
Lu Zhen		Univ. of Liverpool
Li Mengshi		The Univ. of Liverpool
Tang Wenjia		The Univ. of Liverpool
Wu Q. H.		The Univ. of Liverpool
SaA05-3	14:10-14:30	
Optimal Controls for a Class of Impulsive Systems with Hybrid Quadratic Performance, pp.3-465~3-468		

Zhou Yuan		Fudan Univ.
SaA05-4	14:30-14:50	
不确定条件下设备维护与更新最优控制策略的一个极限性质 <i>A Limit Property for the Optimal Control of a Replacement Problem with Maintenance under Uncertainty</i> , pp.3-484~3-488		
张 荣		重庆大学
SaA05-5	14:50-15:10	
基于集成预测模型与专家推理策略的铅锌烧结配料优化方法 <i>An Optimization Method Based on Integrated Predictive Models and Expert Reasoning Strategies for Mix Proportions in Lead-zinc Sinter</i> , pp.3-489~3-493		
王春生		中南大学
吴 敏		中南大学
曹卫华		中南大学
SaA05-6	15:10-15:30	
基于鲁棒离散优化建模方法的电梯群控调度策略 <i>On Elevator Group Scheduling Strategy Based on Robust Discrete Optimization Modeling Method</i> , pp.3-507~3-511		
宗 群		天津大学
王维佳		天津大学
孙志明		天津大学
SaA06	13:30-15:30	Meeting Room 6
模糊系统与模糊控制 (1) Fuzzy System and Fuzzy Control (1)		
Chair: Wang Renming		China Three-Gorges Univ.
Co-Chair: 吴 涛		安徽大学
SaA06-1	13:30-13:50	
Improved Performance of Permanent Magnet Synchronous Motor by Using Particle Swarm Optimization Techniques, pp.4-326~4-330		
Wahsh Said		Electronics Research Inst.
SaA06-2	13:50-14:10	
一种模糊构造性神经网络及其应用 <i>A Kind of Fuzzy Constructive Neural Network and Its Application</i> , pp.4-217~4-221		
吴 涛		安徽大学
陈黎伟		安徽大学
毛军军		安徽大学
张 铃		安徽大学
SaA06-3	14:10-14:30	
Active Suspension System Based on LMS Adaptive Fuzzy Algorithm, pp.4-412~4-415		
Sun Jianmin		Beijing Inst. of Civil Engineering & Architecture
Yang Qingmei		Beijing Union Univ.
SaA06-4	14:30-14:50	
Delay-dependent LMI Conditions for Stability and Stabilization of T-S Fuzzy Systems with Time-delay, pp.4-416~4-419		
Wang Renming		China Three-Gorges Univ.
Pan Juntao		China Three-Gorges Univ.
SaA06-5	14:50-15:10	
基于协同进化算法的焦炉火道温度模糊优化控制 <i>Fuzzy Optimization Control of the Temperature for the Heating Process in Coke Oven Based on Co-evolution</i> , pp.4-420~4-424		
雷 琪		中南大学
吴 敏		中南大学
SaA06-6	15:10-15:30	
基于逆系统方法和模糊逻辑的导弹自动驾驶仪设计 <i>Nonlinear Autopilot Design Based on Inversion System and Fuzzy Logic</i> , pp.2-357~2-360		
李海军		哈尔滨工业大学
黄显林		哈尔滨工业大学
班晓军		哈尔滨工业大学

SaA07	13:30-15:30	Meeting Room 7	SaA08-3	14:10-14:30
非线性系统及其控制 (3)			<i>Tracking of Nonholonomic Control Systems Based on Visual Servoing Feedback</i> , pp.6-459~6-463	
Nonlinear System and Control (3)			Li Qingsong	Univ. of Shanghai for Sci. & Tech.
Chair: Sun Yimin		Tsinghua Univ.	Wang Chaoli	Univ. of Shanghai for Sci. & Tech.
Co-Chair: Chen Tianshi		Chinese Univ. of Hong Kong	Niu Wenbin	Univ. of Shanghai for Sci. & Tech.
SaA07-1	13:30-13:50		SaA08-4	14:30-14:50
<i>Input-to-state Stabilization of Feedforward Systems with Dynamic Uncertainties</i> , pp.2-385~2-389			一种基于热电偶分度表的线性温度变送装置	
Chen Tianshi		Chinese Univ. of Hong Kong	<i>A Linear Temperature Transmitter Based on Thermocouples Reference Tables</i> , pp.6-307~6-310	
Huang Jie		Chinese Univ. of Hong Kong	刘希民	济南大学
SaA07-2	13:50-14:10		SaA08-5	14:50-15:10
<i>Attitude Control Based on the Lie-group Structure of Unit Quaternions</i> , pp.2-326~2-331			比利时巧克力系统的低阶控制器设计	
Han Da peng		National Univ. of Defense Tech.	<i>Stabilization of the Belgian Chocolate System via Low-order Controllers</i> , pp.3-88~3-92	
Wei Qing		National Univ. of Defense Tech.	何冠男	中国科学院
Li Zexiang		The Hong Kong Univ. of Sci. & Tech.	王 龙	北京龙
SaA07-3	14:10-14:30		夏璧灿	北京大学
非线性微分代数系统的耗散 Hamilton 实现			郁文生	中国科学院
<i>Dissipative Hamiltonian Realization of Nonlinear Differential Algebraic Systems</i> , pp.2-452~2-456			SaA08-6	15:10-15:30
刘艳红		郑州大学	基于 Windows Vista 的 TTS 系统实现	
李春文		清华大学	<i>Implementation of TTS System Based on Windows Vista</i> , pp.6-400~6-403	
SaA07-4	14:30-14:50		肖 志	江南大学
<i>Globally Asymptotical Controllability of Nonlinear Systems</i> , pp.2-347~2-350			于凤芹	江南大学
Sun Yimin		Tsinghua Univ.	李 玉	江南大学
Mei Shengwei		Tsinghua Univ.	SaA09	13:30-15:30
SaA07-5	14:50-15:10		Meeting Room 9	
<i>A Novel Observer-based Output Feedback Sliding Mode Control for Uncertain Discrete-time Systems</i> , pp.4-31~4-35			智能机器人 (1)	
Li Juntao		Beihang Univ.	Intelligent Robot (1)	
Jia Yingmin		Beihang Univ.	Chair: 方勇纯	南开大学
Du Junping		Beijing Univ. of Posts & Telecommunications	Co-Chair: 马宏绪	国防科技大学
Yu Fashan		Henan Polytechnic Univ.	SaA09-1	13:30-13:50
SaA07-6	15:10-15:30		欠驱动两足步行机器人 3D 动态行走控制方法研究	
广义下三角非线性系统的自适应输出跟踪			<i>Dynamic Walking Control of Underactuated 3D Biped Robot</i> , pp.5-93~5-98	
<i>Adaptive Output Tracking of Nonlinear Systems in General Lower-Triangular Form</i> , pp.2-231~2-234			绳 涛	国防科技大学
王 冰		河海大学	王 建	国防科技大学
季海波		中国科学技术大学	蔡文澜	国防科技大学
奚宏生		中国科学技术大学	马宏绪	国防科技大学
SaA08	13:30-15:30	Meeting Room 8	SaA09-2	13:50-14:10
控制设计方法 (3)			非完整移动机器人的集合镇定控制	
Control System Design (3)			<i>Set Stabilization of Nonholonomic Mobile Robots</i> , pp.2-497~2-501	
Chair: 刘希民		济南大学	杨 杰	东南大学
Co-Chair: 廖力清		中南大学	李世华	东南大学
SaA08-1	13:30-13:50		SaA09-3	14:10-14:30
基于 DSP 的飞机防滑刹车交叉冗余度控制器的设计与实现			一种基于 2D 单应矩阵的摄像机标定方法	
<i>Design and Realization on the Digital Aircraft Anti-skid Braking Controller of Crossing Dual Redundancy Based on DSP</i> , pp.6-426~6-429			<i>A Camera Calibration Method Based on 2D Homography</i> , pp.5-113~5-117	
刘建良		中南大学	张雪波	南开大学
安剑奇		中南大学	方勇纯	南开大学
廖力清		中南大学	马博军	南开大学
SaA08-2	13:50-14:10		SaA09-4	14:30-14:50
采用爪极同步发电机和 PWM 整流器的汽车发电系统的高性能控制设计			一种新型排水管道检测机器人研究	
<i>High-Performance Control Design of Automotive Power Generation System with Claw-Pole Synchronous Generator and PWM Rectifier</i> , pp.6-233~6-236			<i>On a New Detecting Robot in Sewer Pipe</i> , pp.5-189~5-192	
卢子广		广西大学	杨清梅	北京联合大学
纵葵花		广西大学	孙建民	北京建筑工程学院
SaA09-5	14:50-15:10		SaA09-5	14:50-15:10
约束分析在并行机器人运动控制中的应用			<i>Constraints Analysis in the Motion Control Process of Parallel Robots</i> , pp.5-123~5-127	
<i>Guo Sheng</i>		Beijing Jiaotong Univ.	Guo Sheng	Beijing Jiaotong Univ.
FANG Yuefa		Beijing Jiaotong Univ.	FANG Yuefa	Beijing Jiaotong Univ.
Huai Chuangfeng		Beijing Jiaotong Univ.	Huai Chuangfeng	Beijing Jiaotong Univ.

SaA09-6 **15:10-15:30**
 基于 SPF 模型的闭链机构自适应控制

Adaptive Control of Closed Kinematics Chains Based on Singularly Perturbed Formulation, pp.5-128~5-132

吴爱玲 济南大学
 王中华 济南大学
 周志群 济南大学

SaA10 13:30-15:30 Meeting Room 10
 信息处理系统 (1)
 Information Processing System (1)

Chair: 吕金虎 中国科学院
 Co-Chair: Liu Lin Beijing Jiaotong Univ.

SaA10-1 **13:30-13:50**

自校正分量解耦信息融合 Kalman 平滑器
Self-tuning Decoupled Component Information Fusion Kalman Smoother, pp.5-303~5-307

高媛 黑龙江大学
 张鹏 黑龙江大学
 贾文静 黑龙江大学
 邓自立 黑龙江大学

SaA10-2 **13:50-14:10**

装卸桥调度问题及其混合智能优化算法 GASA
The Crane Scheduling Problem and the Hybrid Intelligent Optimization Algorithm GASA, pp.6-92~6-96

孙俊清 天津理工大学
 李平 天津理工大学
 韩梅 天津理工大学

SaA10-3 **14:10-14:30**

振动控制 of Vehicle-bridge Dynamic Interactive System,
 pp.6-21~6-25

Wu Wei Beijing Jiaotong Univ.
 Liu Lin Beijing Jiaotong Univ.

SaA10-4 **14:30-14:50**

高阶蔡氏电路及其 FPGA 实现
High Order Chua's Circuit and Its FPGA Realization, pp.6-409~6-413

禹思敏 广东工业大学
 吕金虎 中国科学院

SaA10-5 **14:50-15:10**

Optimization Design on Sensing Field of Electromagnetic Tomography, pp.5-386~5-390

Xue Yixuan Tianjin Univ.
 Zhao Shu Chinese Acad. Medical Sci.
 Dong Feng Tianjin Univ.

SaA10-6 **15:10-15:30**

基于向量空间模型的信息安全审计系统
Information Audit System Based on Vector Space Model, pp.5-359~5-362

喻飞 江苏省计算机信息处理技术重点实验室
 夏晓燕 苏州大学
 吴蓉晖 湖南大学
 徐成 湖南大学

SaA11 13:30-15:30 Meeting Room 11
 建模、辨识与信号处理 (3)
 Modeling, Identification and Signal Processing (3)

Chair: Hu Yueming South China Univ. of Tech.
 Co-Chair: 宋其江 中国科学院

SaA11-1 **13:30-13:50**

一类连续不确定动态系统的鲁棒融合滤波器设计与性能分析
Design and Performance Analysis of Robust Fusion Filters for a Class of Continuous Uncertain Dynamic Systems, pp.3-301~3-305

孙航 杭州电子科技大学

刘荣利 杭州电子科技大学
 文成林 杭州电子科技大学

SaA11-2 **13:50-14:10**

基于变量聚类和 PCA 的神经网络在碳分分解率预测中的应用研究
On Neural Network Based on Variables Clustering and PCA for Prediction of Carbonation Precipitation Ratio, pp.3-217~3-221

王晓丽 中南大学
 阳春华 中南大学
 桂卫华 中南大学

SaA11-3 **14:10-14:30**

车辆燃油波动模型分析及滤波方法研究
An Approach to Fluctuation Modeling and Filter Design of Vehicle Oil Tank, pp.3-232~3-236

尹海 哈尔滨工业大学
 刘志远 哈尔滨工业大学

SaA11-4 **14:30-14:50**

Modeling and Analysis of SMT Motion Control System, pp.3-237~3-240

Zhang Yachen South China Univ. of Tech.
 Hu Yueming South China Univ. of Tech.
 Yuan Peng South China Univ. of Tech.

SaA11-5 **14:50-15:10**

基于因果聚类的多变量时间序列相关性研究及预测
Multivariate Time Series Correlation Extract and Prediction Based on Cluster, pp.3-187~3-191

韩敏 大连理工大学
 李德才 大连理工大学

SaA11-6 **15:10-15:30**

量测噪声为 ARMA 的变量带误差系统的辨识
Identification of Errors-In-Variables Systems with ARMA Measurement Noises, pp.3-292~3-295

宋其江 中科院系统所
 陈翰馥 中国科学院

SaB01 15:45-17:45 Meeting Room 1
 Invited Session: Recent Advances in Control of Automotive Systems

Chair: Shen Tielong Sophia Univ.
 Co-Chair: Liu Kang-Zhi Chiba Univ.

SaB01-1 **15:45-16:05**

A Nonlinear Semiactive Rear Differential Control in Rear Wheel Drive Vehicles, pp.6-597~6-602

Riccardo Marino Univ. of Rome Tor Vergata
 Scalzi Stefano Univ. of Rome Tor Vergata
 Cinili Fabio Univ. of Rome Tor Vergata

SaB01-2 **16:05-16:25**

Efficient Engine Development Using Model Based Development (MBD), pp.6-603~6-607

Junichi Kako Toyota Motor Corporation
 Soejima Shinichi Toyota Motor Corporation
 Ohata Akira Toyota Motor Corporation

SaB01-3 **16:25-16:45**

Automatic Parking Benchmark Problem: Experimental Comparison of Nonholonomic Control Methods, pp.6-608~6-612

Horii Masaki Chiba Univ.
 Liu Kang-Zhi Chiba Univ.

SaB01-4 **16:45-17:05**

Experimental Analysis and Control-Oriented Modeling for Cyclic Variation of Cylinder Pressure in IC Engines, pp.6-613~6-617

Li Po Wuhan Univ.
 Shen Tielong Sophia Univ.
 Oguri Yasufumi Sophia Univ.

SaB01-5 <i>Nonlinear Feedback Speed Control of Internal Combustion Engines</i> , pp.6-618~6-622 Zhang Jiangyan Shen Tielong Junichi Kako Jiao Xiaohong	17:05-17:25	Yanshan Univ. Sophia Univ. Toyota Motor Corporation Yanshan Univ.	<i>tems</i> , pp.2-5~2-8 王国胜 刘峰 梁冰 段广仁	装甲兵工程学院 装甲兵工程学院 哈尔滨工业大学 哈尔滨工业大学
SaB01-6 <i>A Model Predictive Control Method for A High-speed Magnetic Actuator</i> , pp.6-623~6-626 Mukai Masakazu Seikoba Suguru Kawabe Taketoshi	17:25-17:45	Kyushu Univ. Kyushu Univ. Kyushu Univ.	SaB03-2 <i>Robust Filtering and Fixed-lag Smoothing for Linear Uncertain System with Single Delayed Measurement</i> , pp.2-23~2-27 Zhao Hongguo Zhang Huanshui Zhang Chenghui Song Xinmin	16:05-16:25 Shandong Univ. Shandong Univ. Shandong Univ. Shandong Univ.
SaB02 Invited Session: Quantum Control and Quantum Information Chair: 丛爽 Co-Chair: 李春文	15:45-17:45	Meeting Room 2 中国科学技术大学 清华大学	SaB03-3 不可约迭代函数系统的商空间理论 <i>Quotient Space Theory About an Irreducible Iterated Function System</i> , pp.4-190~4-192 张铃 张燕平 方宏彬 张沆	16:25-16:45 安徽大学 安徽大学 安徽大学 安徽大学
SaB02-1 <i>Reinforcement Strategy Using Quantum Amplitude Amplification for Robot Learning</i> , pp.6-571~6-575 Dong Daoyi Chen Chunlin Li Hanxiong	15:45-16:05	Chinese Acad. of Sci. Nanjing Univ. City Univ. of Hong Kong	SaB03-4 基于二维混合模型的最优重复控制 <i>Optimal Repetitive Control Based on Two-Dimensional Hybrid Model</i> , pp.2-89~2-92 兰永红 吴敏 余锦华	16:45-17:05 中南大学 中南大学 东京工业大学
SaB02-2 基于 Bloch 球的量子系统状态演化的轨迹控制 <i>Track Control of the States Evolution of Quantum System Based on Bloch Sphere</i> , pp.6-576~6-580 楼跃升 丛爽	16:05-16:25	中国科学技术大学 中国科学技术大学	SaB03-5 <i>Distributed Remote Control System of UAV Based on Man-in-loop Real-time Operation</i> , pp.2-119~2-122 Zhang Fengqing KONG QUANCUN	17:05-17:25 Beihang Univ. Beijing Information Sci. & Tech. Univ.
SaB02-3 操控多个量子位系统的“代价”分析 <i>Cost Analysis of Manipulating Multiple Qubit Systems</i> , pp.6-581~6-585 张明	16:25-16:45	国防科学技术大学	SaB03-6 无轴承异步电机径向悬浮力的微分几何变结构解耦控制 <i>Decoupling Control of the Bearingless Induction Motor Based on Differential Geometry Variable-structure Method</i> , pp.4-17~4-21 董磊 刘贤兴 孙宇新	17:25-17:45 江苏大学 江苏大学 江苏大学
SaB02-4 <i>Performance Comparison Between Classical and Quantum Control for a Simple Quantum System</i> , pp.6-586~6-588 Xi Zairong	16:45-17:05	Chinese Acad. of Sci.	SaB04 鲁棒控制与 H_∞ 控制 (1) Robust and H_∞ Control (1) Chair: Xue Anke Co-Chair: Gao Huijun	15:45-17:45 Meeting Room 4 Hangzhou Dianzi Univ. Univ. of Alberta
SaB02-5 基于状态转移矩阵的薛定谔方程的解 <i>Solution of Schrödinger Equation Based on State Transition Matrix</i> , pp.6-589~6-591 邢艺凡 肖钦文 储迪阳 孙喜策 吴俊	17:05-17:25	浙江大学 浙江大学 浙江大学 浙江大学 浙江大学	SaB04-1 <i>On an Output Feedback Stabilization Problem for a Class of Non-linear Systems</i> , pp.3-561~3-564 Li Zili Chen Zengqiang Yuan Zhuzhi	15:45-16:05 Nankai Univ. Nankai Univ. Nankai Univ.
SaB02-6 $SU(1,1)$ 型双输入量子系统能量最优控制 <i>Energy Optimal Control for Two-input Quantum System Evolving on the Lie Group $SU(1,1)$</i> , pp.6-592~6-596 吴建武 李春文 张靖	17:25-17:45	清华大学 清华大学 清华大学	SaB04-2 离散时间代数 Riccati 方程解矩阵的迹的下界 <i>On Lower Bounds of the Solution of the Discrete Time Algebraic Riccati Equation</i> , pp.3-565~3-567 陈东彦 毕海云	16:05-16:25 哈尔滨理工大学 哈尔滨理工大学
SaB03 系统理论与控制理论 (3) System Theory and Control Theory (3) Chair: 王国胜 Co-Chair: Zhao Hongguo	15:45-17:45	Meeting Room 3 装甲兵工程学院 Shandong Univ.	SaB04-3 数值界不确定关联大系统输出反馈分散鲁棒 H_∞ 控制 <i>Decentralized Robust H_∞ Output Feedback Control for Value Bounded Uncertain Large-scale Interconnected Systems</i> , pp.3-583~3-589 谢永芳	16:25-16:45 中南大学
SaB03-1 二阶动力学系统的全维 PD 观测器设计 <i>Design of Full-order PD Observers for Second-order Dynamic Sys-</i>	15:45-16:05			

黄 灿 桂卫华 蒋朝辉 阳春华	中南大学 中南大学 中南大学 中南大学		
SaB04-4 <i>Delay-dependent Robust H_∞ Control for Uncertain Discrete Singular Time-varying Delay Systems Based on a Finite Sum Inequality</i> , pp.3-595~3-599	16:45-17:05 Hangzhou Dianzi Univ. Hangzhou Dianzi Univ. Hangzhou Dianzi Univ. Hangzhou Dianzi Univ.		
SaB04-5 <i>Delay-dependent Robust Stability and H_∞ Control for Jump Linear System with Interval Time-varying Delay</i> , pp.3-609~3-614	17:05-17:25 Wenzhou Univ. Wenzhou Univ.		
SaB04-6 <i>Robust H_∞ Filter Design for 2DFM Model</i> , pp.3-615~3-619	17:25-17:45 Harbin Inst. of Tech. Univ. of Alberta Univ. of Alberta		
SaB05 最优控制与最优化 (4) Optimal Control and Optimization (4)	15:45-17:45 Meeting Room 5		
Chair: Su Weizhou Co-Chair: 阳春华	South China Univ. of Tech. 中南大学		
SaB05-1 基于分布式混合优化策略的有限装卸力下取送车作业优化 <i>Optimal Operation for Placing-in and Taking-out Wagons with the Limited Loading/Unloading Capacity Based on Distributed Hybrid Optimization Strategy</i> , pp.3-512~3-516	15:45-16:05 中南大学 中南大学 中南大学 中南大学		
SaB05-2 一类离散时间多智能体系统的线性二次分散动态博弈 <i>Linear Quadratic Decentralized Dynamic Games for a Class of Discrete-time Multi-agent Systems</i> , pp.3-517~3-521	16:05-16:25 中国科学院 中国科学院		
SaB05-3 需求不确定闭环供应链鲁棒运作策略设计 <i>Robust Operation Strategy Design for a Closed-loop Supply Chain with Uncertain Demands</i> , pp.3-522~3-526	16:25-16:45 沈阳航空工业学院 沈阳航空工业学院		
SaB05-4 <i>Optimal Tracking Performance of a Linear System with a Quantized Control Input</i> , pp.3-531~3-535	16:45-17:05 South China Univ. of Tech. South China Univ. of Tech. South China Univ. of Tech.		
SaB05-5 基于对等 SAP 的 Q 学习在机器人作业分配中的应用 <i>The Application of Peer to Peer SAP-based Q-Learning in Task Assignment to Multiple Robots</i> , pp.3-536~3-539	17:05-17:25 合肥工业大学 合肥工业大学 合肥工业大学		
SaB05-6 <i>Stackelberg Equilibriums of Open-loop Differential Games</i> , pp.3-446~3-450	17:25-17:45 Xu Yashan Fudan Univ.		
SaB06 模糊系统与模糊控制 (2) Fuzzy System and Fuzzy Control (2)	15:45-17:45 Meeting Room 6		
Chair: 喻 飞 Co-Chair: 王俊玲	江苏省计算机信息处理技术重点实验室 哈尔滨工程大学		
SaB06-1 基于模糊推理的入侵检测系统 <i>Intrusion Detection Based on Fuzzy Reasoning</i> , pp.4-331~4-335	15:45-16:05 喻 飞 沈 岳 廖桂平 张林峰 徐 成	江苏省计算机信息处理技术重点实验室 湖南农业大学 湖南农业大学 湖南农业大学 湖南大学	
SaB06-2 采用模糊逻辑的同位素在线矿浆浓度计 <i>Isotope Online Ore Pulp Concentration Gauge Using Fuzzy Logic</i> , pp.4-262~4-265	16:05-16:25 唐耀庚 高 嵩 欧阳惠斌 李兰君	南华大学 南华大学 南华大学 南华大学	
SaB06-3 基于模糊逻辑的变速恒频风电系统最大风能追踪控制 <i>The Maximal Wind-Energy Tracing Control of Variable-Speed Constant-Frequency Wind Generation System Based on Fuzzy Logic</i> , pp.4-294~4-298	16:25-16:45 肖运启 徐大平 吕跃刚	华北电力大学 华北电力大学 华北电力大学	
SaB06-4 基于模糊控制的 IU1a 特性智能充电机 <i>A Automatic Charger with IU1a Characteristic Based on Fuzzy Control</i> , pp.4-318~4-321	16:45-17:05 高飞燕 李兰君 阳武娇	南华大学 南华大学 南华大学	
SaB06-5 模糊路径查询系统及其在 PX 吸附分离过程中的应用 <i>Fuzzy Path-Query Algorithm and Its Application in PX Absorption and Separation Process</i> , pp.5-381~5-385	17:05-17:25 任 佳 雷美珍 张益波	浙江理工大学 浙江理工大学 浙江理工大学	
SaB06-6 不确定性非线性离散系统的非脆弱模糊保性能控制 <i>Non-Fragile Fuzzy Guaranteed Cost Control of Uncertain Nonlinear Discrete-Time Systems</i> , pp.4-361~4-365	17:25-17:45 王俊玲 舒喆醒 陈 亮 王忠信	哈尔滨工程大学 哈尔滨理工大学 哈尔滨工程大学 哈尔滨工程大学	
SaB07 非线性系统及其控制 (4) Nonlinear System and Control (4)	15:45-17:45 Meeting Room 7		
Chair: Wang Yuzhen Co-Chair: Zhang Jing	Shandong Univ. Kunming Univ. of Sci. & Tech.		

- SaB07-1** 15:45-16:05
Stability and Control of a Class of Constrained Hamiltonian Systems, pp.2-482~2-486
Cai Xin Shandong Univ.
Wang Yuzhen Shandong Univ.
Sun Weiwei Shandong Univ.
- SaB07-2** 16:05-16:25
多重分形和商空间理论在蛋白质结构类分析中的应用
Protein Structure Class Analysis Based on Multifractal and Quotient Space, pp.2-487~2-491
郑婷婷 安徽大学
毛军军 安徽大学
吴涛 安徽大学
宋杰 安徽大学
- SaB07-3** 16:25-16:45
Linearization of Switched Nonlinear Systems, pp.2-419~2-423
Yuan Yanyan Chinese Acad. of Sci.
Cheng Daizhan Chinese Acad. of Sci.
- SaB07-4** 16:45-17:05
Hierarchy Modeling for Component-based Complex Control Software, pp.2-395~2-398
Zhang Jing Kunming Univ. of Sci. & Tech.
Zhang Yunsheng Kunming Univ. of Sci. & Tech.
Xiang Fenghong Kunming Univ. of Sci. & Tech.
- SaB07-5** 17:05-17:25
一类离散双线性系统的全局渐近稳定控制
Globally Asymptotically Stabilizing Control for a Class of Discrete-time Bilinear Systems, pp.2-309~2-311
齐义文 黑龙江大学
张显 黑龙江大学
- SaB07-6** 17:25-17:45
基于线性微分包含的约束非线性系统双模预测控制
Dual-mode Predictive Control of Constrained Nonlinear Systems via Linear Differential Inclusion, pp.2-434~2-438
赵敏 上海交通大学
李少远 上海交通大学
- SaB08** 15:45-17:45 Meeting Room 8
工业系统 (1)
Industrial System (1)
Chair: 孟庆金 济南大学
Co-Chair: Liu Lin Beijing Jiaotong Univ.
- SaB08-1** 15:45-16:05
Rotor Speed Estimation Using Zero-Crossing Times Signal of Stator Current, pp.6-298~6-302
Ghanbarian Mahdi Islamic Azad Univ.
Mohammadi Ali Islamic Azad Univ.
Kavehnia Farzad Islamic Azad Univ.
Keivani Hamid Islamic Azad Univ.
Askari Mohammad Islamic Azad Univ.
Mohammadi Sirous Islamic Azad Univ.
- SaB08-2** 16:05-16:25
基于体绘制技术的虚拟光刻系统建模与实现
Modeling and Implementation of Virtual Optical Lithography System Based on Volume Rendering, pp.4-783~4-786
张启程 南开大学
孙广毅 南开大学
赵新 南开大学
王俊伟 南开大学
金纯 南开大学
卢桂章 南开大学
- SaB08-3** 16:25-16:45
基于多目标智能优化的铅锌烧结生产全流程协调控制
Coordinating Control Based on Multi-objective Intelligent Optimization for the Overall Lead-zinc Sintering Process, pp.6-249~6-253
段平 中南大学
吴敏 中南大学
徐辰华 中南大学
- SaB08-4** 16:45-17:05
Wireless Sensing and Control of Structural Vibration From Earthquake, pp.6-194~6-198
Liu Lin Beijing Jiaotong Univ.
Dyke Shirley J. Washington Univ. in St. Louis
Veto Rebecca Washington Univ. in St. Louis
- SaB08-5** 17:05-17:25
热电厂 CFB 锅炉燃烧智能控制策略研究
On Intelligent Control of Combustion for CFB Boiler in Thermal Power Plant, pp.6-311~6-313
孟庆金 济南大学
权悦 济南大学
景绍洪 济南大学
- SaB08-6** 17:25-17:45
An LQR/Pole Placement Controller Design for STATCOM, pp.6-189~6-193
Nekoui Mohammad Ali Islamic Azad Univ.
Valipourearkhloo Amin Islamic Azad Univ.
- SaB09** 15:45-17:45 Meeting Room 9
智能机器人 (2)
Intelligent Robot (2)
Chair: 苏剑波 上海交通大学
Co-Chair: 阮久宏 山东交通学院
- SaB09-1** 15:45-16:05
凿岩机器人液压系统 ADRC 控制器设计与仿真
Study on ADRC Controller Design and Simulation of Rock Drill Robot Joint Hydraulic Drive System, pp.5-133~5-136
阮久宏 山东交通学院
荣学文 山东大学
吴三友 山东交通学院
- SaB09-2** 16:05-16:25
无标定手眼协调跟踪系统性能分析与改进
Performance Investigation and Improvement for the Uncalibrated Hand-Eye Coordination System, pp.5-141~5-144
苏剑波 上海交通大学
- SaB09-3** 16:25-16:45
基于地标信息融合的家庭环境机器人组合导航
Robot Integrated Navigation Based on Landmark Information Fusion in Home Environment, pp.5-145~5-148
王红霞 山东大学
田国会 山东大学
李晓磊 山东大学
卜范骞 山东大学
- SaB09-4** 16:45-17:05
Gait Design and Balance Control for the Biped Robot Based on Reaction Null-space Method, pp.5-169~5-173
Huai Chuangfeng Beijing Jiaotong Univ.
FANG Yuefa Beijing Jiaotong Univ.
Guo Sheng Beijing Jiaotong Univ.
- SaB09-5** 17:05-17:25
A Novel Path Planning Method Based on Certainty Grids Map for Mobile Robot, pp.5-185~5-188
Li Jigong Lanzhou Univ. of Tech.
Feng Yiwei Lanzhou Univ. of Tech.
Zhu Chaoqun Lanzhou Univ. of Tech.

SaB09-6 **17:25-17:45**
The Control of Search and Rescue Robots with the General Suppression Control Framework, pp.5-229~5-233
 LAU Henry The Univ. of Hong Kong

SaB10 15:45-17:45 Meeting Room 10
 信息处理系统 (2)
 Information Processing Systems (2)
 Chair: 董峰 天津大学
 Co-Chair: 洪伟 吉林大学

SaB10-1 **15:45-16:05**
 城市交通信号的在线强化学习控制
On-line Reinforcement Learning Control for Urban Traffic Signals, pp.6-34~6-37
 刘智勇 五邑大学
 马凤伟 五邑大学

SaB10-2 **16:05-16:25**
 自适应的动态地图匹配方法
A Dynamic Map-matching Method for Adaptability, pp.6-66~6-70
 洪伟 吉林大学通信学院
 田彦涛 吉林大学通信学院
 徐斌 吉林大学通信学院

SaB10-3 **16:25-16:45**
 基于压电扫描管动态特性分析的 AFM 成像方法研究
AFM Imaging Method Based on the Analysis of Piezo-Scanner Dynamic Characteristic, pp.5-404~5-408
 董晓坤 南开大学
 方勇纯 南开大学
 周娴玮 南开大学
 张玉东 南开大学

SaB10-4 **16:45-17:05**
 多截面电阻层析成像系统并行数据采集的设计
Multi-Plane Electrical Resistance Tomography System Based on Parallel Data Acquisition Strategy, pp.5-391~5-395
 谭超 天津大学
 董峰 天津大学
 王斌斌 天津大学

SaB10-5 **17:05-17:25**
A New Multi-scale Estimation Scheme for Dynamic System, pp.5-396~5-399
 Zhou Funa Henan Univ.
 Tang Tianhao Shanghai Maritime Univ.
 Wen Chenglin Hangdian Univ.

SaB10-6 **17:25-17:45**
On Vibration Control Methods of Vehicle, pp.6-71~6-74
 Sun Jianmin Beijing Inst. of Civil Engineering & Architecture
 Yang Qingmei Beijing Union Univ.

SaB11 15:45-17:45 Meeting Room 11
 建模、辨识与信号处理 (4)
 Modeling, Identification and Signal Processing (4)
 Chair: Fang Haitao Chinese Acad. of Sci.
 Co-Chair: 陈泰任 中南大学

SaB11-1 **15:45-16:05**
 多传感器信息融合 Wiener 反卷积预报器
Multisensor Information Fusion Wiener Deconvolution Predictor, pp.3-120~3-123
 毛琳 黑龙江大学
 邓自立 黑龙江大学

SaB11-2 **16:05-16:25**
 激光陀螺捷联惯导系统的系统级标定方法研究
Systematic Calibration Method for the Laser Gyro Strapdown Inertial Navigation System, pp.6-478~6-483

杨晓霞 中国科学院
 黄一 中国科学院

SaB11-3 **16:25-16:45**
 制导炸弹误差模型的仿真与分析
Error Model Simulation and Analysis for Guided Bomb, pp.3-256~3-259

穆育强 南京理工大学
 钱龙军 南京理工大学
 盛安冬 南京理工大学

SaB11-4 **16:45-17:05**
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 Zhang Jian Hunan Univ. of Sci. & Tech.
 Fan Xiaoping Central South Univ.
 Huang CaiLun Central South Univ.

SaB11-5 **17:05-17:25**
 一种新的集成模型在焦炉火道温度软测量中的应用
A New Integrated Model and Its Application to Soft-sensing of the Flue Temperature in Coke Oven, pp.3-282~3-286
 陈泰任 中南大学
 曹卫华 中南大学
 吴敏 中南大学
 雷琪 中南大学

SaB11-6 **17:25-17:45**
Recursive Subspace Identification for Closed-loop Systems, pp.3-287~3-291
 Jiang YuePing Chinese Acad. of Sci.
 Fang Hai-Tao Chinese Acad. of Sci.

Poster Session PSaA
July 28, 14:30-16:00
 Chair: 李少远 上海交通大学
 Co-Chair: 钟宣生 清华大学
 Co-Chair: 俞立 浙江工业大学

PSaA-1
 基于小波变换和形态学的复杂背景文本定位
Text Location on Complex Background Using DWT and Morphology Operation, pp.4-467~4-471
 沈庆华 湖南大学
 李树涛 湖南大学
 李怡 中南大学

PSaA-2
 直流电机调速系统的无模型学习自适应控制
The Model-free Learning Adaptive Control for DC Motor Rotate Speed Systems, pp.3-738~3-742
 曹荣敏 北京机械工业学院
 侯忠生 北京交通大学
 黄健 北京机械工业学院

PSaA-3
Image Segmentation Based on the Mean-Shift in the HSV Space, pp.4-476~4-479
 Li Si qiang Daqing Petroleum Inst.
 Liu Wei Harbin Engineering Univ.

PSaA-4
A Line Detection Algorithm Based on Error Propagation, pp.4-493~4-496
 Gao Xiaoping Wuhan Univ. of Sci. & Engineering
 Peng Tao Wuhan Univ. of Sci. & Engineering

PSaA-5
 基于输入点集求解 k-Means 聚类算法
An Approximate Algorithm for K-Means Problem Based on Input Points, pp.4-500~4-504

- 王守强 山东交通学院
朱大铭 山东大学
史士英 山东交通学院
- PSaA-6**
Generalized Fuzzy Enhancement Based Recognizing Method for Planar Objects, pp.4-505~4-509
Wang Zaifu Hangzhou Dianzi Univ.
- PSaA-7**
A Novel Kernel PCA Support Vector Machine Algorithm with Feature Transition Function, pp.4-510~4-512
Wang Lianhong Hunnan Univ.
ZHANG Guo-yun Hunan Inst. of Sci. & Tech.
Zhang Jing Hunan Univ.
- PSaA-8**
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A Fuzzy Clustering Ensemble Based on Dual Boosting, pp.4-549~4-553
翟素兰 安徽大学
罗斌 安徽大学
郭玉堂 安徽省教育学院
- PSaA-9**
An Improved General Particle Swarm Optimization Algorithm for Fast Infrared Image Segmentation, pp.4-558~4-562
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Li Qi Southeast Univ.
Xia Liang-zheng Southeast Univ.
- PSaA-10**
The Path Planning of Virtual Endoscopy Based on Image Segmentation, pp.4-567~4-570
Gao Xiangjun South China Univ. of Tech.
Tian LianFang South China Univ. of Tech.
Wang Lifei Guangzhou Univ. of Traditional Chinese Medicine
Mao Zongyuan South China Univ. of Tech.
- PSaA-11**
基于 RJMCMC 的多维尺度分析维数选择
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王行愚 华东理工大学
- PSaA-12**
VSC Based on CMAC Neural Network for a Class of MIMO Nonlinear System, pp.4-6~4-9
Wu Guangbin Naval Aeronautical Engineering Acad.
- PSaA-13**
3D Variable Structure Guidance Law Based on Adaptive Model-following Control with Impact Angular Constraints, pp.4-61~4-66
Sun Wei-meng National Univ. of Defense Tech.
ZHENG Zhi-qiang National Univ. of Defense Tech.
- PSaA-14**
执行器失效不确定时滞系统的指数稳定鲁棒 H_∞ 可靠控制
Robust H_∞ Reliable Control with Exponential Stabilization for Uncertain Delay Systems Against Actuator Failure, pp.4-634~4-638
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范多旺 兰州交通大学
- PSaA-15**
深海采矿移动机器人控制的关键技术
On Key Control Problems of Deep Seabed Moving Mining Robot, pp.4-660~4-663
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桂卫华 中南大学
阳春华 中南大学
- 王随平 中南大学
谢永芳 中南大学
- PSaA-16**
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Li Quanshan Beijing Univ. of Chemical Tech.
Wei Huan Beijing Univ. of Chemical Tech.
Wang Wenxin Beijing Univ. of Chemical Tech.
Jin Qibing Beijing Univ. of Chemical Tech.
Pan Lideng Beijing Univ. of Chemical Tech.
- PSaA-17**
工业硬实时控制嵌入式软件设计中的时间触发构架 (TTA) 机制
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王彬 昆明理工大学
张云生 昆明理工大学
熊新 昆明理工大学
王帅 昆明理工大学
- PSaA-18**
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- PSaA-19**
Robust Self-tuning IMC for Opto-electronic Tracking Time-delay System, pp.4-758~4-762
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Ji Wei Jiangsu Univ.
Pan Wei Jiangsu Univ.
Qian Yanping Hohai Univ.
- PSaA-20**
无轴承同步磁阻电动机反馈解耦控制
Feedback Decoupling Control of Bearingless Synchronous Reluctance Motor, pp.4-763~4-767
张汉年 南京信息职业技术学院
朱焜秋 江苏大学
刁小燕 江苏大学
- PSaA-21**
商品混凝土企业集成系统研究
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姚明海 浙江工业大学
李海红 浙江工业大学
朱华 浙江工业大学
- PSaA-22**
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景绍洪 济南大学
孟庆金 济南大学
袁铸钢 济南大学
- PSaA-23**
基于 Petri 网的企业信息化系统统一建模研究
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王志坚 广东商学院
蔡自兴 中南大学
- PSaA-24**
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薛朝改 郑州大学
高激 郑州大学
曹海旺 郑州航空工业管理学院

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基于扩展卡尔曼滤波器的无速度传感器异步电动机直接转矩控制
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刘贤兴 江苏大学
 乔薇 江苏大学
 周旭 江苏大学
 胡育文 南京航空航天大学

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高性能直线/圆弧插补的设计与对比
Comparison and Design of High Performance Straight-Line and Circular Arc Interpolations, pp.5-14~5-18

刘宜 中国科学技术大学
 丛爽 中国科学技术大学

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无轴承异步电机转子磁场定向控制研究
Rotor Magnetic Field Oriented Control for Bearingless Induction Motors, pp.5-19~5-22

朱焜秋 江苏大学
 李烽 江苏大学
 潘伟 江苏大学
 孙晓东 江苏大学

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修杰 天津大学
 夏长亮 天津大学

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Xiu Jie Tianjin Univ.
 Xia Chang-liang Tianjin Univ.

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基于 ARM 的机器人运动控制系统
A Robot Motion Control System Based on ARM, pp.5-54~5-57

田景文 北京联合大学
 高美娟 北京联合大学
 李瑾 北京化工大学
 李凯 北京化工大学

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王立强 浙江大学
 雷美珍 浙江理工大学
 卢琴芬 浙江大学
 叶云岳 浙江大学

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 Zhou Zhou Northwestern Polytechnical Univ.

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 XUAN DONG JI Chonnam National Univ.
 Kim Jin wan Chonnam National Univ.
 Kim Young Bae Chonnam National Univ.

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杨毅 北京理工大学
 付梦印 北京理工大学
 孙常胜 北京理工大学
 王美玲 北京理工大学
 赵诚 北京理工大学

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非完整性约束下移动机器人带虚拟障碍物的路径规划
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雷兆明 河北工业大学
 孙鹤旭 河北工业大学
 刘作军 河北工业大学
 林涛 河北工业大学
 杨鹏 河北工业大学

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YANG Qiliang PLA's Univ. of Sci. & Tech.
 Xing Jianchun PLA's Univ. of Sci. & Tech.
 WANG Ping PLA's Univ. of Sci. & Tech.

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GDCS 任务调度的 SPN 模型研究
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 黄道平 华南理工大学
 李小亚 华南理工大学

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 Guo Ge Dalian Maritime Univ.
 Hong Yi Lanzhou Univ. of Tech.
 Luo Dongsong Lanzhou Univ. of Tech.

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 黄建新 南京师范大学
 曹弋 南京师范大学

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Create Multi-dimension Linked Lists on Recursive Algorithm and the Application, pp.5-336~5-339

Chen Guangyi Foshan Univ.
 He Zhaoyong South China Univ. of Tech.

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结合图像信息的污染企业选址研究
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张航 中南大学
 王一军 中南大学
 罗大庸 中南大学
 王潇 中南大学

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何晓峰 国防科技大学

- 胡小平 国防科技大学
吴美平 国防科技大学
秦海力 国防科技大学总装备部
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Wallace Michael WSP
Evans David WSP Company
- PSaA-44**
劣化系统的故障诊断和检测策略的综合研究
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王丽英 石家庄铁道学院
方攸同 浙江大学
苏丽颖 北京工业大学
刘宝友 石家庄铁道学院
- PSaA-45**
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李俊 南京工业大学
陆爱晶 南京工业大学
张广明 南京工业大学
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Liang Baoshe Hebei Univ. of Engineering
Fan Feng Hebei Univ. of Engineering
Shen Songhua Beijing Univ. of Aeronautics & Astronautics
- PSaA-47**
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Hou Rongtao Nanjin Univ. of Information Sci. & Tech.
- PSaA-48**
Traffic Flow Forecasting Based on Fuzzy-Neural, pp.4-391~4-394
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- PSaA-49**
On Remote Real-time Communication Between MATLAB and PLC Based on OPC Technology, pp.5-545~5-548
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Zeng Aiqun Guilin Univ. of Tech.
Zhang Yunsheng Kunming Univ. of Sci. & Tech.
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- Chair: 胥布工 华南理工大学
Co-Chair: 楚天广 北京大学
Co-Chair: 周彤 清华大学
- PSaB-1**
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马长林 华中师范大学
姜红 湖北长江职业技术学院
- PSaB-2**
网络控制系统采样速率和时延抖动稳定性分析
Stability Analysis of Network-Based Control Systems Subject to Jitter of Sampling Rates and Time Delays, pp.5-567~5-570
沈青 中南大学
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阳春华 中南大学
熊英 中南大学
- PSaB-3**
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孙鹤旭 河北工业大学
林涛 河北工业大学
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- PSaB-4**
Energy Efficient Routing Protocol Based on Residual Energy and Energy Consumption Rate for Heterogeneous Wireless Sensor Networks, pp.5-587~5-590
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Huang Daoping South China Univ. of Tech.
Yang Jian South China Univ. of Tech.
- PSaB-5**
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杨洪勇 鲁东大学
闫孝泉 鲁东大学
张嗣瀛 东北大学
- PSaB-6**
一种基于 P2P 技术的 Gnutella 网络的资源定位搜索算法的研究
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郭玉堂 安徽大学
吕皖丽 安徽大学
罗斌 安徽大学
- PSaB-7**
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邓鹏程 重庆大学
张阳 重庆大学
- PSaB-8**
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Dynamic Scheduling and Robust Control Co-Design for Networked Control Systems, pp.5-639~5-643
王艳 江南大学
纪志成 江南大学
谢林柏 江南大学
胡维礼 南京理工大学
- PSaB-9**
自适应 Internet 主动队列管理算法
Internet Adaptive Active Queue Management Algorithm, pp.5-648~5-651
赵永升 鲁东大学
张福增 鲁东大学
杨洪勇 鲁东大学
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严旭影 中南大学
彭军 中南大学
张伟 中南大学
李春明 中南大学
童海涛 中南大学

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程远林 长沙理工大学
李茂军 长沙理工大学

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Chen Guang-Yi Foshan Univ.
Guo Wei Guangdong Univ. of Tech., Foshan Univ.
Huang Kai-sheng Guangdong Univ. of Tech.

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Li Youxin South China Univ. of Tech.
Mao Zongyuan South China Univ. of Tech.
Tian Lianfang South China Univ. of Tech.

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崔志华 太原科技大学
蔡星娟 太原科技大学
曾建潮 太原科技大学
孙国基 西安交通大学

PSaB-15

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蔡星娟 太原科技大学
崔志华 太原科技大学
曾建潮 太原科技大学
谭瑛 太原科技大学

PSaB-16

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Jin Jian Xun Univ. of Electronic Sci. & Tech. of China
Guo Youguang Univ. of Tech., Sydney
Chen Jiaxin Donghua Univ.
Zheng LuHai Univ. of Electronic Sci. & Tech. of China
Zhu Jianguo Univ. of Tech., Sydney

PSaB-17

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王正武 中南大学
罗中庸 中南大学
黄中祥 长沙理工大学

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吴义虎 长沙理工大学
宋丹丹 长沙理工大学
侯志祥 长沙理工大学
袁祥 长沙理工大学

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刘泓 杭州电子科技大学

王慧 浙江大学
张晋 浙江大学
郑民 义乌工商学院

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王红蕾 贵州大学
魏一鸣 中国科学院

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魏长顺 安徽工程科技学院
沈银花 铜陵学院
魏利胜 上海大学

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Yang Suying Dalian Univ. of Tech.
Fang Lixin Dalian Univ. of Tech.
Zhong Chongquan Dalian Univ. of Tech.
Lu Xinkai Dalian Univ. of Tech.

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Dai Bo Beijing Inst. of Petro-chemical Tech.
Zhang Huiping Beijing Inst. of Petro-chemical Tech.
SHENG Sha Beijing Inst. of Petro-chemical Tech.
Dong Jinxi Beijing Inst. of Petro-chemical Tech.
XIE Zurong Beijing Inst. of Petro-chemical Tech.
TANG Dongliang Beijing Inst. of Petro-chemical Tech.

PSaB-24

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高潮 深圳信息职业技术学院

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王孝红 济南大学
吴姝芹 济南大学
申涛 济南大学
范勇 桂林电子科技大学

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曹丽婷 北京联合大学
田景文 北京联合大学
李淑琴 北京众恒自动化有限公司
邢莉萍 北京众恒自动化有限公司

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Liu Hua Hebei Univ. of Engineering
Zhao Baoquan Hebei Univ. of Engineering
Wang Guangjian Hebei Univ. of Engineering

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丁光彬 河北工程大学理学院
庞培林 河北工程大学理学院

PSaB-29

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戴波 北京石油化工学院
盛沙 北京石油化工学院
田小平 北京石油化工学院
杨卓然 北京化工大学
谢祖嵘 北京石油化工学院

PSaB-30

一种新型的蓄电池组状态在线检测及故障预报算法

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尹春杰 山东大学
孙洁君 山东大学
张承慧 山东大学

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陈志盛 长沙理工大学
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岳菊梅 西安电子科技大学
李俊民 西安电子科技大学
闫永义 西安电子科技大学

PSaB-33

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黄志武 中南大学
阳同光 中南大学
桂卫华 中南大学
单勇腾 中南大学
年晓红 中南大学

PSaB-34

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Cao Hui Xi'an Jiao Tong Univ.
Si Gangquan Xi'an Jiao Tong Univ.
Zhang Yanbin Xi'an Jiao Tong Univ.
Ma Xikui Xi'an Jiao Tong Univ.

PSaB-35

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Qiao Jihong Beijing Tech. & Business Univ.
Dai YaPing Beijing Inst. of Tech.
Liu JinKun Beijing Univ. of Aeronautics & Astronautics
Wang Hongyan Acad. of Armored Force Engineering

PSaB-36

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Jiang MingHua Wuhan Univ. of Sci. & Engineering
Zhou Jingli Huazhong Univ. of Sci. & Tech.
Hu Ming Wuhan Univ. of Sci. & Engineering

PSaB-37

基于遗传算法的锅炉过热汽温聚类自适应模糊控制器的设计

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李鑫滨 燕山大学
窦春霞 燕山大学
年晓红 中南大学

PSaB-38

Control of Proton Exchange Membrane Fuel Cell Based on Fuzzy Logic, pp.4-345~4-349

Zhan Yuedong Kunming Univ. of Sci. & Tech.
Zhu Jianguo Univ. of Tech., Sydney
Guo Youguang Univ. of Tech., Sydney
Jin Jian Xun Univ. of Electronic Sci. & Tech. of China

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基于模糊理论的智能服装交易系统研究

Humanized Clothing Recommendation System Based on Fuzzy Set Theory, pp.4-380~4-385

解迎刚 北京科技大学
王志良 北京科技大学
张琴 北京科技大学

PSaB-40

Fuzziness in Covering Generalized Rough Sets, pp.4-386~4-390

Xu Weihua Xi'an Jiaotong Univ.
Zhang Xiaoyan Guangdong Ocean Univ.

PSaB-41

Using Fuzzy Neural Network in Real Estate Prices Prediction, pp.4-399~4-402

Zhang Xiaoli Chongqing Tech. & Business Univ.

PSaB-42

基于 MATLAB 供热温度模糊自整定 PID 控制系统仿真

On Fuzzy Self-tuning PID MATLAB Simulation for Central Heating, pp.4-425~4-429

蒋蔚 北京联合大学
印平 北京联合大学
曹丽婷 北京联合大学

PSaB-43

Feature Extraction Method in Fault Diagnosis Based on Wavelet Fuzzy Network for Power System Rotating Machinery, pp.4-437~4-441

Kang Shanlin Hebei Univ. of Engineering
Pang Peilin Hebei Univ. of Engineering
Fan Feng Hebei Univ. of Engineering
Ding Guangbin Hebei Univ. of Engineering

PSaB-44

基于满意度的 T-S 模糊建模方法及应用

T-S Fuzzy Modeling and Application Based on Satisfactory Optimization, pp.4-446~4-450

刘剑锋 中南大学
桂卫华 中南大学
黄志武 中南大学

PSaB-45

永磁同步电机直接转矩控制系统的开关频率优化及其模糊控制

Switching Frequency Optimize and Fuzzy Logic Based Direct Torque Control of Permanent Magnetic Synchronous Motor, pp.4-374~4-379

盛义发 南华大学
喻寿益 中南大学
洪镇南 南华大学
高金生 中南大学

PSaB-46

Indefinite Stochastic Linear Quadratic Control in Infinite Time Horizon, pp.3-502~3-506

Tang Huaibin

Shandong Univ.

Wu Zhen

Shandong Univ.

Zhang Weihai

Shandong Univ. of Sci. & Tech.

PSaB-47

A Novel Bionic Neural Network Control Method for Vivid Animation of Virtual Animal's Locomotion, pp.4-156~4-161

Zhang Daibing

National Univ. of Defense Tech.

July 29, 2007

SuA01 08:30-10:30 Meeting Room 1
Invited Session: Advanced Control Theory and Applications (I)

Chair: Feng Gang City Univ. of Hong Kong
Co-Chair: Huang Jie Chinese Univ. of Hong Kong

SuA01-1 08:30-08:50
Finite-Time Input-to-State Stability and Related Lyapunov Analysis, pp.6-652~6-656

Hong Yiguang Chinese Acad. of Sci.
Jiang Zhong-Ping Polytechnic Univ. of New York
Feng Gang City Univ. of Hong Kong

SuA01-2 08:50-09:10
Global Robust Output Regulation for Non-minimum Phase Nonlinear Systems in Lower Triangular Form, pp.6-657~6-661

Zhong Renxin The Chinese Univ. of Hong Kong
Huang Jie Chinese Univ. of Hong Kong

SuA01-3 09:10-09:30
Design and Implementation of a Fully Autonomous Flight Control System for a UAV Helicopter, pp.6-662~6-667

Peng Kemao National Univ. of Singapore
Dong Miaobo National Univ. of Singapore
Chen Ben M. National Univ. of Singapore
Cai Guowei National Univ. of Singapore
Lum Kai Yew National Univ. of Singapore
Lee Tong H. National Univ. of Singapore

SuA01-4 09:30-09:50
An Improved Approach to Robust H2 and H-infinity Filter Design for Uncertain Linear Systems with Time-varying Parameters, pp.6-668~6-672

XU JUN National Univ. of Singapore
Xie Lihua Nanyang Technological Univ.

SuA01-5 09:50-10:10
Synchronization of Vicsek Model with Large Population, pp.6-673~6-677

Liu Zhi-Xin Chinese Acad. of Sci.
Guo Lei Chinese Acad. of Sci.

SuA01-6 10:10-10:30
A Parametric Lyapunov Equation Approach to the Design of Low Gain Feedback, pp.6-678~6-682

Zhou Bin Harbin Inst. of Tech.
Duan Guang-Ren Harbin Inst. of Tech.
Lin Zongli Univ. of Virginia

SuA02 08:30-10:30 Meeting Room 2
Invited Session: 认知模式识别
Invited Session: Cognitive Pattern Recognition

Chair: Pi YouGuo South China Univ. of Tech.
Co-Chair: 田联房 华南理工大学

SuA02-1 08:30-08:50
一种突触后抑制递归神经网络结构及其在模式识别中的应用
A Post-Synaptic Inhibition Recurrent Neural Network Structure and Its Application to Pattern Classification, pp.6-683~6-688

苏彩红 佛山科学技术学院
曾永发 佛山科学技术学院
张志飞 佛山大学
吴菁 华南理工大学

SuA02-2 08:50-09:10
Simple Grid Based on Cognitive Mechanism and Application Research on Description for Structure of Chinese Character, pp.6-689~6-693

Liang TianCai South China Univ. of Tech.
Qiu Zhiwen South China Univ. of Tech.
Pi YouGuo South China Univ. of Tech.

SuA02-3 09:10-09:30
The Frame of Cognitive Pattern Recognition, pp.6-694~6-696

Pi YouGuo South China Univ. of Tech.
Shu HuaiLin Guangzhou Univ.
Liang TianCai South China Univ. of Tech.

SuA02-4 09:30-09:50
Bi-criteria Acceleration Minimization of Redundant Robot Manipulator Using LVI-based Primal-Dual Neural Network, pp.6-701~6-706

Zhang Yunong Sun Yat-sen Univ.
Yin Jiangping Sun Yat-sen Univ.
Tian LianFang South China Univ. of Tech.

SuA02-5 09:50-10:10
混沌免疫网络的多峰函数优化算法
Multi-modal Function Optimization Based on Artificial Immune Network and Chaos, pp.6-707~6-710

邓九英 广东教育学院
毛宗源 华南理工大学

SuA02-6 10:10-10:30
基于小波变换和纹理测度的多模医学图像融合
Multi-modal Medical Image Fusion Based on Wavelet Transform and Texture Measure, pp.6-697~6-700

康原原 华南理工大学
李彬 华南理工大学
田联房 华南理工大学
毛宗源 华南理工大学

SuA03 08:30-10:30 Meeting Room 3
系统理论与控制理论 (4)
System Theory and Control Theory (4)

Chair: Li Shaoyuan Shanghai Jiao Tong Univ.
Co-Chair: Wu Ai-Guo Harbin Inst. of Tech.

SuA03-1 08:30-08:50
Controllability of Switched Linear Systems, pp.2-128~2-131

Qiao Yupeng Chinese Acad. of Sci.
Cheng Daizhan Chinese Acad. of Sci.

SuA03-2 08:50-09:10
Stability and Stabilization of Discrete-time Linear Systems Over Networks with Control Input Quantization, pp.2-137~2-140

Guo Yafeng Shanghai Jiao Tong Univ.
Li Shaoyuan Shanghai Jiao Tong Univ.

SuA03-3 09:10-09:30
Time-Delay Dependent Robust Passive Control for a Class of Nonlinear Time-Delay Systems, pp.2-151~2-155

Yang Li Liaoning Univ.
Zhang Qingling Northeastern Univ.

SuA03-4 09:30-09:50
A Proof of the Discrete-Time KYP Lemma Using Semidefinite Programming Duality, pp.2-156~2-160

Cheng Yiping Beijing Jiaotong Univ.

SuA03-5 09:50-10:10
PMID Observer Design of Descriptor Linear Systems, pp.2-161~2-165

Wu Ai-Guo Harbin Inst. of Tech.
Duan Guangren Harbin Inst. of Tech.

SuA03-6 10:10-10:30
Continuous Finite Time Control for Stewart Platform with Terminal Sliding Mode, pp.4-27~4-30

Zhao Dongya Shanghai Jiao Tong Univ.
Li Shaoyuan Shanghai Jiao Tong Univ.
Gao Feng Shanghai Jiao Tong Univ.

SuA04	08:30-10:30	Meeting Room 4
鲁棒控制与 H_∞ 控制 (2) Robust and H_∞ Control (2)		
Chair: 钟宜生		清华大学
Co-Chair: Xu Xiaojie		Wuhan Univ.
SuA04-1	08:30-08:50	
<i>Nonlinear H_∞ Control of Switched Homogeneous Nonlinear Systems</i> , pp.2-537~2-541		
Zhang Lijun		Harbin Engineering Univ.
Xue Suqin		Yan'an Univ.
SuA04-2	08:50-09:10	
不确定时滞系统的时滞相关非脆弱 H_∞ 控制 <i>Non-fragile Delay-dependent H_∞ Control for Uncertain Systems</i> , pp.3-625~3-629		
肖伸平		中南大学
吴敏		中南大学
张先明		中南大学
SuA04-3	09:10-09:30	
<i>Non-Fragile Mixed LQR/H_∞ Control Problem for Linear Discrete-time Systems with Controller Uncertainty</i> , pp.3-635~3-639		
Xu Xiaojie		Wuhan Univ.
SuA04-4	09:30-09:50	
<i>Quantized Dynamic Output Feedback H_∞ Controller Design</i> , pp.3-665~3-669		
Che Weiwei		Northeastern Univ.
Yang Guang-Hong		Northeastern Univ.
SuA04-5	09:50-10:10	
<i>Improvement of Robust Positive Realness for a Class of Uncertain Systems</i> , pp.3-674~3-677		
Li Jing		Xiamen Univ.
Zeng Jian ping		Xiamen Univ.
SuA04-6	10:10-10:30	
多工作点 PMSM 伺服系统的高精度鲁棒控制器设计 <i>High Precision Robust Controller Design for PMSM Servo System with Multi-operating-points</i> , pp.3-691~3-695		
杨书生		清华大学
钟宜生		清华大学
SuA05	08:30-10:30	Meeting Room 5
自适应控制与学习控制 (1) Adaptive Control and Learning Control (1)		
Chair: 张天平		扬州大学
Co-Chair: 孟斌		北京控制工程研究所
SuA05-1	08:30-08:50	
高超声速飞行器基于特征模型的自适应控制 <i>Adaptive Control Based on Characteristic Model for a Hypersonic Flight Vehicle</i> , pp.3-720~3-724		
孟斌		北京控制工程研究所
吴宏鑫		北京控制工程研究所
SuA05-2	08:50-09:10	
仿人智能 MFA 控制在过热蒸汽温度系统中的应用 <i>Model-free Adaptive with Human-simulated Intelligent Control and Its Application in Super-heated Steam Temperature System</i> , pp.3-725~3-728		
徐爱东		山东电力工程咨询院
李传庆		山东电力工程咨询院
陈艳军		山东电力工程咨询院
刘广生		东北电力大学
韩莉		东北电力大学
SuA05-3	09:10-09:30	
<i>Adaptive Constrained Predictive PID Controller via Particle Swarm Optimization</i> , pp.3-729~3-733		
Song Ying		Nankai Univ.

Chen Zengqiang		Nankai Univ.
Yuan Zhuzhi		Nankai Univ.
SuA05-4	09:30-09:50	
基于动态面控制的间接自适应神经网络控制 <i>Indirect Adaptive Neural Network Control Using Dynamic Surface Control</i> , pp.3-756~3-760		
张天平		扬州大学
李红春		扬州大学
王芹		扬州大学
SuA05-5	09:50-10:10	
一类高阶非线性系统的自适应重复学习控制 <i>Adaptive Repetitive Learning Control for a Class of Nonlinear Time-varying Systems</i> , pp.3-766~3-770		
孙云平		西安电子科技大学
李俊民		西安电子科技大学
张果		西安电子科技大学
SuA05-6	10:10-10:30	
基于 AdaBoost 的手写体汉字相似字符识别 <i>Handwritten Chinese Similar Characters Recognition Based on AdaBoost</i> , pp.4-576~4-579		
张彬		华南理工大学
金连文		华南理工大学
SuA07	08:30-10:30	Meeting Room 7
非线性系统及其控制 (5) Nonlinear System and Control (5)		
Chair: Tan Yonghong		Guilin Univ. of Electronic Tech.
Co-Chair: Wang Jing		Peking Univ.
SuA07-1	08:30-08:50	
<i>Model Reduction for a Class of Nonlinear Systems</i> , pp.2-390~2-394		
Wang Jing		Department of Mechanics & Engineering Sci., Peking Univ.
Huang Lin		Peking Univ.
SuA07-2	08:50-09:10	
<i>Stationary Set and Stability: a Case Study for Mechanical Systems with Discontinuities</i> , pp.2-429~2-433		
Zheng Kai		Harbin Inst. of Tech.
Shen Tielong		Sophia Univ.
Yao Yu		Harbin Inst. of Tech.
SuA07-3	09:10-09:30	
<i>Backstepping Based Constrained Control of Nonlinear Hydraulic Active Suspensions</i> , pp.2-463~2-466		
Ma Miaomiao		Jilin Univ.
Chen Hong		Jilin Univ.
Cong Yanfeng		Jilin Univ.
SuA07-4	09:30-09:50	
<i>Modeling Inverse-Hysteretic Systems Based on Expanded Input Space</i> , pp.2-444~2-447		
Tan Yonghong		Guilin Univ. of Electronic Tech.
SuA07-5	09:50-10:10	
<i>Adaptive Tracking Control for Uncertain Robot Manipulator with Additive Disturbance</i> , pp.2-332~2-336		
Xian Bin		Tianjin Univ.
SuA07-6	10:10-10:30	
<i>Generating Hyperchaos via a Simple Periodic Forcing Signal</i> , pp.2-380~2-384		
Li Yuxia		Shandong Univ. of Sci. & Tech.
Tang Wallace K. S.		City Univ. of Hong Kong
Chen Guanrong		City Univ. of Hong Kong

SuA08 工业系统 (2) Industrial Systems (2)	08:30-10:30	Meeting Room 8	Wang Zhaokui Zhang Yulin	Tsinghua Univ. Tsinghua Univ.
Chair: 李春文 Co-Chair: Li Lanjun		清华大学 Univ. of South China		
SuA08-1 <i>On MEMS Design Automation</i> , pp.4-774~4-778	08:30-08:50		SuA09-3 具有冗余自由度的移动操作臂逆运动学分析 <i>Inverse Kinematics Analysis for a Mobile Manipulator with Redundant DOFs</i> , pp.5-118~5-122	09:10-09:30 南开大学 南开大学 南开大学
Zhao Xin Sun Guangyi Ren Liang Lu Guizhang		Nankai Univ. Nankai Univ. Nankai Univ. Nankai Univ.	马博军 方勇纯 张雪波	
SuA08-2 基于切换线性系统的三相 APF 建模与保性能控制 <i>Modeling and Guaranteed Cost Control of Three-phase APF Based on Switched Linear System</i> , pp.6-180~6-184	08:50-09:10		SuA09-4 <i>An Adaptive Localization Method for Autonomous Digging Robot</i> , pp.5-46~5-49	09:30-09:50 北京工业大学 北京工业大学 北京工业大学
汤洪海 李春文 郑雪生 戎袁杰 刘艳红		清华大学 清华大学 清华大学 清华大学 郑州大学	Sun Yi Lu Haijun	
SuA08-3 总线技术在汽车车门系统中的应用 <i>BUS Technology Application in Automobile</i> , pp.6-185~6-188	09:10-09:30		SuA09-5 多移动机器人的分布式编队与避障控制 <i>Distributed Formation Control of Multiple Nonholonomic Mobile Robots</i> , pp.5-278~5-282	09:50-10:10 东南大学 东南大学
解小华 马彦 陈虹		吉林大学 吉林大学 吉林大学	陈杨杨 田玉平	
SuA08-4 <i>DCS-Based Process Control Simulating System</i> , pp.5-261~5-263	09:30-09:50		SuA10 故障诊断 (1) <i>Fault Diagnosis (1)</i>	08:30-10:30 Meeting Room 10
Li Lanjun Yu Shouyi Luo Wu Gao Song		Univ. of South China Central South Univ. Guangzhou Inst. of Railway Tech. Univ. of South China	Chair: 胡绍林 Co-Chair: Tang Wenhui	南京理工大学 The Univ. of Liverpool
SuA08-5 航材维修商评估决策过程模型及实现 <i>Decision Model and Implementation of Evaluation and Selection to MRO Enterprise</i> , pp.4-805~4-809	09:50-10:10		SuA10-1 计算机巡回检测控制系统的容错设计 <i>Fault-tolerant Design of Computer Cyclic Check and Control System</i> , pp.5-426~5-430	08:30-08:50 南京理工大学 Royal Inst. of Tech. of Sweden 南京理工大学
陈静杰 陈玖圣 张晓瑜		中国民航大学 中国民航大学 中国民航大学	胡绍林 Karl Meinke 陈如山	
SuA08-6 区域供冷系统三级逆向冷量调节和控制技术 <i>Triple Reverse Cool Adjustment and Control Technology with DCS</i> , pp.6-418~6-421	10:10-10:30		SuA10-2 基于尺度 - 小波能量谱、粗糙集和神经网络集成的内燃机故障诊断方法 <i>Fault Diagnosis Method to Internal-combustion Engine Based on Integration of Scale-wavelet Power Spectrum, Rough Set and Neural Network</i> , pp.5-431~5-435	08:50-09:10 三峡大学 三峡大学 三峡大学
周璇 闫军威 朱冬生 梁列全		华南理工大学 华南理工大学 华南理工大学 广东商学院	陈保家 李力 赵新泽	
SuA09 智能机器人 (3) Intelligent Robot (3)	08:30-10:10	Meeting Room 9	SuA10-3 <i>An FDI Approach for Aircraft Actuator Partial Failure</i> , pp.5-440~5-444	09:10-09:30 大连海事大学 大连海事大学 大连海事大学 大连海事大学
Chair: 田玉平 Co-Chair: 刘磊		东南大学 华中科技大学	Wang Dan Wu Zhiliang Yao Yubin Niu Xiaobing	
SuA09-1 基于单目视觉的机器人动态目标识别与跟踪 <i>Robotic Dynamic Target Recognition and Tracking Based on the Monocular Vision</i> , pp.5-193~5-197	08:30-08:50		SuA10-4 基于 Lyapunov 指数的一类轴承故障检测研究 <i>One-class Bearings Fault Detection Model Based on Lyapunov Exponent Spectrum</i> , pp.5-445~5-450	09:30-09:50 哈尔滨工程大学 哈尔滨工程大学 哈尔滨工程大学
刘磊 王永骥		华中科技大学 华中科技大学	陶新民 杜宝祥 徐勇	
SuA09-2 <i>Design of a VSC Controller of Reduced Inputs for Satellite Formation Flying</i> , pp.4-22~4-26	08:50-09:10		SuA10-5 <i>Fault Diagnosis of Hydro-Generator Unit via GA-Nonlinear Principal Component Analysis Neural Network</i> , pp.5-468~5-472	09:50-10:10 武汉大学 武汉大学 武汉大学
			Ji Qiao-Ling Qi Wei-Min Cai Wei-You	

SuA10-6	10:10-10:30		SuB01-4	11:45-12:05
<i>Transformer Dissolved Gas Analysis Using Least Square Support Vector Machine and Bootstrap</i> , pp.5-482~5-486			<i>Equivalent-Input-Disturbance Method Improves Disturbance Rejection Performance: the MIMO Case</i> , pp.6-642~6-647	
Tang Wenhui	The Univ. of Liverpool		She Jin-Hua	Tokyo Univ. of Tech.
SHINTEMIROV ALMAS	The Univ. of Liverpool		Xin Xin	Okayama Prefectural Univ.
Wu Q. H.	The Univ. of Liverpool			
SuA11	08:30-10:30	Meeting Room 11	SuB01-5	12:05-12:25
建模、辨识与信号处理 (5)			<i>Modeling and Control of an Underactuated Helicopter Experimental System</i> , pp.6-648~6-651	
Modeling, Identification and Signal Processing (5)			Deng Mingcong	Okayama Univ.
Chair: Zhang Jifeng	Chinese Acad. of Sci.		Inoue Akira	Okayama Univ.
Co-Chair: 周彤	清华大学		Kishida Takuya	Okayama Univ.
			Ueki Nobuyuki	Okayama Univ.
SuA11-1	08:30-08:50		SuB02	10:45-12:25
<i>Identification for Multivariate ARMA Systems without SPR Condition</i> , pp.3-140~3-144			稳定性与镇定	Meeting Room 2
Chen Han-Fu	Chinese Acad. of Sci.		Stability and Stabilization	
			Chair: Nian Xiaohong	Central South Univ.
SuA11-2	08:50-09:10		Co-Chair: 张国琪	北京控制工程研究所
线性分式扰动下奇异系统的鲁棒卡尔曼滤波				
<i>Robust Kalman Filtering of Descriptor Systems Subject to Linear Fractional Uncertainties</i> , pp.3-212~3-216			SuB02-1	10:45-11:05
张光磊	清华大学		<i>BMI Approach to Decentralized and Cooperative Control of Large-scale System</i> , pp.3-5~3-9	
周彤	清华大学		Cao Li	Central South Univ.
			Nian Xiaohong	Central South Univ.
SuA11-3	09:10-09:30		Tang Wenyan	Central South Univ.
平移不变小波快速算法在电力通信消噪中的研究				
<i>Power Communication Denoising Based on Fast Algorithm of Translation Invariant Wavelet</i> , pp.3-306~3-309			SuB02-2	11:05-11:25
王炬	长沙理工大学		<i>An MPC Approach to Networked Control Design</i> , pp.3-10~3-14	
樊绍胜	长沙理工大学		Wu Jing	Univ. of Alberta
			Zhang Liqian	Univ. of Alberta
SuA11-4	09:30-09:50		Chen Tongwen	Univ. of Alberta
<i>Online Multivariable Identification of a MIMO Distillation Column Using Evolving Takagi-Sugeno Fuzzy Model</i> , pp.3-328~3-332				
Molazem Sanandaji Borhan	Petroleum Univ. of Tech.		SuB02-3	11:25-11:45
Salahshoor Karim	Petroleum Univ. of Tech.		状态反馈传输滞后情形下线性离散系统的镇定	
			<i>Stabilization of Linear Discrete Systems with Transmission Delay</i> , pp.3-15~3-18	
SuA11-5	09:50-10:10		朱建栋	南京师范大学
<i>Robust FIR Filters for Linear Continuous-time State Space Models with Uncertainties</i> , pp.3-341~3-344				
Quan Zhonghua	Seoul National Univ		SuB02-4	11:45-12:05
Han Soohee	Seoul National Univ.		单输入单输出 LTI 系统一类部分状态反馈镇定控制律的存在性及应用	
Kwon Wook Hyun	Seoul National Univ.		<i>On Existence of a Class of Partial States Feedback Stabilizing Law for Single-Input-Single-Output Linear LTI Systems and Its Applications</i> , pp.3-43~3-48	
			张国琪	北京控制工程研究所
SuA11-6	10:10-10:30		SuB02-5	12:05-12:25
<i>Parametric Identification of Input-delay Systems with Unknown Time Delay</i> , pp.3-246~3-250			<i>Stability Analysis for Spatially Distributed Dynamic Systems</i> , pp.3-54~3-58	
Najafi Majd Aldin	Isfahan Univ. of Tech.		Zhou Tong	Tsinghua Univ.
Kamali Marzieh	Isfahan Univ. of Tech.			
Askari Javad	Isfahan Univ. of Tech.		SuB03	10:45-12:25
			系统理论与控制理论 (5)	Meeting Room 3
SuB01	10:45-12:25	Meeting Room 1	System Theory and Control Theory (5)	
Invited Session: Advanced Control Theory and Applications (II)			Chair: Duan Guangren	Harbin Inst. of Tech.
Chair: Liu Kang-Zhi	Chiba Univ.		Co-Chair: Jin Huiyu	Univ. of Sci. & Tech. of China
Co-Chair: Shen Tielong	Sophia Univ.			
SuB01-1	10:45-11:05		SuB03-1	10:45-11:05
<i>Beyond the Small-gain Paradigm: How to Make Use of the Phase Information of Uncertainty</i> , pp.6-627~6-631			不确定离散时滞系统分散鲁棒 H_∞ 控制: LMI 方法	
Liu Kang-Zhi	Chiba Univ.		<i>Robust Decentralized H_∞ Control for Uncertain Discrete Time-delay Systems: LMI Approach</i> , pp.2-725~2-729	
			桂卫华	中南大学
SuB01-2	11:05-11:25		陈宁	中南大学
<i>A Switching Control Scheme for the Synchronization of Serially Connected Multi-Stage Systems</i> , pp.6-632~6-636			谢永芳	中南大学
Lu Di	Harbin Univ. of Sci. & Tech.			
Shen Tielong	Sophia Univ.		SuB03-2	11:05-11:25
Fu Minyue	The Univ. of Newcastle		<i>New Consistency Condition for Exponential Stabilization of Smapled-data Nonlinear Systems</i> , pp.3-84~3-87	
			JIN HuiYu	Univ. of Sci. & Tech. of China
SuB01-3	11:25-11:45		Yin Baoqun	Univ. of Sci. & Tech. of China
<i>Structural Insights and Constructive Procedures for Multidimensional Realization and LFR Uncertainty Modeling</i> , pp.6-637~6-641				
Xu Li	Akita Prefectural Univ.			

SuB03-3	11:25-11:45		<i>on a Max-Min Method</i> , pp.3-806~3-810	
<i>Analyzing Quantization Effect of Digital Control System by Cell Mapping Method</i> , pp.2-97~2-99			陈彭年 秦化淑	中国计量学院 中国科学院
Wang Liang		Huazhong Univ. of Sci. & Tech.		
Wang Bing wen		Huazhong Univ. of Sci. & Tech.		
Guo Yi Ping		Huazhong Univ. of Sci. & Tech.		
SuB03-4	11:45-12:05		SuB05-2	11:05-11:25
一类线性时不变广义系统的完全能观性			基于学习控制的 AFM 快速扫描模式研究	
<i>Complete Observability of a Class of Linear Time-invariant Descriptor Systems</i> , pp.2-200~2-204			<i>A High-speed AFM Scanning Mode Based on Learning Control</i> , pp.3-815~3-819	南开大学
谭冲		黑龙江大学	方勇纯	
张显		黑龙江大学		
SuB03-5	12:05-12:25		SuB05-3	11:25-11:45
<i>Closed Form Solutions for Matrix Linear Systems Using Double Matrix Exponential Functions</i> , pp.2-123~2-127			<i>Higher-order Adaptive Iterative Control for Uncertain Robot Manipulators</i> , pp.3-825~3-829	
Zhou Bin		Harbin Inst. of Tech.	Quan Quan	Beihang Univ.
Duan GuangRen		Harbin Inst. of Tech.	Wang Xinhua	Beihang Univ.
			Cai Kai-Yuan	Beihang Univ.
SuB04	10:45-12:25	Meeting Room 4	SuB05-4	11:45-12:05
鲁棒控制与 H_∞ 控制 (3)			<i>Output-feedback MRAC for Continuous State Delay Systems: the Relative Degree Two Case</i> , pp.3-830~3-834	
Robust and H_∞ Control (3)			Kamali Marzieh	Isfahan Univ. of Tech.
Chair: Mei Shengwei		Tsinghua Univ.	Askari Javad	Isfahan Univ. of Tech.
Co-Chair: 蒋朝辉		中南大学		
SuB04-1	10:45-11:05		SuB05-5	12:05-12:25
离散区间 2-D 系统的二次镇定			<i>Adaptive Control of Flexible Satellite</i> , pp.3-771~3-776	
<i>Quadratic Stabilization of Discrete Interval 2-D Systems</i> , pp.3-696~3-699			Arif Thawar	Al-Isra Private Univ.
刘征宇		合肥工业大学		
韩江洪		合肥工业大学		
张利		合肥工业大学		
郭祺君		桂林电子科技大学		
SuB04-2	11:05-11:25		SuB07	10:45-12:25
<i>Robust Stabilization and Disturbance Attenuation of a Class of MIMO Nonlinear System with Multi-operation Points</i> , pp.3-700~3-704			非线性系统及其控制 (6)	Meeting Room 7
Zhong Yisheng		Tsinghua Univ.	Nonlinear System and Control (6)	
			Chair: Hong Yiguang	Chinese Acad. of Sci.
SuB04-3	11:25-11:45		Co-Chair: Xi Zairong	Chinese Acad. of Sci.
<i>H_∞ Analysis Method for the Small Signal Stability of Power System</i> , pp.3-705~3-710				
Mei Shengwei		Tsinghua Univ.		
Che Wenyan		Tsinghua Univ.		
SuB04-4	11:45-12:05		SuB07-1	10:45-11:05
一类不确定非线性系统的鲁棒输出调节问题			<i>Numerical Realization of Plane CW Complexes under a Given 'Flow Condition' in Gradient-like Morse-Smale Controlled Systems</i> , pp.2-508~2-513	
<i>Robust Output Regulation for a Class of Uncertain Nonlinear Systems</i> , pp.2-514~2-517			Enomoto Ryuji	Toba National College of Maritime Tech.
陈作贤		中国科学技术大学	Hamaguchi Saori	Toba National College of Maritime Tech.
季海波		中国科学技术大学		
何德峰		中国科学技术大学		
SuB04-5	12:05-12:25		SuB07-2	11:05-11:25
不确定关联大系统输出反馈分散鲁棒 H_∞ 控制			<i>Fault Tolerant Control Based on Sliding Mode Control Approach with Application to Water Tank System</i> , pp.2-415~2-418	
<i>Decentralized Robust H_∞ Output Feedback Control for Interconnected Large-scale Systems with Uncertainties</i> , pp.2-740~2-744			Rafi Youssef	Central South Univ.
蒋朝辉		中南大学	Peng Hui	Central South Univ.
桂卫华		中南大学		
谢永芳		中南大学		
SuB05	10:45-12:25	Meeting Room 5	SuB07-3	11:25-11:45
自适应控制与学习控制 (2)			<i>A Two Level Non Linear Inverse Control Structure for Rotorcraft Trajectory Tracking</i> , pp.2-321~2-325	
Adaptive Control and Learning Control (2)			Mora-Camino Felix	ENAC French Civil Aviation Inst.
Chair: 陈彭年		中国计量学院		
Co-Chair: 方勇纯		南开大学		
SuB05-1	10:45-11:05		SuB07-4	11:45-12:05
基于极大极小方法的一类非线性系统的自适应控制			<i>Nonlinear Control for Synchronization Scheme to Chaotic Fractional Order Chen-Lee Systems</i> , pp.2-267~2-269	
<i>Adaptive Control of a Class of Uncertain Nonlinear Systems Based</i>			Toossian Shandiz Heydar	Shahrood Univ. of Tech.
			Hajipoor Ahmad	Shahrood Univ. of Tech.
			SuB07-5	12:05-12:25
			<i>Using Sequential Kalman Filters for State Estimation of Nonlinear Systems</i> , pp.2-258~2-261	
			Mohammadi Sirous	Islamic Azad Univ.
			Mohammadi Ali	Islamic Azad Univ.
			Keivani Hamid	Islamic Azad Univ.
			Askari Mohammad	Islamic Azad Univ.
			Kavehnia Farzad	Islamic Azad Univ.
			Ghanbarian Mahdi	Islamic Azad Univ.
			SuB08	10:45-12:25
			混杂系统与 DEDS	Meeting Room 8
			Hybrid Systems and DEDS	
			Chair: Sun Zhendong	South China Univ. of Tech.
			Co-Chair: Kang Yu	Chinese Acad. of Sci.

SuB08-1 <i>Converse Lyapunov Theorem for Switched Stability of Switched Linear Systems</i> , pp.2-678~2-680 Sun Zhendong South China Univ. of Tech.	10:45-11:05	
SuB08-2 一类分层非结构化 P2P 系统的随机优化 <i>Stochastic Optimization for a Class of Hierarchical Unstructured P2P System</i> , pp.2-693~2-696 徐陈锋 奚宏生 江琦 殷保群 中国科学技术大学 中国科学技术大学 中国科学技术大学 中国科学技术大学	11:05-11:25	
SuB08-3 <i>Study of QoS Based on Flow Classification in Multi-Layer Switch</i> , pp.5-622~5-625 Cheng Chuanqing Wuhan Li Wuhan Univ. of Tech. & Sci. Wuhan Univ.	11:25-11:45	
SuB08-4 <i>Stochastic Stabilization of Markovian Jump Systems with State and Input Delays</i> , pp.2-716~2-720 Kang Yu Chinese Acad. of Sci.	11:45-12:05	
SuB08-5 <i>Variable Structure Control for Interval Systems</i> , pp.4-46~4-50 WANG Cuihong HAO Guang HUANG Tianmin Southwest Jiaotong Univ. Southwest Jiaotong Univ. Southwest Jiaotong Univ.	12:05-12:25	
SuB09 神经网络 Neural Networks Chair: Liu Meiqin Co-Chair: Che Yan-Qiu Zhejiang Univ. Tianjin Univ.	10:45-12:25	Meeting Room 9
SuB09-1 <i>Supervisory Control of Chaotic Systems Using Online GA Tuning Neural Networks</i> , pp.4-193~4-197 Che Yan-Qiu Wang Jiang Zhou Si-Si Tianjin Univ. Tianjin Univ. Tianjin Univ.	10:45-11:05	
SuB09-2 <i>Standard Neural Network Model for the Feedback Stabilization of Intelligent Systems</i> , pp.4-104~4-108 Liu Meiqin Zhang Senlin Yan Gangfeng Zhejiang Univ. Zhejiang Univ. Zhejiang Univ.	11:05-11:25	
SuB09-3 <i>H_∞ Control for Chaotic System with Cooperative Weights Neural Network</i> , pp.4-198~4-202 Sun Li Wang Jiang You Hao Deng Bin Tianjin Univ. Tianjin Univ. Tianjin Univ. Tianjin Univ.	11:25-11:45	
SuB09-4 <i>NN-ANARX Structure for Control of Nonlinear SISO and MIMO Systems: Neural Networks Based Approach</i> , pp.4-138~4-144 Petlenkov Eduard Belikov Juri Tallinn Univ. of Tech. Inst. of Cybernetics at Tallinn Univ. of Tech.	11:45-12:05	
SuB09-5 最小覆盖算法 <i>The Least Covering Algorithm</i> , pp.4-181~4-185 赵妹 张燕平 张铃 徐峰 安徽大学 安徽大学 安徽大学 华安证券公司	12:05-12:25	
SuB10 故障诊断 (2) Fault Diagnosis (2) Chair: 陈杰 Co-Chair: 刘士荣 北京理工大学 杭州电子科技大学	10:45-12:25	Meeting Room 10
SuB10-1 基于观测器的 Delta 算子系统故障检测 <i>Observer-Based Fault Detection for Delta Operator Systems</i> , pp.5-492~5-495 张瑞金 张爱玲 郑州大学 郑州大学	10:45-11:05	
SuB10-2 <i>Modeling of a Power Transformer Winding for Deformation Detection Based on Frequency Response Analysis</i> , pp.5-506~5-510 SHINTEMIROV ALMAS Tang Wenhu Wu Q. H. The Univ. of Liverpool The Univ. of Liverpool The Univ. of Liverpool	11:05-11:25	
SuB10-3 基于模糊概率 SDG 模型的复杂系统故障诊断研究 <i>Research on Fault Diagnosis Based on Fuzzy Probability SDG in Complex System</i> , pp.5-516~5-519 朱琳 陈杰 陈文颖 邓方 北京理工大学 北京理工大学 北京理工大学 北京理工大学	11:25-11:45	
SuB10-4 基于强跟踪粒子滤波器的非线性系统故障诊断 <i>Strong Tracking Particle Filter Based Fault Diagnosis for Nonlinear Systems</i> , pp.5-539~5-543 刘士荣 何文波 杭州电子科技大学 宁波大学	11:45-12:05	
SuB10-5 工程机械设备远程监控故障诊断系统的设计与实现 <i>Design and Implementation of Remote Supervisory Control and Fault Diagnostic System for Construction Equipments</i> , pp.6-445~6-448 周璇 梁列全 华南理工大学 广东商学院	12:05-12:25	
SuB11 随机系统 Stochastic Systems Chair: 王远 Co-Chair: Ma Shuping 北京信息工程学院 Shandong Univ.	10:45-12:25	Meeting Room 11
SuB11-1 非线性时变随机控制系统的能控性判据 <i>The Algebraic Criterion for Nonlinear Stochastic Control Systems Which the Coefficient is Time-dependent</i> , pp.2-754~2-756 刘峰 彭实戈 北京交通大学 山东大学	10:45-11:05	
SuB11-2 <i>Repeated N-Person Stochastic Cooperative Games: Superadditivity, Convexity</i> , pp.2-762~2-765 E Cheng-guo Gao Zuo-feng Mao Ali Yanshan Univ. Yanshan Univ. Qinhuangdao Foreign Language Professional College	11:05-11:25	
SuB11-3 <i>Delay-Dependent Stability and Stabilization for Uncertain Discrete Markovian Jump Singular Systems with Mode-Dependent Time-Delay</i> , pp.2-766~2-770 Ma Shuping Zhang Chenghui Shandong Univ. Shandong Univ.	11:25-11:45	

SuB11-4 **11:45-12:05**
State Feedback Stabilization of Nonlinear Stochastic Systems,
pp.2-784~2-788

Zhang Weihai
Yan Zhiguo

Shandong Univ. of Sci. & Tech.
Shandong Inst. of Light Industry

SuB11-5 **12:05-12:25**
带有有色观测噪声系统 Kalman 滤波算法的稳定性研究
The Stability of the Kalman Filter for Systems with Colored Observation Noises, pp.3-71~3-75

王 远
李 忱

北京信息工程学院
北京信息工程学院

July 27, 2007

FrA01 13:30-15:30 Meeting Room 1
 申请《关肇直奖》入围论文报告
 Guan Zhao-Zhi Award Final List
 Chair: 郑大钟 清华大学

FrA01-1 13:30-14:00
Eigenstructure Assignment in Second-order Linear Systems: A Parametric Design Method, pp.2-9~2-13
 Wang Guo-sheng Acad. of Armored Force Engineering
 Liang Bing Harbin Inst. of Tech.
 Lv Qiang Acad. of Armored Force Engineering
 Duan Guangren Harbin Inst. of Tech.

Eigenstructure assignment via the proportional-plus-derivative feedback in second-order linear systems is investigated. Simple, general, complete parametric expressions for both the closed-loop eigenvector matrix and the feedback gains are established. The approach utilizes directly the original system data and involves manipulations only on n-dimensional matrices. Furthermore, it reveals all the degrees of freedom, which can be further utilized to achieve additional system specifications. An example shows the effect of the proposed approach.

FrA01-2 14:00-14:30
Kalman Filtering in the Presence of State Space Equality Constraints, pp.2-107~2-113
 Gupta Nachi Univ. of Oxford

We discuss two separate techniques for Kalman Filtering in the presence of state space equality constraints. We discuss these methods and then prove that despite the lack of similarity in their formulations, under certain conditions, the two methods result in mathematically equivalent constrained estimate structures. We then discuss numerical stability for implementations. We conclude that the potential benefits of using equality constraints in Kalman Filtering often outweigh the computational costs, and as such, equality constraints, when present, should be enforced by way of one of these two methods.

FrA01-3 14:30-15:00
Output Feedback Stabilization for Discrete-time Systems with a Time-varying Delay, pp.3-64~3-70
 He Yong Central South Univ.
 Wu Min Central South Univ.
 Liu Guoping Univ. of Glamorgan
 She Jin-Hua Tokyo Univ. of Tech.

The free-weighting matrix approach is employed to investigate the output feedback control of linear discrete-time systems with an interval time-varying delay. First, a delay-dependent stability analysis is carried out using a new method of estimating the upper bound on the difference of a Lyapunov function without ignoring any useful terms; and a design criterion for a static output feedback (SOF) controller is formulated based on that analysis. Since the conditions thus obtained for the existence of admissible controllers are not expressed strictly in terms of linear matrix inequalities, a modified cone complementary linearization (CCL) algorithm is employed to solve the nonconvex feasibility SOF control problem. This enables the problem of designing a dynamic output feedback controller to be reduced to one of designing an SOF controller. Numerical examples demonstrate the effectiveness of the method and its advantage over existing methods.

FrA01-4 15:00-15:30
An Iterative Learning Control with Alignment Initial Condition for a Class of Nonlinear Systems, pp.2-502~2-507
 YANG Zaiyue The Univ. of Hong Kong

Chan C. W. The Univ. of Hong Kong

Iterative learning control (ILC) is effective for nonlinear systems to track repetitive trajectories. However, identical initial condition is usually assumed for perfect tracking. This assumption can be relaxed for a class of nonlinear systems that has a unique steady-state response for an input. A contraction mapping ILC with selective learning is proposed to achieve perfect tracking under the alignment initial condition, such that the end state of the preceding iteration becomes the initial state of the current iteration. The input updating law and the sufficient condition of monotonic convergence of the input sequence are given. The tracking performance is illustrated by a simulated example.

FrA02 13:30-15:30 Meeting Room 2
 Invited Session: Advances in Iterative Learning Control
 Chair: SUN Mingxuan Zhejiang Univ. of Tech.
 Co-Chair: Zhou Keliang Southeast Univ.

FrA02-1 13:30-13:50
Convergence Analysis in the Sense of Lebesgue-p Norm for Open-Closed-Loop Iterative Learning Control, pp.6-511~6-514
 Ruan Xiaoe Xi'an Jiaotong Univ.
 Chen Fengmin Xi'an Jiaotong Univ.
 Wang Jianguo Xi'an Univ. of Architecture & Tech.

In this paper, a PD-type open-closed-loop iterative learning control strategy is studied for linear time-invariant system. By means of Hausdorff-Young inequality of convolution integral, the convergence of the proposed open-closed-loop iterative learning control updating law is analyzed for a given system in the sense of Lebesgue-p norm. It is shown from the theoretical analysis that the sufficient condition for convergence in sense of Lebesgue-p norm is dominated by not only the derivative learning gains but also the proportional learning gains. A comparable conclusion is theoretically discussed and the advantage of the updating law is numerically simulated.

FrA02-2 13:50-14:10
Hybrid Adaptive Iterative Learning Control of Non-uniform Trajectory Tracking for Nonlinear Time-delay Systems, pp.6-515~6-519
 Li Junmin Xidian Univ.
 Li Xinmin Xi'an Sci. & Tech. Univ.
 Xing Keyi Xi'an Jiaotong Univ.

A novel adaptive iterative learning control approach is proposed for a class of hybrid parametric nonlinear time-delay systems. The approach consisted of a differential-deference type updating law and a learning control law, can deal with the non-uniform trajectory tracking problem, in which avoids the restricted on the tracking trajectory in the traditional ILC. A sufficient condition of tracking error converging to zero in the means of mean-square on the finite interval is also given by constructing a novel composite energy function. A simulation example shows the feasibility and efficiency of the approach.

FrA02-3 14:10-14:30
Iterative Learning Identification and Control of Discrete Time-varying Systems, pp.6-520~6-524
 SUN Mingxuan Zhejiang Univ. of Tech.
 He Xiongxiang Zhejiang Univ. of Tech.

This paper presents discrete iterative learning control for systems with time-varying parametric uncertainties. Two prototype iterative learning identification algorithms, iterative learning projection and iterative learning least squares, are presented for estimating the time-varying unknowns. The main properties of the learning algorithms are explored for establishing the stability and convergence of the control scheme. The proof is based upon the use of a key technical lemma, which extends the existing one and tailored for

the purpose of analysis in the iteration domain. It is shown that the complete tracking is achieved for every instant except for the initial instant, while the input and output signals of the controlled system remain bounded. The proposed scheme in this paper is applicable to tracking iteration-varying trajectories without any restriction on initial repositioning.

FrA02-4 14:30-14:50

Dual-mode Structure Repetitive Control, pp.6-525~6-529

Zhou Keliang Southeast Univ.
Wang Danwei Nanyang Technological Univ.
Zhang Bin Nanyang Technological Univ.
Wang Yigang Nanyang Technological Univ.

A flexible repetitive control scheme named "dual-mode structure repetitive control" is presented in this article. A robust stability criterion for DMRC systems is derived in terms of two parameters, odd-harmonic RC gain and even-harmonic RC gain. The general framework of DMRC offers the flexibility in the development of various RC controllers. Without additional complexity and loss of tracking accuracy, DMRC can achieve faster error convergence rate than conventional RCs. DMRC requires the same data memory size as that of conventional RC one. An application example of DMRC controlled PWM inverter illustrates the validity of our proposed DMRC scheme. Comparisons of DMRC, conventional RC and odd-harmonic RC highlight the advantages of the presented DMRC approach.

FrA02-5 14:50-15:10

基于二自由度控制的鲁棒迭代学习控制设计

Robust Iterative Learning Control Design Based on Two Degree of Freedom Control, pp.6-530~6-534

刘山 浙江大学
林坚 浙江大学

本文将开闭环综合的迭代学习控制结构转换为二自由度控制结构,从而可采用常规的二自由度控制设计方法进行迭代学习控制设计.针对含有不确定性的线性系统,将迭代学习控制的设计问题转化为经典的H_∞无劣优化设计问题,并利用结构奇异值理论和鲁棒性能的Mu综合方法得到了相应的鲁棒迭代学习控制算法.最后针对直流伺服电机系统给出算法的仿真结果.

In this paper, the iterative learning control (ILC) architecture combining feedforward term and feedback term is transformed into two degree of freedom control framework, so that the ILC design problem can be solved according to classical synthesis of two degree of freedom controller. The original problem for uncertain linear plants is first converted to an H_∞ infinite design problem, and the robust ILC is derived by structured singular value and mu synthesis secondly. Simulation results of a DC servo motor are presented in the last to show the effectiveness of the scheme.

FrA02-6 15:10-15:30

Iterative Learning Control for the Singular Systems with Delay, pp.6-535~6-538

Tian Senping South China Univ. of Tech.
He Gang South China Univ. of Tech.
Zhou Lun Xuchang Univ.

In this paper, the iterative learning control method is introduced to carry out the trajectory tracking control for singular systems with delay. Detailed design steps are presented and the feasibility of the controller design method is discussed. Analysis demonstrates that this learning controller is of strong robustness.

FrA03 13:30-15:30 Meeting Room 3

生物与生态系统
Bio & Ecological Systems

Chair: Zhou Tong Tsinghua Univ.
Co-Chair: Wu Yi The Pennsylvania State Univ. Erie

FrA03-1 13:30-13:50

Physiological Control of Rotary Left Ventricular Assist Device, pp.6-469~6-474

Wu Yi The Pennsylvania State Univ. Erie

In rotary left ventricular assist device (LVAD), physiological control system is the element to automatically regulate the pump speed to ensure enough perfusion of patients. In this paper, the design of the physiological control system of rotary LVADs is reviewed first, such as criteria of physiological control system, sensors/signals, and control algorithms. Then the design of an adaptive optimal controller for permanent LVADs is discussed. A Matlab simulation program and an experimental mock circulatory loop are employed as test environments for the controller. Different physiological conditions, such as the variation of left ventricular failures and the variation of activities are simulated to study the performance of the designed physiological controller. Simulation and experimental results consistently show that the abnormal hemodynamic variables of a congestive heart failure patient are restored back to the normal physiological range by the designed controller.

FrA03-2 13:50-14:10

Multi-Target Identification in Intracellular Regulation Networks, pp.6-112~6-116

Zhou Tong Tsinghua Univ.
Li Shao Tsinghua Univ.

In this paper, an algorithm is proposed for identifying desirable multi-targets in an intracellular regulation network. The major ideas are based on constrained state feedback and Monte-Carlo simulations. The computational complexity of the algorithm increases linearly with increasing species number in a gene regulation system. An estimate is derived for the confidence level of the predicted minimal required perturbation strength when targets are prescribed a priori. The algorithm has been applied to the analysis of the cell cycle of *Xenopus* frog eggs. It is found that the analysis results agree well with the available results for single target perturbations, and multi-target interference is usually not equal to the summation of single-target interferences.

FrA03-3 14:10-14:30

Synchronization Control of Hodgkin-Huxley Neurons Exposed to Sinusoidal Electric Field, pp.6-117~6-121

Zhou Si-Si Tianjin Univ.
Wang Jiang Tianjin Univ.
Che Yan-Qiu Tianjin Univ.
Deng Bin Tianjin Univ.

In this paper, H_∞ variable universe adaptive fuzzy control is derived and applied to synchronize two modified Hodgkin-Huxley (HH) neurons exposed to external sinusoidal electric field. Firstly, the modified model of HH neuron exposed to extremely low frequency (ELF) external electric field is established and its periodic and chaotic dynamics in response to sinusoidal electric field stimulation are described. And then the statement of the problem for unidirectional synchronization of two HH neurons is given. Finally H_∞ variable universe adaptive fuzzy control is designed to synchronize the HH systems and the simulation results demonstrate the effectiveness of the proposed control method.

FrA03-4 14:30-14:50

Ghostbuster 模型的混沌分析与控制

Chaos Analysis and Control of the Ghostbuster Model, pp.6-122~6-126

邓斌 天津大学
王江 天津大学
陈立松 天津大学

本文以 ghostbuster 模型为研究对象,该模型引入胞体和树突之间信息编码的传导,从胞体和树突两部分出发整体地描述了柱状细胞的动

态特性. 首先选取外界的直流刺激为分岔参数, 通过最大 Lyapunov 指数方法对 ghostburter 模型进行单参数的分岔分析, 得到了该模型独特的 ghostbursting 簇放电模式; 选用 wash-out 滤波器来实现系统逃离混沌簇放电区域, 并向周期放电转变. 由于本文的控制器选取的控制变量为可测量的胞体膜电压, 所以该方法完全具有现实意义. 数值仿真结果证明了理论分析的正确性.

In this paper, we took the model of the pyramidal cell in the electrosensory lateral line lobe (ELL) of weakly electric fish as study object, which described the dynamic characteristic on the both soma and dendrite, and after theoretical analysis and simulation we analyze its phenomenon by choosing the applied current which is the synaptic one flowing into the somatic compartment as the bifurcation parameter; then, we choose Wash-out filter as a controller to force the dynamical system from the periodic firing to the chaotic bursting. The easy measurable of membrane voltage, make such kind of analysis a meaningful research. The simulation results verify the analysis and methods are all accurate.

FrA03-5 **14:50-15:10**
Fire Patterns of HH Neuron under External Sinusoidal ELF Stimulus, pp.6-127~6-131

Han Chun-Xiao Tianjin Univ.
 Wang Jiang Tianjin Univ.
 Li Hui-Yan Tianjin Univ. of Tech. & Automation

Neuron as the main information carrier in neural systems is able to generate diverse fire trains in response to different stimuli. In this paper, the stimulus frequency is taken as the bifurcation parameter, and the ISI is considered to be one of the state variables. Via numerical simulation, we mainly concentrate on investigating the kinds of fire patterns that the HH neuron model displays such as period-n, bursting, and modulation fire patterns, etc. under the effect of external sinusoidal ELF electric field, and the relation between the ISI sequences and the external stimulus just like synchronization and transition in the manner of pitchfork-bifurcation. In addition, an explanation is put forwards from the electrophysiology point of view to try to interpret why neurons generate so many different kinds of ISI sequences.

FrA03-6 **15:10-15:30**
仿人智能控制策略的研究
Control Strategy of Human-Like Intelligent Control, pp.2-54~2-58

王培进 烟台大学
 慕志强 烟台大学
 马文明 烟台大学

仿人智能控制不需要被控对象的数学模型, 模拟人的控制经验与技巧. 文中对被控量的动态特性、被控量和控制量之间的关系、控制量的动态特性、干扰量的动态特性等进行了分析研究, 有助于仿人智能控制策略的确定. 文中还对开、闭环控制切换策略进行了研究, 为仿人智能控制的应用提供了理论基础. 实验证明, 在仿人智能控制算法的基础上融合控制策略, 取得更好的控制效果.

Human-Like Intelligent Control simulates human control experiences and methods without the controlled system mathematical model. Controlled variable dynamic features, manipulated variable dynamic features, the relationship between a controlled variable and a manipulated variable, and disturbing variable dynamic features are discussed, all of the analysis which is called control strategy, is helpful to design a control system by Human-Like Intelligent Control method. Open-Close control switch of Human-Like Intelligent Control is also studied. The test shows that the combination of Human-like intelligent control method and the control strategy is more effective to the control system.

FrA04 **13:30-15:30** **Meeting Room 4**
 分布参数系统
 Distributed Parameter Systems

Chair: Yan Ningning Chinese Acad. of Sci.

Co-Chair: Zhang Zhifei Chinese Acad. of Sci.

FrA04-1 **13:30-13:50**
Boundary Element Method for Boundary Control Problems, pp.2-621~2-625

Yan Ningning Chinese Acad. of Sci.

In this paper, we discuss the numerical simulation for a class of convex boundary control problems. The boundary element method is used for the approximations of the problems. The a priori error estimates and a posteriori error estimators for the boundary element schemes are presented.

FrA04-2 **13:50-14:10**
Global Smooth Solutions for Quasilinear Wave Equation with Locally Internal Damping, pp.2-626~2-629

Zhang Zhifei Chinese Acad. of Sci.
 Yao Pengfei Chinese Acad. of Sci.

We study the existence of global smooth solutions for the quasilinear wave equations with internal locally damping when initial data are near a given equilibrium. Our interest is to study the effect of the damping region which guarantees the existence of global solutions. Our results show that the structure of the damping region depends on geometric properties of a Riemannian metric, given by the variable coefficients and the equilibrium of the system. Some geometrical conditions are presented to obtain the damping region.

FrA04-3 **14:10-14:30**
Model Predictive Control of a Powder Coating Curing Process: an Application of the MPC@CB Software, pp.2-630~2-634

Abid Kamel Univ. Claude Bernard Lyon 1, CNRS
 Dufour Pascal Univ. Claude Bernard Lyon 1, CNRS
 Bombard Isabelle Univ. Claude Bernard Lyon 1, CNRS
 Laurent Pierre Univ. Claude Bernard Lyon 1, CNRS

This paper deals with the control of a powder coating radiative curing process by infrared flow. This approach is based on a unidirectional dynamic modelling where both heat transfert and cure phenomena are accounted for within the thickness of the powder coated metal. The control problem is concerned with the constrained optimization of the curing cycle of the powder. This is solved using a special model predictive control framework where the nonlinear diffusional model is directly used in the controller formulation. A general model predictive controller is designed such that the calculation time is smaller than the sampling time (a few seconds), in spite of the need to solve the non-linear partial differential equation based model involved during the online constrained optimization task resolution. Simulation results show here the efficiency of the control software developed (MPC@CB) under Matlab. MPC@CB may be easily used for any other constrained control problem.

FrA04-4 **14:30-14:50**
树形网络 Timoshenko 梁系统的镇定
Stabilization of Tree-shaped Network of Timoshenko Beams, pp.2-640~2-645

韩忠杰 天津大学
 许跟起 天津大学

文章研究三根 Timoshenko 梁按树形网络连接弹性系统的镇定问题及 Riesz 基性质. 假设该系统在中间节点处位移是连续的, 力满足和力为零条件. 通过在边界点处设置控制器, 采用速度反馈, 形成闭环系统, 并证明了该闭环系统是渐近稳定的. 通过对系统算子谱的渐近分析, 在一定条件下得到了算子谱由本征值组成, 分布在平行于虚轴的带域, 相应的广义本征向量系统构成一加括号 Riesz 基, 从而得到系统满足谱确定增长条件. 最后通过验证虚轴不是算子谱的渐近线, 得到了该闭环系统是指数稳定的.

In this paper we study stabilization problem of tree-shaped network of Timoshenko beams which consists of three beams. Suppose

that the root of the network is clamped, at the interior node, the displacement are continuous, and the forces satisfy the transmission conditions. The feedback controllers at exterior vertices are applied to stabilize the system. We show that the closed loop system is asymptotically stable. By spectral analysis, we show that the spectrum of the system operator consists of all eigenvalues and distributes in a strip parallel to the imaginary axis, the generalized eigenfunctions of the system forms a Riesz basis with parentheses for the state space under some conditions. Finally, we prove that the closed loop system is stable exponentially.

FrA04-5 **14:50-15:10**
Asymptotic Stability of Software Systems with Rejuvenation Policy, pp.2-646~2-650

XU Houbao Beijing Inst. of Tech.
Wang Jun-Min Beijing Inst. of Tech.

Asymptotic stability of software systems with rejuvenation policy is studied. Both partial restart and reboot from crash are considered in gradually deteriorating software systems. An integral-differential mathematical model of software systems is constructed. We show that the system operator generates a positive C_0 -semigroup of contractions in the state Banach space. Moreover, 0 is an eigenvalue with algebraical multiplicity 1 and it is also a unique spectral point on the imaginary axis. As a result, the asymptotic stability of software systems is then obtained and the steady-state space of the system is spanned by the eigenfunction of eigenvalue 0.

FrA04-6 **15:10-15:30**
发展方程的周期能控性
Periodic Controllability of Evolution Equations, pp.2-651~2-655

李洪恒 四川大学
张旭 中国科学院

在本文中, 我们研究了在 Hilbert 空间中的线性发展方程的周期能控性问题。我们得到周期能控性的等价条件, 并将此结果应用到边界受控的波方程和板方程中。

In this paper, we study the periodic controllability of linear evolution equations in Hilbert space. Equivalent conditions for this property are presented. Moreover, applications to both the boundary controlled wave equation and plate equation are given.

FrA05 **13:30-15:30** Meeting Room 5
最优控制与优化 (1)
Optimal Control and Optimization (1)

Chair: 何德峰 中国科学技术大学
Co-Chair: 毛建军 安徽大学

FrA05-1 **13:30-13:50**
区域稳定的有效非线性预测控制
Effective Nonlinear Predictive Control with Regional Stability, pp.3-365~3-369

何德峰 中国科学技术大学
季海波 中国科学技术大学
陈作贤 中国科学技术大学
郑涛 中国科学技术大学

考虑连续时间约束非线性系统, 本文提出了一种计算有效的预测控制算法。算法的基本思想是用控制 Lyapunov 函数离线构造预测控制器的一个可行稳定方向; 再在线计算这个方向的最优步长。这样在数值求解时, 在线优化的计算量只取决于步长的维数而与预测时域无关。进一步, 通过引入了区域稳定性概念证明算法的可行性和稳定性。最后, 用数值仿真验证本文算法的有效性。

This paper proposes a computationally effective predictive control algorithm for continuous-time, constrained nonlinear systems. The basic idea of the algorithm is to construct off-line a feasible and stable direction for the predictive controller via control Lyapunov functions (CLFs); and solve on-line the optimal step of the direction. Thus, the computational demand of the online optimization relies

on the dimension of the step and is independent on the predictive horizon when the optimization is solved by numerical approaches. Furthermore, the feasibility and stability properties of the algorithm are guaranteed by introducing the notion of regional stability. Finally, a numerical simulation is utilized to illustrate the effectiveness of the mentioned algorithm.

FrA05-2 **13:50-14:10**
基于商空间理论的高分形模型
The Model of Quotient Fractal Based on the Theory of Quotient Space, pp.4-222~4-227

毛建军 安徽大学
张铃 安徽大学
郑婷婷 安徽大学
吴涛 安徽大学

本文讨论分形几何与商空间理论的关系, 提出商分形的概念, 并讨论分形图的逼近与商空间粒度计算之间的关系。得到的主要结论: (1) 证明一个函数迭代系统对应于一个分层递阶商空间链, 并给出商空间链对应的距离函数。(2) 给出上的商映射和商集的构造方法, 证明是在上的不变子集。(3) 给出商分形模型的定义和结构。(4) 给出到原空间的嵌入方法, 证明在原空间按豪斯道夫距离收敛于 (P 是 W 的不变子集) (5) 给出函数迭代系统能产生分形图的充要条件。

In this paper, the relationship between theory of fractal geometry and theory of quotient space is discussed and a new model which combines the character of granularity and fractal is put forward. Furthermore, approaching to fractal graph with quotient granularity is investigated. Some conclusions are proved separately. (1) Given a function iterative system $X, W_i, S_i, i=1, 2, \dots, n$, a hierarchical structure $X_k, k=1, 2, \dots$ can be proved, and the distance is induced on the quotient chain $X_k, k=1, 2, \dots$. (2) Given quotient mapping W_k and quotient sets P_k on X_k , then P_k are proved to be invariable sets on X_k along with W_k . (3) The model of Quotient-Fractal $(X_k, W_k, P_k), k=1, 2, \dots$ is constructed. (4) Lay X_k into primary space, P_k are proved that converge to with Hausdorff distance. (5) a sufficient and necessary condition which performed from a function iterative system to fractal graph is proposed.

FrA05-3 **14:10-14:30**
Decentralized Control of Linear Systems Based on the New Viewpoint of Cooperative Control, pp.3-360~3-364

Tang Wenyan Central South Univ.
Nian Xiaohong Central South Univ.
Gao Li Central South Univ.

The problem of designing cooperative control of linear system with a quadratic performance index is considered. A necessary and sufficient condition for optimal cooperative strategies is given. Then, the decentralized control of the large-scale linear system is studied based on the new viewpoint of cooperative control and the necessary and sufficient condition for optimal decentralized control is obtained. Furthermore, the problem for designing the suboptimal decentralized control of linear quadratic large-scale system is formulated to a concave optimization problem with BMI constrains and solved by an alternative optimization algorithm via LMIs. Finally, examples are given to illustrate the main results of this paper.

FrA05-4 **14:30-14:50**
Fast Modular Multivariable Nonlinear Model Predictive Controller, pp.3-415~3-419

Zheng Tao Univ. of Sci. & Tech. of China
Wu Gang Univ. of Sci. & Tech. of China
Ling Qing Michigan Technological Univ.
Chen Wei Univ. of Sci. & Tech. of China
HE DeFeng Univ. of Sci. & Tech. of China

To solve nonlinear multi-objective dynamic optimization problem originates from process control, a modified frame of dynamic modular multivariable controller based on lexicographic optimization

strategy is proposed, which had control modules with different priorities. A modified one-step fast nonlinear predictive control algorithm is used to solve control input in every module. Strategy of the selection of final control input is also proposed. The computer simulations on a two-tank system are carried out to confirm the effectiveness of the algorithm.

FrA05-5

基于 Multi-agent 的地铁列车智能控制集成框架

The Integrated Intelligent Control Framework of Subway Train Based-on Multi-agent, pp.3-395~3-398

路飞
宋沐民
田国会
李晓磊

14:50-15:10

山东大学
山东大学
山东大学
山东大学

在详细分析地铁列车的运营特点的基础上, 将降低列车群的总晚点时间和提高相邻列车对客流的吸纳水平作为性能指标, 建立地铁列车运行调整模型。在分析 Multi-agent 的技术特点后, 将人工智能技术、计算机网络技术融合其中, 提出了基于 Multi-agent 的地铁交通系统智能控制集成框架。将整个系统划分为管理 Agent、区域 Agent 和列车 Agent, 系统能够根据环境的变化进行动态响应及动态协作控制, 对列车运行中的不确定性事件进行自动调整, 提高线路的运营能力。仿真结果表明, 基于 Multi-Agent 理论进行列车运行调整控制是合理有效的。

Based on the analysis of movement of subway train, the model of train operation adjustment problem is constructed. In this model, decreasing the total delay time and increasing the absorption to passengers of the successive trains are taken as the object. After the analysis of the character of Multi-agent, the integrated control framework based on Multi-agent is proposed, in which the artificial intelligence and network technology are syncretized into Multi-agent. The system is divided into manager agent, region agent and train agent, it can respond and cooperated control dynamically according to the environment, so it can adjust the unexpected event automatically during the train operation and improve the operation ability of the line. The simulation result shows the train operation adjustment control based on Multi-agent is reliable and effective.

FrA05-6

免疫连续蚁群算法

Immunized Continuous Ant Colony Algorithm, pp.5-705~5-709

高玮

15:10-15:30
武汉工业学院

蚁群算法是模拟自然界蚂蚁群体的路径搜索行为而抽象提出的一种仿生优化算法, 目前其算法已成了一种有效的组合离散优化新方法。为了扩展算法的研究范围, 已有一些学者研究了蚁群算法在连续优化问题中的应用问题, 提出了一些解决连续优化问题的连续域蚁群算法。为了改善连续蚁群算法的搜索性能, 把进化算法和免疫算法的原理同连续蚁群算法相结合, 对蚂蚁个体进行自适应变异及基于浓度的选择, 提出一种免疫连续蚁群算法。为了验证算法的有效性, 通过典型函数 Schaffer 函数和“大海捞针”函数优化的仿真实验进行研究, 并和没有改进的连续蚁群算法进行比较, 结果表明, 免疫连续蚁群算法不但收敛速度更快, 而且计算精度也有很大提高。

Nowadays, to solve continuous optimization problem and extend the traditional ant colony algorithm, some Continuous Ant Colony Algorithms have been proposed. To improve the searching performance, the principles of evolutionary algorithm and immune algorithm have been combined with the typical Continuous Ant Colony Algorithm, and one new immunized Continuous Ant Colony Algorithm is proposed here. In this new algorithm, the ant individual is transformed by adaptive Cauchi mutation and thickness selection. To verify the new algorithm, the typical functions, such as Schaffer function and “Needle-in-a-haystack” function, are all used. The results show that, the convergent speed and computing precision of new algorithm are all very good.

FrA07

13:30-15:30

Meeting Room 7

非线性系统及其控制 (1)

Nonlinear System and Control (1)

Chair: Ji Guojun
Co-Chair: 李树荣

Xiamen Univ.
中国石油大学

FrA07-1

永磁同步电动机系统的有限时间跟踪控制

Finite Time Tracking Controller Design of the Permanent-Magnet Synchronous Motor, pp.4-13~4-16

武玉强
马新
宗广灯

13:30-13:50

曲阜师范大学
曲阜师范大学
曲阜师范大学

考虑了一类永磁同步电动机的有限时间跟踪控制问题。在控制器设计中利用中继切换控制使系统在给定的当前控制律的作用下运行到某一特定状态 (或某一特定区域) 后, 控制律被切换到有限时间收敛的终端滑模控制器, 使得系统在有限时间内达到平衡状态。有限时间跟踪控制器的设计保证了闭环系统所有信号的有界性和平衡点的全局稳定性, 以及系统在有限时间内精确地跟踪给定的参考信号。最后, 通过一个数值仿真验证了所提算法的正确有效性。

The problem of the finite time tracking controller design is considered for a class of permanent-magnet synchronous motor. During the control process, the first phase is to induce the system state into a prescribed state (or region) under the current control law by using the relay switching control; the second phase is to switch to a terminal sliding mode control such that system state reaches the equilibrium point in a finite time. The boundedness of all signals of closed-loop system and the global stability of equilibrium point are guaranteed and the system states accurately track the states of the reference signal in a finite time. Finally, numerical simulation validates the efficiency of the control scheme.

FrA07-2

13:50-14:10

Comparisons of Two Sufficient Conditions for Chaos Synchronization, pp.2-235~2-240

Cai Jianping
Wang Jiangen
Wu Xiaofeng
Chen Shuhui

Zhongshan Univ.
South China Univ. of Tech.
South China Univ. of Tech.
Zhongshan Univ.

Two sufficient conditions for a generic master-slave synchronization scheme by linear state error feedback control are derived based respectively on Sylvester's criterion and Gerschgorin disc theorem, which are expressed by some inequalities. It is proven theoretically that the sufficient condition by Sylvester's criterion is more flexible than that by Gerschgorin disc theorem. The two sufficient conditions are further compared by three typical chaotic systems: the Duffing equation of two dimensions, the Lorenz system of three dimensions and a loudspeaker system of four dimensions. Numerical simulations support the theoretical result.

FrA07-3

14:10-14:30

一类带有不确定性的时滞系统的鲁棒控制器设计

Robust Controller Design for a Class of Time Delay Systems with Uncertainty, pp.2-245~2-249

李树荣
杨青
薛秀莉

中国石油大学
中国石油大学
中国石油大学

本文考虑一类带有不确定性的单输入单输出时滞非线性系统, 利用反步设计的迭代设计思想, 在每一步构造一个李亚普诺夫-克拉索夫斯基泛函, 用放大不等式的方法获得一种鲁棒控制器表达式, 该控制器保证闭环系统是一致最终有界的。最后, 以两阶的连续搅拌化学反应器为例的仿真结果也验证了控制器具有良好的控制特性。

In this paper, a class of single input single output time-delay nonlinear systems with uncertainty is considered. Based on an iterative procedure known as backstepping, the Lyapunov-Krasovskii functionals are constructed at each step. By magnifying inequation at

each step, a controller expression can be acquired, and the uniformly ultimately boundedness of the closed loop system can be guaranteed. A practice industry process - a two stage CSTR has been provided to illustrate the application of the main result. The simulation shows that the controller proposed in this paper has well control behavior.

FrA07-4 **14:30-14:50**
Synchronization of Lur'e Networks with Time Delay, pp.2-312~2-315

Xu Shiyun Peking Univ.
Yang Ying Peking Univ.
Huang Lin Peking Univ.

In this paper, we present a network model in which every identical node is a time-delay Lur'e system, and we investigate the synchronization problem of such models. It is shown that the synchronization condition is determined by the dynamics of each uncoupled node by using a decoupling technique, which reduces a high-dimension linear matrix inequality to the test of a set of LMIs with dimensions of the same as that of each node. These derived criteria are very easy to be verified through Matlab Toolbox. The efficiency of the derived results is demonstrated by a numerical example through simulation.

FrA07-5 **14:50-15:10**
The Passive Energy Tracking Control Law of the Compass Bipedal Robot, pp.2-457~2-462

Liu Zhenze Jilin Univ.
Zhang Peijie Jilin Univ.
Tian Yantao Jilin Univ.
Zhou Changjiu Advanced Robotics & Intelligent Control Centre (ARICC)

Some basic passive energy tracking control strategies on the passive compass biped, with controller added at the hip and at the ankle respectively following the model Goswami has presented 1997, have been addressed in the paper. The idea is, with the use of the hip and ankle control respectively, to attain to the reference energy of certain limit cycle more efficiently than that without control and also to attain to any target limit cycle we expect within some region. In addition, we analyzes the global control property on the robots in detail and moreover a comparison between the simply ankle and hip control respectively has been discussed ,consequently, a result comes out that both the control law we presented will enlarge the basin of attraction of the limit cycle in great degree.

FrA07-6 **15:10-15:30**
基于扩展卡尔曼滤波的板球系统摩擦力估计
Friction Estimation of Ball and Plate System Based on Extended Kalman Filter, pp.2-375~2-379

张雪菲 吉林大学
田彦涛 吉林大学
王红睿 吉林大学
丁策 吉林大学

针对板球系统中球与板之间存在的摩擦力精确模型难以建立的问题,提出了一种基于扩展卡尔曼滤波的摩擦力状态估计方法,该方法不必对摩擦力建立精确的数学模型,而是通过引入模型误差的概念,设计扩展卡尔曼观测器对摩擦力的值进行在线估计.同时针对测量误差和模型误差引起滤波器发散的问题,提出协方差矩阵加权修正的改善方法,最后给出实验和结果分析.

In the literature,a method of friction estimation based on extended Kalman filter aimed at the difficulty of obtaining the exact friction model was proposed. This method induced the concept of model error and designed an extended Kalman filter observer to estimate the value of friction on line. At the same time, the method of covariance matrix weighted modify was provided for the question of divergence of Kalman filter. The experiment result was shown in

the end of paper.

FrA08 **13:30-15:30** Meeting Room 8
控制设计方法 (1)
Control Design (1)

Chair: Fei Shumin Southeast Univ.
Co-Chair: 阮久宏 山东交通学院

FrA08-1 **13:30-13:50**
Design of Tiltrotor Flight Control System Using Optical Control, pp.4-687~4-691

Fan Yong hua Northwestern Polytechnical Univ.
Yang Jun Northwestern Polytechnical Univ.

Tiltrotor can flight both airplane mode and helicopter mode by changing the propulsion thrust vector via angle of nacelle. Therefore tiltrotor has performance of vertical and short take-off and land (V/STOL), multi-purpose aircraft with excellent high-speed cruise. However, it is very difficult to design the flight control system for transforming the flight mode because both thrust vector and aerodynamic force are used. First the model of the tiltrotor is given, and then the method of optical control is present to design the flight control system. The power of propeller constant conversion scheme that is supporting the power of the propeller is constant while tiltrotor converts the flight mode has been interpreted. Finally the flight control system is simulated and the simulation results have been proved that the flight control system is feasible.

FrA08-2 **13:50-14:10**
一类不确定系统可靠跟踪控制器设计

Reliable Tracking Control for a Class of Uncertain Systems, pp.4-696~4-698

申涛 济南大学
王孝红 济南大学
景绍洪 济南大学

针对一类不确定系统,研究了执行器故障情况下可靠跟踪控制器的设计问题,以线性矩阵不等式(LMI)的形式给出了可靠跟踪控制器的存在条件,通过求解该线性矩阵不等式可以得到状态反馈可靠控制器的参数化形式.最后通过仿真算例验证了本文结果具有更小的保守性.

The problem of the reliable tracking controller design against actuator failure was studied for a class of uncertain systems. The sufficient conditions for existence of reliable tracking controller were presented in the form of linear matrix inequality (LMI). And the parameterized representation of state feedback reliable controller was provided in terms of the feasible solutions to a certain LMI. It was proved that the results proposed by this paper are less conservative by numerical example.

FrA08-3 **14:10-14:30**
Override and Model Predictive Control of Particle Size and Feed Rate in Grinding Process, pp.4-704~4-708

Chen Xisong Southeast Univ.
Zhai Junyong Southeast Univ.
Li Qi Southeast Univ.
Fei Shumin Southeast Univ.

A new grinding control strategy based on override control (ORC) and model predictive control (MPC) is presented to control product particle size and feed rate in grinding process. ORC is employed to avoid mill overloading and to optimize fresh ore feed rate. MPC is adopted for its outstanding features in dealing with large time delay and the constraints imposed on process variables. The proposed control strategy not only ensures a long-term stableness of particle size, but also optimize the fresh ore feed rate. More than half a year's industrial application demonstrates the control strategy's practicality, reliability, and convenience for on-line implementation.

FrA08-4 **14:30-14:50**
一种新的智能控制器设计方法及其在船舶航向控制中的应用

A New Method of Intelligent Controller Design and Its Application in Ship Course Control, pp.4-709~4-714

阮久宏
李贻斌

山东交通学院
山东大学

基于参考轨迹设置和噪声加入技术,提出一种新的智能控制器设计方法。在该方法中,控制器设计分四个步骤:第一步获取具有一定精度的对象与扰动数学模型;第二步使用参考轨迹设置技术规划被控对象控制目标;第三步选择模糊神经网络作为智能控制器并进行结构设计;第四步在动态和不确定性模拟环境下使用进化算法自动搜索和优化控制器参数。然后,将所提出的方法用于设计船舶航向非线性系统智能控制器,并在典型海洋环境下进行船舶航向跟踪与保持控制仿真。结果表明,所设计的控制器有较强的鲁棒性,系统过渡过程快速,动态与稳态精度高,证明了新设计方法的可行性和有效性。

Based on the Reference Trajectory Setting (RST) and Noise Adding (NA) technologies, a new intelligent controller design method was proposed. According to the method, there are four steps in controller design process. Firstly, a certain precision model of the plant and the disturbances should be acquired. Secondly, RST was used to plan the control objective. Thirdly, the Fuzzy-Neural Network (FNN) was chosen as the controller structure to be designed. Fourthly, in the dynamic and uncertainty environment, the FNN's parameters were searched and optimized automatically by using one certain evolutionary algorithm. At last, the new method was used to design the ship nonlinear course system's controller, and the simulations of course track and keep control were done in the classical ocean environment. The results show that the controller designed has good robustness performance, and the system has fast transition process and high dynamic and stable precision. And the new method's feasibility and validity are proved successfully.

FrA08-5 **14:50-15:10**

多工作点加速度计组合件高精度鲁棒温度控制
High Precision Robust Temperature Control for an Accelerometer Unit High Precision Robust Temperature Control for an Accelerometer Unit with Multi-operating Conditions, pp.4-715~4-719

余瑶
钟宜生

清华大学
清华大学

本文将存在多个工作环境的加速度计组合件温度控制受控对象描述为存在有界时变参数摄动和有界干扰的非线性时变不确定系统,提出了一种基于信号补偿的鲁棒温度控制方法,该方法设计的控制器由标称控制器和鲁棒补偿器组成。文中证明了闭环系统的鲁棒控制特性,实验结果显示所设计的控制系统能够在多个工作环境下实现高精度的鲁棒温度控制。

An accelerometer unit temperature control system with multi-operating conditions is described as a nonlinear time-varying uncertain system with bounded time-varying parameter perturbations and bounded disturbance, and a robust temperature control method based on signal compensation is proposed. A controller designed by this method consists of a nominal controller and a robust compensator. Robust control properties of the closed-loop system is proven and experience results shows that the designed control system can guarantee high precision robust temperature control under multi-operating conditions.

FrA08-6 **15:10-15:30**

Development of Intelligent Monitor-system Based on Agent, pp.4-639~4-642

Xu Dahua

Nanjing Agricultural Univ.

Designed a kind of intelligent monitor system module between port and temperature sensor based on Agent, by research the technology of Agent. Then we designed a method of how to use the control COMM to implementing transmission data and reading data, and how to control sensors effectively. With the object oriented method and the multi-thread technology, developed a execute module of Agent with well adaptability and a communication module of

agent which could transmit real time data quickly, increased the self-behavior and the self-adaptability to the surroundings of the intelligent monitor system. At last, the technology obstacle of the monitor system running stably solved.

FrA09 **13:30-15:30** **Meeting Room 9**

模式识别
Pattern Recognition

Chair: 陈增强
Co-Chair: 金连文

南开大学
华南理工大学

FrA09-1

一种新的快速矫正倾斜车牌图像的算法

A New Fast Algorithm to Rectify Tilt Image of Vehicle License Plates, pp.4-485~4-488

叶青
朱亮红
朱素红
李学

长沙理工大学
长沙理工大学
南昌工程学院
长沙理工大学

在车牌自动识别系统(LPR)中,车牌图像常不可避免地存在某种程度的倾斜。车牌的倾斜会给下一步字符的准确切分和识别带来困难,最终也将大大影响车牌识别的准确度。传统的基于 Hough 变换的矫正方法因运算量很大,在实际应用中常常不能准确、迅速地矫正车牌,整体效果不理想。本文采用一种新的基于几何区域的算法,此算法通过旋转车牌,寻找最小几何区域,进而快速、准确地矫正车牌。实验结果表明,该方法可以准确地检测出车牌的倾斜角度,且算法简洁,运算量少,精度高,比传统的基于 Hough 变换算法具有更强的优越性。

In the vehicle license plate recognition system (LPR), the license plate image would inevitably be tilted to an extent. A tilt image brings difficulties for further accurate segmentation and identification of characters, eventually affects the recognition accuracy greatly. The traditional method which is based on Hough transform, in many situation, often can not accurately and promptly rectify the plates for it needs a great amount of calculation, so the overall result is unsatisfactory. In this paper, a new algorithm based on geometric region is used to collect the plates fast and accurate by rotating license plates, seeking for the minimum geometry region. The experimental results show that this method can detect the angle of tilt plates with simple calculation and high precision, which is better than the traditional algorithm based on Hough transform.

FrA09-2 **13:50-14:10**

基于边界设计高斯型传递函数

Gaussian Transfer Function Based on Boundary, pp.4-521~4-525

赵颖
周芳芳
樊晓平

中南大学
中南大学
中南大学

在体绘制中传递函数将体数据转换成颜色、不透明度等光学属性,决定了绘制效果,成为体绘制研究的关键。本论文提出了基于边界设计高斯型传递函数的高效方法。该方法首先通过梯度阈值提取边界体元,简化数据场,然后将提取边界面的目标函数设计为计算边界面的平均梯度的极值。最后利用提取出的边界面来设计高斯型传递函数,并采用分段分析积分法实现了采样点的颜色合成。该设计方法在保证绘制效果的同时,提高了边界面的准确度和传递函数的设计效率。

This paper advances the use of boundary information in transfer functions with a methodology for computing high-quality boundary measurements. An efficient approach for the extraction of boundary from volume datasets was describes. First, boundary voxels are defined by gradient magnitude threshold to refine the dataset. And then an objective function to detect the good boundary can be defined as the surface integral of the mean gradient magnitude. The boundaries are detected as maxima in cumulative Laplacian-weighted gray value histograms divided by boundary area values, with a computationally efficient method that requires only a single

pass through the boundary volume. Last, a Gaussian transfer function is designed by the boundaries for high-quality rendering, and the transfer function can be analytically integrated over a line segment under the assumption that data values vary linearly between two sampled points.

FrA09-3 14:10-14:30

候选字静态生成技术及其在两级 LDA 汉字识别中的应用

A Static Candidates Generation Technique and Its Application in Two-stage LDA Chinese Character Recognition, pp.4-571~4-575

刘志斌

华南理工大学

金连文

华南理工大学

线性判别分析 (Linear Discriminate Analysis, LDA) 作为一种有效的特征选择工具已经被广泛地运用在汉字识别当中。本文在传统 LDA 方法基础上, 提出了一种新颖的候选字静态生成技术, 从而克服了 LDA 训练时间长、计算量大的缺陷, 实现了一种基于两级 LDA 的大类别手写汉字分类方法。实验表明, 使用两级 LDA 分类方法与单纯使用最小距离分类器和使用了一级 LDA 的分类方法比较, 误识率分别大幅降低了 60% 和 35%。

As an effective tool for feature selection, Linear Discriminate Analysis (LDA) has been widely used in the field of Chinese Character Recognition. In this paper, we propose a novel static candidates generation technique, which significantly reduces the storage and the computational complexity of the traditional LDA. Using the proposed technique, a two-stage LDA recognition scheme for Chinese character recognition is presented. Compared with minimum distance classifier and LDA plus minimum distance classifier, the error ratio of proposed scheme significantly decline 60% and 35% respectively, which shows the validity of the proposed approach.

FrA09-4 14:30-14:50

抗剪切鲁棒水印的自适应多址嵌入与提取算法

Resisting Cropping Robust Adaptive Watermarking Embedding and Extracting Algorithm Based on Multi-address, pp.4-614~4-617

顾巧论

上海交通大学

高铁杠

南开大学

陈增强

南开大学

首先对二值水印图像进行变换, 而后利用自适应算法将其分别嵌入到灰度图像的不同地址的小波子带系数中; 子带系数的选择采取自适应调整算法; 提取水印图像时, 将从不同分块提取的水印依据水印相关系数进行自适应组合, 最终得到最优的数字水印图像。本文提出的这种水印多址自适应嵌入和提取技术对于常规的剪切攻击具有极强的鲁棒性, 对非常规剪切的攻击也能提取较为清晰的水印信息, 实验结果验证了算法的性能。

Binary image is first transformed, and then is embedded in the coefficients of subband of host image imperceptibly, which is divided into different parts, coefficients of band are found out based on adaptive algorithm. The extracting process is carried out by combining watermarking extracted from different sections of the image based on correlation coefficient between original watermark and derived one. The scheme proposed here by utilizing multi-address embedding and extracting based on adaptive algorithm is extremely robust to wide variety of regular cropping, and the derived watermark is still readily recognizable even if it is cropped randomly. Experiments show the good effectiveness of the algorithm normalized electronic documents in order for readers to search and read papers conveniently.

FrA09-5 14:50-15:10

基于最优全局仿射变换的分级汉字字库的设计及实现

Hierarchical Chinese Character Database Based on Global Affine Transformation, pp.4-584~4-588

俎小娜

华南理工大学

金连文

华南理工大学

本文采用最优全局仿射变换 (GAT) 的方法构建分级汉字字库, 该方法能够自动匹配字库中的部件与汉字中对应部件的几何形状与位置,

避免了手动选点方法中大量的人工工作。本文求得了仿射变换参数的具体表达式, 并对汉字和部件图像进行了预处理。实验结果表明, 在保证结构相似度的基础上, GAT 的计算速度提高了二十倍。

This paper uses optimal Global Affine Transformation (GAT) to construct Hierarchical Chinese Character Database. GAT can automatically match the components in database and the corresponding components in characters. Therefore, GAT can avoid large labor that is needed for selecting points by hand. In order to improve the computing speed, specific expressions of the parameters are achieved and preprocessings are applied to characters' and components' images in this paper. Experimental results show that computing speed has been improved twenty times with good simulated results.

FrA09-6 15:10-15:30

基于细胞神经网的道路图像快速分割算法

A Fast Road Image Segmentation Algorithm Based on Cellular Neural Networks, pp.4-114~4-116

徐国保

广东海洋大学

尹怡欣

北京科技大学

殷路

北京科技大学

郝彦爽

北京科技大学

周美娟

广东海洋大学

针对非结构化道路的阴影和水迹等环境因素的影响, 利用细胞神经网络并行图像处理能力, 提出一种基于细胞神经网的道路图像快速分割算法。采用细胞神经网的灰度阈值分割, 膨胀腐蚀, 边缘检测等操作。实验结果表明: 该算法具有较强的环境适应能力, 不仅能实现结构化道路和非结构化道路快速分割, 而且能消除阴影和水迹对道路图像分割效果的影响, 快速有效地分割出道路区域。

The main factors that affect segmentation of unstructured road images are shadows and water marks on the road surface. Taking advantage of the parallel image processing capability of cellular neural networks, a fast algorithm for road image segmentation based on cellular neural networks was proposed. In the algorithm, gray threshold segmentation, dilation and erosion, and edge detection using CNN are performed successively. Experimental results demonstrated that the algorithm has strong environmental adaptability, which can fast segment structured and unstructured roads. The proposed method can segment the lane area quickly, effectively and robustly, and can eliminate the influence of shadows and water marks on the segmentation of road images.

FrA10 13:30-15:30 Meeting Room 10

通讯网络系统 (1)

Communication Network Systems (1)

Chair: Yu Li

Zhejiang Univ. of Tech.

Co-Chair: 梁新荣

五邑大学

FrA10-1 13:30-13:50

无线传感器网络的滚动时域状态估计方法

Moving Horizon State Estimation for Wireless Sensor Networks, pp.5-571~5-575

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本文利用滚动时域方法对无线传感器网络的状态估计问题进行研究, 给出了基于量化测量值的滚动时域估计算法。当前的滚动时域估计方法是在测量值的信息全部获取的情况下得到的, 而本文的方法考虑了传感器只发送一个比特至融合中心的状态估计问题。与其它传感器网络中的状态估计方法相比, 该方法减少了每一步的计算量。仿真结果验证了该算法的有效性。

The state estimation based on quantized measurements of wireless sensor networks is studied using the moving horizon estimation methodology. The current moving horizon strategies cannot deal with quantized measurements since they use the whole information of measurements. In this work we assume that the sensors are send only one bit data to the fusion center at each time slot.

Compared with other estimation approaches for wireless sensor networks, the moving horizon method proposed in this paper can reduce the computation complexity and still provides satisfactory estimation quality. Finally a numerical example is given to demonstrate our algorithms.

FrA10-2 13:50-14:10

人工免疫控制器在高速公路匝道控制中的应用
Application of Artificial Immune Controller to Freeway Ramp Metering, pp.6-41~6-44

梁新荣
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生物免疫系统依靠 T 细胞在不同的免疫阶段起着促进或抑制两种不同的调节作用,保证了免疫系统在各种抗原入侵时能够快速响应并保持足够的稳定性,进而维持生物体体内平衡。本文借鉴生物特异性免疫中 T 细胞、B 细胞协同免疫机理,提出了一种人工免疫控制方法,并将其应用到高速公路入口匝道控制中。首先建立了高速公路交通流模型;然后阐述了生物免疫机理,结合反馈控制理论用人工免疫控制器实现了高速公路入口匝道控制;最后用 MATLAB 软件进行系统仿真,并将其与模糊逻辑入口匝道控制器的控制效果进行比较。结果表明,人工免疫控制器在响应速度、动态性能方面都要优于模糊逻辑入口匝道控制器,该方法为高速公路入口匝道控制提供了一种切实可行的新途径。

A biological immune system can respond to various antigens immediately and maintain adequate stabilization, which dues to the active and inhibitive function of T cells in different stages of the immune process. Based on the mechanism of B-cell cooperating with T-cell exhibited in biological special immune, an artificial immune control method is proposed, and is applied to freeway on-ramp metering. First, the freeway traffic flow model is built. Then the mechanism of a biological immune system is formulated. In conjunction with the feedback control theory, a freeway on-ramp metering is realized by using artificial immune controller. Finally, the control system is simulated in MATLAB software. Fuzzy logic on-ramp controller is also chosen in contrast to the artificial immune controller. The result shows that the artificial immune controller improves evidently on the aspects of response speed and dynamic performance. This method provides a novel and practical way to realize freeway on-ramp metering.

FrA10-3 14:10-14:30

SCTP 流量的混沌控制研究
On SCTP Traffic Chaotic Control, pp.5-603~5-606

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SCTP (Stream control transport protocol) 是下一代网络信令传送控制的主要协议之一,我们提出基于参数微扰的混沌流量控制 (PP-BCTC) 方法,并将这一方法应用于 SCTP 的流量控制中,利用参数微扰的方法降低 SCTP 流量的初始条件敏感性。仿真实验结果表明:该方法能有效地控制 SCTP 流量的蝴蝶效应。

SCTP (Stream control transport protocol) is one of the primary signaling transport protocols in NGN. We proposed PPBCTC (Parametric Perturbation Based Chaotic Traffic Control) method. By this method, the "sensitive dependence on initial conditions" of the SCTP traffic can be reduced. Simulation results show that this method has reduced the "butterfly effect" of SCTP traffic.

FrA10-4 14:30-14:50

A Novel Management Method Based on SNMP, pp.5-619~5-621

Cheng Chuanqing
Wang Li

Wuhan Univ. of Tech. & Sci.
Wuhan Univ.

This paper introduces a novel management method base on SNMP. There are some shortages in the standard SNMP protocol. The standard SNMP protocol is not transparently transmitted, so when the management objects' amount is big, the requests and

responses are many. A novel management method is brought out in the paper, the method changes transmitting way to transparently transmitting, and add a error return scheme in the process. The method is very fit for high speed network.

FrA10-5 14:50-15:10

Modelling and Control of Networked Control Systems with Random Packet Losses, pp.5-695~5-699

Zhang Wen'an
Yu Li
Song Hongbo

Zhejiang Univ. of Tech.
Zhejiang Univ. of Tech.
Zhejiang Univ. of Tech.

The modelling and control problems are studied for a class of networked control systems (NCSs) with both network-induced delays and random packet losses. The packet-loss processes in the forward channel and the backward channel are modelled as two Markov chains. The state feedback control law is considered, and the resulting closed-loop system is a discrete-time Markovian linear system with two modes. Mean-square exponential stability conditions are derived for the closed-loop NCS by using a properly constructed Lyapunov function. Corresponding state feedback controllers design procedures are also presented based upon the stability conditions. Finally, an illustrative example is given to demonstrate the effectiveness of the proposed method.

FrA10-6 15:10-15:30

VHF 空地数据链通信协议架构及转换流程研究
On VHF Air-Ground Datalink Communication Protocols Framework and Transformation Flow, pp.5-626~5-629

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介绍了甚高频空地数据链结构与通信协议,分析了甚高频空地数据链通信协议的架构,在此基础上综合描述 ARINC (Aeronautical Radio Inc) 协议的关系及报文在各协议间格式的转换流程,抽象出空地数据链数据通信及报文转换系统模型,为空地数据链数据在民航领域推广应用奠定了坚实的基础。

The structure of VHF (Very High Frequency) air-ground datalink and communication protocols are introduced, and the framework of VHF air-ground datalink communication protocols is analyzed. Relationship between ARINC specifications is analyzed comprehensively and the message format conversion between protocols is given. The model of data communication and messages conversion based on air-ground datalink is abstracted. Research on the framework and transformation flow of communication protocols establishes a steady base for the further application of VHF air-ground datalink messages in the civil aviation field.

FrA11 13:30-15:30 Meeting Room 11

建模、辨识与信号处理 (1)

Modeling, Identification and Signal Processing (1)

Chair: 奚宏生
Co-Chair: 阳春华

中国科学技术大学
中南大学

FrA11-1 13:30-13:50

基于陷波器的自适应直接复频率估计算法
Adaptive Notch Filter Based Algorithm for Direct Complex Frequency Estimation, pp.3-145~3-147

杨坚
奚宏生

中国科学技术大学
中国科学技术大学

给出了一种用于单个复频率估计的陷波器传递函数,并将陷波器模型转换成状态空间模型,此模型具有很好的稳定性。在此基础上,建立了最小方差损失函数,并结合高斯牛顿预测误差方法,提出了稳定的,高性能的,在线的复频率直接估计算法。最后,对算法进行仿真,结果表明算法具有快速收敛和高精度特性。

A notch filter is proposed for single complex frequency estimation

problem. It is represented as state-space equation model, which has good stability. A cost function is presented, and by applying Gaussian-Newton type recursive prediction error based method, a stable and efficient online frequency estimation algorithm is derived. Finally, the simulations are performed, and the results show that the proposed algorithm has fast convergence and high estimation accuracy.

FrA11-2 13:50-14:10

一种基于输出概率密度函数的动态系统参数辨识方法
A New Method of Parameters Identification of Dynamic Systems Using Output Probability Density Function, pp.3-108~3-111

刘太元	中国科学院
贾建芳	中国科学院
王宏	中国科学院
岳红	中国科学院

当系统模型未知参数的估计值接近参数的真值时,模型预测输出的概率密度函数也将逼近参数真实值时的模型输出概率密度函数。基于以上思想,提出了动态系统的一种新的参数辨识方法。该方法以参数真实值时系统输出的概率密度函数与估计值时的系统预测输出概率密度函数之间的距离为目标函数来估计参数。为了解决输出 PDF 估计计算量大,对数据质量要求高的缺点,同时根据模型输出的直方图,提出了另外一种目标函数。以 HIV/AIDS 三维模型为例进行了仿真试验,仿真结果表明了该方法的有效性及其鲁棒性。

When the estimated parameter values are close to the true values, the probability density function of output with the estimated will be close to the probability density function with the true parameter values. Based on this idea, a new method is proposed to estimate unknown parameters using output probability density function. To cope with shortcomings of estimation algorithms of output probability density function, another performance function is also proposed based on the histogram of model output. In order to illustrate the effectiveness and robustness of this method, HIV/AIDS model is taken as an example and the simulation results are encouraging.

FrA11-3 14:10-14:30

一种新的里程计刻度因子在线辨识算法
A New Online-Identification Algorithm for Odometer's Scale Factor, pp.3-115~3-119

张红良	国防科技大学
吴文启	国防科技大学
胡小平	国防科技大学

讨论了一种非线性随机系统——捷联惯导系统中的辨识问题,提出了一种新的里程计刻度因子在线辨识算法。根据零速修正原理,惯导速度误差满足 Schuler 周期,具有缓变的特性,算法将短时间间隔的速度变化作为信息量,采用最小二乘法辨识里程计刻度因子。为了增强工程实用性,辨识计算中采用了跟踪微分器和渐消记忆最小二乘法。算法能够跟踪里程计刻度因子的变化,因此适用于载体行驶时间长,路面状况变化大的导航场合。通过跑车仿真实验,算法跟踪速度快,辨识精度高,能够大大提高导航定位精度。

A identification in a nonlinear stochastic system—strapdown inertial navigation system is addressed. A new online-identification algorithm of odometer's scale factor is proposed. From zero velocity update (ZUPT), the velocity errors in inertial navigation system propagate in the Schuler loops, and based the slow-varying property of velocity errors, the algorithm identifies the odometer's scale factor using the changes of velocity during a short time. A tracking differentiator and a fadeout memory LMS algorithm is adopted in the identification to make the algorithm more practicable. The algorithm can track the odometer's scale factor varying with time, and therefore be suitable for navigation case in which a vehicle runs a long time and roads vary a lot. Simulation indicates that this new algorithm can identify the odometer's scale factor fast with small errors, so as to improve the accuracy of navigation.

FrA11-4 14:30-14:50

自校正观测融合 Kalman 预报器

Self-tuning Measurement Fusion Kalman Predictor, pp.3-124~3-129

贾文静	黑龙江大学
高媛	黑龙江大学
邓自立	黑龙江大学

对于带未知噪声方差和带相同右因子的不同观测阵的多传感器系统,基于求解相关函数矩阵方程组,提出了噪声方差在线估值器。进而基于 Riccati 方程,提出了一种自校正加权观测融合 Kalman 预报器。用动态误差系统分析方法,严格证明了它按实现或以概率 1 收敛于稳态全局最优融合 Kalman 预报器,因而它具有渐近全局最优性。一个带 3-传感器的目标跟踪系统的仿真例子说明了其有效性。

For the multisensor system with unknown noise variances and with the different measurement matrices which have the same right common factor, based on the solution of the matrix equations for correlation function, the on-line estimators of the noise variance matrices are obtained. Further, a self-tuning weighted measurement fusion Kalman predictor is presented based on the Riccati equation. By using the dynamic error system analysis method, it is strictly proved that it converges to the steady state globally optimal fusion Kalman predictor in a realization or with probability one, so that it has asymptotic global optimality. A simulation example for a target tracking system with 3-sensor shows its effectiveness.

FrA11-5 14:50-15:10

一种基于微粒群优化算法的 T-S 模型参数辨识方法
Parameter Identification of T-S Fuzzy Models Based on Particle Swarm Optimization Algorithms, pp.4-442~4-445

丁园	哈尔滨工业大学
高晓智	赫尔辛基工业大学
黄显林	哈尔滨工业大学
尹航	哈尔滨工业大学

当采用 T-S 模糊模型来辨识非线性过程时,通常所采用的 T-S 模糊模型的规则后件是局部线性或仿射非线性模型。在此基础上辨识得到的 T-S 模型具有规则数目多的缺点。为了减少模糊规则的数目而同时获得较高的辨识精度,本论文提出了将模糊规则后件中的线性模型用简单多项式模型代替并进一步利用微粒群优化算法辨识规则后件参数的方案。数值仿真表明:同具有线性规则后件的 T-S 模糊模型相比,应用本文所提出的方案辨识得到的 T-S 模型具有在相同辨识精度下规则数目显著减少的优点,这一优势随着模型输入变量的增加表现得更为突出。

Most of the T-S fuzzy models commonly used in the identification of nonlinear processes have linear or affine consequents. More specifically, the local mathematical models in the consequents of fuzzy rules are taken to be linear or affine. However, it can always be observed that the number of fuzzy rules of the resultant T-S fuzzy models is very large. In order to reduce the number of fuzzy rules and keep the model accuracy unchanged, a special class of T-S fuzzy models is taken to be the candidate models in this study. In more detail, the consequent of the fuzzy rule in this research is polynomial models instead of linear or affine ones. Based on this candidate T-S fuzzy model, the particle swarm optimization algorithms are employed to estimate the parameters in this model. Numerical simulations demonstrate that the number of fuzzy rules is significantly reduced while the model accuracy is still unchanged. This advantage comes to be more prominent with the increase of input variables.

FrA11-6 15:10-15:30

基于核偏最小二乘的简约最小二乘支持向量机及其应用研究
Reduced Least Squares Support Vector Based on Kernel Partial Least Squares and Its Application Research, pp.3-207~3-211

宋海鹰	中南大学
桂卫华	中南大学

阳春华

中南大学

首先提出一种用于构造稀疏最小二乘向量机的核矩阵快速简约方法,该方法通过最小化原特征空间中的映射向量和简约特征空间中基的线性组合间的欧式距离,并结合由原核矩阵各列向量中最大元素所组成的有序数组,对核矩阵的列向量进行剔除,从而使简约后的核矩阵具有一定稀疏性。并利用核偏最小二乘方法辨识出简约最小二乘向量机的参数。然后利用基于核偏最小二乘的简约最小二乘向量机建立了非线性动态预测模型,对铜转炉造渣期吹炼总时间进行预测。仿真结果表明,基于核偏最小二乘回归的简约最小二乘支持向量机具有计算效率高、预测精度好的特点,具有较好的应用价值。

Firstly, a rapidly reducing kernel matrix method to construct sparse least squares support vector machines is proposed. By minimizing the Euclidean distance between the mapping of sample vector in original feature space and linear combination of base in reduced feature space, the columns in kernel matrix are eliminated according to a order array which are composed of the maximum of every column in original kernel matrix, so that the reduced kernel matrix is sparse. Then, the parameters of reduced least squares vector machine are identified by kernel partial least squares. Lastly, a nonlinear dynamic prediction model using reduced least squares support vector machine on the base of kernel partial least squares is constructed to predict the total converting time of copper converter blowing time during slag making period. The simulation results show that the reduced least squares support vector machine based on kernel partial least squares has the performances like, better efficiency of computation, accuracy of prediction and preferable application value.

FrB01 15:45-17:45 Meeting Room 1
Invited Session: Complex Systems: Analysis and Control (I)

Chair: Jiang Zhong-Ping Polytechnic Univ. of New York
Co-Chair: Hu Xiaoming Royal Inst. of Tech.

FrB01-1 15:45-16:05
Reaching Agreement in Finite Time via Continuous Local State Feedback, pp.6-711~6-715

Xiao Feng Peking Univ.
Wang Long Peking Univ.

In this paper, we consider finite-time state agreement problems for continuous-time multi-agent systems and propose two continuous protocols, which ensure that states of agents reach an agreement in a finite time. Moreover, the second protocol solves the finite-time average-agreement problem and can be applied to the systems under switching topology. Upper bounds of convergence times are also established. Examples are presented to show the effectiveness of our theoretical results.

FrB01-2 16:05-16:25
Sampled-Data Based Average Consensus Control for Networks of Continuous-Time Integrator Agents with Measurement Noises, pp.6-716~6-720

Li Tao Chinese Acad. of Sci.
Zhang Ji-Feng Chinese Acad. of Sci.

In this paper, sampled-data based average-consensus control is considered for networks consisting of continuous-time first-order integrator agents under a noisy distributed communication environment. The impact of the sampling size and the number of network nodes on the system performances is analyzed. The control input of each agent is based only on the information measured at the sampling instants from its neighborhood rather than the complete continuous process, and the measurement of its neighbors' states are corrupted by communication noises. By probability limit theory and the property of graph Laplacian, it is shown that for a connected network, when the sampling size is sufficiently small, the static mean square error between the individual state and the average initial states of all nodes is arbitrarily small. Furthermore, by

choosing properly the consensus gains the almost sure consensus can be achieved. It is worth pointing out that an uncertainty principle of Gaussian networks is obtained, which tells us that in the case of white Gaussian noises, no matter what the sampling size is, the product of the static and transient performance indexes is always equal to or larger than a constant depending on the noise intensity, network topology and the number of network nodes.

FrB01-3 16:25-16:45
Decentralized Discrete-Time Consensus Algorithms for Multi-agent Systems, pp.6-721~6-725

Li Qin Polytechnic Univ.
Jiang Zhong-Ping Polytechnic Univ. of New York

In this paper, inspired by Vicsek's model, two decentralized heading consensus algorithms, WHCA and LBHCA, are proposed. It is proved that, under some well-known connectivity assumption, the WHCA can ensure almost global consensus of the headings except the only situation where they are balanced at the beginning. For the LBHCA, the global heading consensus is guaranteed under the same connectivity assumption. Simulation results are provided to justify the proposed algorithms.

FrB01-4 16:45-17:05
Consensus of Multi-agent System with Diverse Communication Delays, pp.6-726~6-730

Liu Chenglin Southeast Univ.
Tian Yuping Southeast Univ.

In this paper, a protocol is proposed to solve the consensus problem of multi-agent system with diverse communication delays. Sufficient conditions for the convergence to a consensus are obtained based on the frequency-domain analysis and matrix theory. The conditions depend on each agent's self-delay, the weights of the edges to each agent's neighbors, and the interconnection topology of the network. Under the proposed protocol, introducing self-delay can speed up the convergence rate for the system with communication delays. Moreover, the communication delays do not influence the convergence; they prolong the converging time instead. Simulation results illustrate the correctness of the results.

FrB01-5 17:05-17:25
Integration and Implementation of a Low-cost and Vision-based UAV Tracking System, pp.6-731~6-736

Lin Feng National Univ. of Singapore
Chen Ben M. National Univ. of Singapore
Lum Kai Yew National Univ. of Singapore

We present in this paper some preliminary research work carried out for SheLion, a vision-based unmanned aerial vehicle (UAV) designed and built by the UAV research team at the National University of Singapore. Unlike HeLion, a twin brother of SheLion, the latter is equipped with an onboard camera and image processing system, which is capable of detecting and tracking ground targets. We first give in this work a brief introduction to the UAV system, which consists of a bare helicopter, an onboard flight system and a ground supporting unit. We then focus on the development of a real-time vision algorithm, which is able to efficiently detect and identify ground targets. Experimental result based on images captured in actual flight tests is also presented.

FrB01-6 17:25-17:45
Robust Consensus of Multi-agent Systems with Noise, pp.6-737~6-741

Wang Lin Chinese Acad. of Sci.
Liu Zhi-Xin Chinese Acad. of Sci.
Guo Lei Chinese Acad. of Sci.

The consensus problem of multi-agent systems has attracted wide attention from researchers in recent years, following the initial work of Jadbabaie on the analysis of a simplified Vicsek model. While

the original Vicsek model contains noise effects, almost all the existing theoretical results on consensus problem, however, do not take the noise effects into account. The purpose of this paper is to initiate a study of the consensus problems under noise disturbances. First, the class of multi-agent systems under study is transformed into the following general time-varying systems with noises: $x(t+1)=P(t)x(t)+w(t+1)$, where $P(t)$ is a sequence of non-negative stochastic matrices. Then, for such a general time-varying systems, the equivalent relationships are established among (i) robust consensus, (ii) the positivity of the second smallest eigenvalue of a weighted Laplacian matrix, and (iii) the joint connectivity of the associated dynamical neighbor graphs. Finally, this basic equivalence result is shown to be applicable to several class of concrete multi-agent models with noises.

FrB02	15:45-17:45	Meeting Room 2
Invited Session: 登月飞行控制		
Invited Session: Lunar Lander		
Chair: 段广仁		哈尔滨工业大学
Co-Chair: 刘兴隆		哈尔滨工业大学

FrB02-1 **15:45-16:05**

应用非线性规划求解月球探测器软着陆最优控制问题
Applying Nonlinear Programming to Solve Optimal Control Problem of Lunar Probe Soft Landing, pp.6-485~6-487

单永正 哈尔滨工业大学
段广仁 哈尔滨工业大学

研究了一种应用非线性规划求解有限推力作用下月球探测器软着陆最优控制问题的方法。从庞德里亚金极大值原理出发,将有限推力作用下月球软着陆问题转化为两点边值问题;在考虑边界条件及横截条件的前提下,将两点边值问题转化为针对共轭变量初值的优化问题;最后应用非线性规划方法求解形成的参数优化问题。仿真结果表明了所提设计方法是简单、有效的。

A method of applying nonlinear program to solve optimal control problem of lunar probe soft landing under finite thrust is studied. Based on Pontryagin maximum principle, the lunar soft landing problem is transformed into a two-point boundary value problem. Considering bound condition and transversality condition, the resulted two-point boundary value problem is converted into parameters optimization problem aiming at the initial values of conjugate variables which is solved by nonlinear programming. The result of the simulation demonstrates the proposed design scheme is simple and effective.

FrB02-2 **16:05-16:25**

A Lunar Terrain Reconstruction Method Using Long Base-line Stereo Vision, pp.6-488~6-492

Jie Ming Harbin Inst. of Tech.
Huang Xianlin Harbin Inst. of Tech.

In order to make lunar lander land on the surface of moon autonomously and safely, the terrain of landing region should be rebuilt, and the description of landing site terrain should be generated. A long base-line stereo vision 3D reconstruction method through motion is proposed. Aimed at the problems of long base-line stereo vision, a series of algorithms are designed to select and match feature points, to estimate the relative rotation and translation between different positions, to rectify stereo image pair, to get the dense disparity image, to perform 3D reconstruction methods through disparity images, and to generate the DEM(Digital Elevation Map) of the landing region. According to the characteristic of lunar terrain, a software simulation test-bed is built, on which the algorithms are tested. The simulations show that this method can be effectively used in 3D reconstruction of lunar terrain.

FrB02-3 **16:25-16:45**

A Novel Algorithm Reducing All-sky Star Pattern Recognition's De-

lay Time, pp.6-493~6-496

Hu Haidong Harbin Inst. of Tech.
Huang Xianlin Harbin Inst. of Tech.

A novel algorithm reducing all-sky star pattern recognition's delay time is proposed. Because of shortages of the all-sky star pattern recognition such as too much delay time and low precision of measured attitude, the novel algorithm can calculate the position of boresight axis' projection of star sensor when all-sky star pattern recognition is completed and starts a localized star pattern recognition in the area centred at the boresight axis' projection to improve time delay and precision of attitude. Simulation results show that the novel algorithm has less delay time and more precision of attitude than the traditional all-sky star pattern recognition.

FrB02-4 **16:45-17:05**

再入体变质心动力学建模与仿真分析
Dynamics Modeling and Simulation for Moving-mass Reentry Vehicle, pp.6-497~6-501

李瑞康 哈尔滨工业大学
荆武兴 哈尔滨工业大学
高长生 哈尔滨工业大学

以超高速再入体为研究对象,采用 Newton-Euler 建模方法完整地推导了变质心再入体的六自由度动力学数学模型,该数学模型显示了内部活动质量体移动对再入体姿态的影响。在 Matlab 环境下,对再入体进行了六自由度弹道仿真,该仿真考虑了地球自转和非圆球体因素的影响,通过数值仿真获得活动质量体横向偏移引起再入落点分布的情况,同时也获得了落点的横向偏差和纵向偏差的范围。仿真结果验证了变质心控制的有效性。

With respect to hypersonic re-entry vehicle, by applying the Newton-Euler's method, the six-degrees of freedom(6-DOF) dynamical equations of moving mass for a re-entry vehicle are derived and the control mechanism is analyzed according to the dynamical equations. Under the environment of Matlab, the 6-DOF trajectory simulation is presented based on the dynamical equations considering the earth's rotation and non-spheroides factors, the cross-range and down-range of the impact point cause by lateral movement of the moving masses are computed by simulation and the results validate the feasibility of moving mass control.

FrB02-5 **17:05-17:25**

适用于大气层外拦截器的近最优中制导律
A Near Optimal Midcourse Guidance Law for Exoatmospheric Interceptor, pp.6-502~6-506

郑立伟 哈尔滨工业大学
荆武兴 哈尔滨工业大学

本文针对大气层外中段拦截问题,设计了一种带有固定推进时间的近最优中制导策略。首先,一种具有解析形式的相对运动表达式被提出,由于在推导过程中考虑了两飞行器间重力差影响,得出的表达式相对于将两飞行器重力差简化为零重力模型得到的解析式具有更高的精度;然后将此表达式与庞特里雅金极小值原理结合得到拦截器闭环加速度指令,为提高制导性能,补偿加速度指令被引入;最后通过仿真算例验证提出方法的有效性。

A near optimal midcourse guidance strategy with fixed-interval propulsive maneuvers for exoatmospheric interceptor is proposed. Firstly, a new analytic expression of relative motion is derived, because the difference of gravity for interceptor and ballistic missile is taken into account, so the expression had good fidelity than the case where gravitational accelerations acting upon both vehicles are equal. The expression and Pontryagin's minimum principle are combined to obtain a closed-loop form acceleration command. In order to improve the performance of the guidance law, a residual acceleration is introduced. Simulation results show that presented guidance law is effective.

FrB02-6 **17:25-17:45**

Optimal Guidance Law Design for Reentry Vehicle Using Virtual

Displacement Concept, pp.6-507~6-510

Gao Chang-sheng Harbin Inst. of Tech.
 Jing Wuxing Harbin Inst. of Tech.
 Li Chaoyong Harbin Inst. of Tech.

The new predictive guidance law for reentry vehicle is presented in this paper. The proposed approach is based on the fact that lateral forces are formed to a plane perpendicular to the reentry vehicle velocity. In particular, the nominal ground location is defined as the ground location generated by the zero lift trajectory, the virtual displacement is defined as the small changes of the nominal ground location, this changes is caused by any instantaneous lateral force at the beginning of the trajectory. The optimal direction of the lateral force is searched by the solution to the optimal virtual displacement, in which case the virtual displacement is pointing to the target ground location. The analytical solution to the reentry trajectory and the linear quadratic gauss (LQG) method are used in this guidance method. The simulation results show that the effectiveness of proposed method.

FrB03 15:45-17:45 Meeting Room 3
 系统理论与控制理论 (1)
 System Theory and Control Theory (1)

Chair: 耿志勇 北京大学
 Co-Chair: 张承慧 山东大学

FrB03-1 15:45-16:05
Solution of Singularity Problem in Motion Control of Acrobats, pp.2-523~2-527

LAI Xuzhi Central South Univ.
 She Jin-Hua Tokyo Univ. of Tech.
 Wu Min Central South Univ.
 Yang Simon X. Univ. of Guelph

This paper gives an integrated fuzzy-control solution of singularity problem in the motion control of an acrobat. First, the singularity that arises in motion control based on Lyapunov function is explained. Then, a fuzzy controller is employed to regulate one of parameters of the control law to solve the singularity problem in the motion control occurred in the motion control law, Finally, two additional fuzzy controllers for different situations are designed to regulate another parameter of the control law in order to improve the control performance. Simulation results show the effectiveness of the proposed control strategy.

FrB03-2 16:05-16:25
 基于状态反馈的关联 Lurie 控制系统参数绝对稳定性
Parametric Absolute Stability of Interconnected Lurie Systems Based on State Feedback, pp.2-730~2-734

陈宁 中南大学
 桂卫华 中南大学
 刘碧玉 中南大学

针对一类具有线性子系统的关联 Lurie 大系统, 研究其参数绝对稳定性的问题, 即同时考虑参数变化引起的平衡点的改变及其稳定性的问题. 推导出基于矩阵不等式的关联 Lurie 大系统参数稳定性存在的条件和参数稳定域. 基于状态反馈的情形, 提出具有参数稳定区域的分散鲁棒镇定的控制器的设计方法.

This paper considers parametric absolute stability of interconnected Lurie systems, which consist of several subsystems. The notion of parametric stability is joint problem of feasibility and stability of equilibrium states as the uncertain parameters vary. The existing condition of parametric absolute stability and the stable region are derived by bilinear matrix inequalities. A design method for decentralized state feedback controller is proposed based on parametric stable region.

FrB03-3 16:25-16:45
Stability of Polynomial Systems via Polynomial Lyapunov Func-

tions, pp.2-528~2-532

Qi Hongsheng Chinese Acad. of Sci.
 Cheng Daizhan Chinese Acad. of Sci.

The stability of a class of polynomial systems is investigated by constructing a polynomial Lyapunov function. The key technique is to convert the polynomial Lyapunov candidate and its derivative into formal quadratic forms and to test their positivity and negativity respectively.

A new mathematical tool, semi-tensor product of matrices, is implemented to convert polynomials into their formal quadratic forms and vice versa. back and forth. Certain formulas are proposed for this purpose. The advantage of this approach is that the solvability of the problem can be converted into a set of algebraic conditions.

FrB03-4 16:45-17:05
 具有静态非线性互联结构的分布式异构系统的稳定性
Stability of Distributed Heterogenous Systems with Static Nonlinear Interconnections, pp.5-239~5-243

耿志勇 北京大学

本文研究了一类具有非线性静态互联结构的分布式异构网络的稳定性. 假定网络的节点为有限平方可积空间上的单输入单输出算子, 节点之间通过满足扇区条件的非线性时变静态环节互联. 对于这样构成的分布式异构网络系统, 首先建立了网络互联映射满足的代数二次约束条件, 在此基础上, 在假定网络互联适定的条件下给出了网络具有有界增益稳定的条件. 进一步, 当节点动力学由线性时不变算子刻画时, 给出了网络具有有界增益稳定的频域条件.

The paper studies the problem of L2 stability of distributed heterogenous systems with static nonlinear interconnection structures. Under the assumptions that the nodes of the network are the single input single output operators defined on the finite square integrable space, and that the nodes are interconnected by the time-varying static nonlinearities that satisfies the sector condition. For such constructed distributed heterogenous systems, the algebraic quadratic condition that is satisfied by the interconnection mapping of the network is established first. Based on this, under the assumption that the interconnection of the network is well-posed, the condition that the network is of finite gain L2 stability is presented. Further more, when the dynamics of the nodes are described by linear time invariant operators, the frequency domain condition that insures the finite gain L2 stability of the network is put forward.

FrB03-5 17:05-17:25
A Study of Dependence in the Patellar-Tendon-Reflex on Tapping Locations, pp.6-328~6-331

Jiang Yan Univ. of Tsukuba
 Mamizuka Naotaka Univ. of Tsukuba
 Hori Noriyuki Univ. of Tsukuba
 Ochiai Naoyuki Univ. of Tsukuba

The present study investigates the changes in the interaction between the tapping-force and the resulting angular-speed of the knee as the impact location is varied. The tapping force is measured with a force sensor mounted on the hammer and the resulting angular speed of the knee joint is calculated using the data obtained with a tri-axial accelerometer fixed at the ankle of the human subject. The data were taken at six different spots on the tendon location separated vertically with an equal distance. The Upper-Area of Tendon (UAT) and Center-Area of Tendon (CAT) areas are suited for eliciting tendon reflex. This result has long been known by many medical doctors from experiences, without scientific proof. Such information is useful in the design of the Patellar-Tendon-Reflex simulator, which assimilates the lower-leg motion in response to the tapping force applied at the load that acts as a human tendon.

FrB03-6 17:25-17:45
 基于 LQR 的磁悬浮系统的变结构控制
Variable Structure Control of A Maglev System Based on Linear

Quadratic Regulator, pp.2-367~2-370

张承慧
孙晓明
刘睿
刘志军

山东大学
山东大学
山东大学
山东大学

针对磁悬浮系统非线性、敏感性的特点,采用了一种将线性二次型优化(LQR)设计和滑模变结构相结合的控制策略。线性二次型优化设计可以满足系统的静态性能指标要求,而滑模变结构控制抑制了外部干扰的影响,并保证了系统的快速动态响应。该控制策略解决了系统动态性能、鲁棒性和静态性能指标之间的矛盾,控制器设计简单易实现。仿真和实验结果表明系统具有快速的动态响应特性,并且对外部干扰具有较强的抑制能力。

Based on the fact that the magnetic levitation system is nonlinear and sensitive, a robust control strategy which is composed of the optimal Linear Quadratic Regulator (LQR) and the sliding mode control is presented. The LQR design makes sure the system performance index is satisfied, while the sliding mode control restrains the disturbance exterior, as well as makes sure fast dynamical response. The strategy solves the conflict between system dynamical performance, robustness and static performance. The controller is easy to design and realize. Simulation and experiment results demonstrate the system has fast dynamical response and is insensitive to disturbance out of the system.

FrB04 15:45-17:45 Meeting Room 4
复杂性与复杂系统理论(1)
Complexity and Complex System Theory (1)

Chair: 王龙
Co-Chair: Jia Yingmin

北京大学
Beihang Univ.

FrB04-1 15:45-16:05
群体行为与自组织合作
Collective Behaviors and Self-organizing Cooperation, pp.2-553~2-557

王龙
伏锋
陈小杰
楚天广
谢广明

北京大学
北京大学
北京大学
北京大学
北京大学

主要研究复杂网络上的演化博弈。首先研究了具有社团结构的无标度网络上的演化囚徒困境博弈,然后研究了 Newman-Watts 小世界网络中异质性和合作演化的影响。另外,我们考察了在不同合作者和作弊者初始分布配置情况下,不同的初始比例条件对合作水平的影响。我们还在社会网络上研究了雪堆博弈中的合作演化。进一步地,我们研究了网络拓扑和博弈动力学的共同演化问题。最后给出了复杂网络上演化博弈论的未来发展方向与应用前景。

We investigate evolutionary games on complex networks. First, we investigate the evolutionary Prisoner's Dilemma game on scale-free networks with community structures. Then we explore the heterogeneity's role in the evolution of cooperation on a variant of Newman-Watts small-world networks. We also study the influence of different initial conditions on the evolution of cooperation corresponding to different initial configurations for cooperators and defectors distributing among the vertices of networks. Moreover, we investigate Snowdrift game on an empirical social network. Furthermore, we study the entangled dynamics of the evolution of network structure and strategy. Finally, we present the unresolved open problems, future research directions, and possible application areas of evolutionary games on complex networks.

FrB04-2 16:05-16:25
Distributed Consensus Control for Second-Order Agents with Fixed Topology and Time-Delay, pp.2-577~2-581

Lin Peng
Jia Yingmin
Du Junping

Beihang Univ.
Beihang Univ.
Beijing Univ. of Posts & Telecommunications

Yuan Shiying

Henan Polytechnic Univ.

In this paper, distributed consensus control is investigated for networks of agents with double integrator dynamics. Two kinds of networks are analyzed, i.e., directed networks with fixed topology and undirected networks with fixed topology and time-delay. For each of the networks, a sufficient and necessary condition is given to guarantee the consensus. It is proved that the largest tolerable time-delay is only related to the largest eigenvalue of the graph Laplacian. Finally, two numerical examples are provided to illustrate the obtained results.

FrB04-3 16:25-16:45
连续碳酸化分解过程智能控制系统
An Intelligent Control System for Continual Carbonation Decomposition Process, pp.2-582~2-586

胡志坤
桂卫华
阳春华
张作良
王晓丽

中南大学
中南大学
中南大学
中南大学
中南大学

在烧结法氧化铝生产中,利用铝酸钠溶液连续碳酸化分解法生产氢氧化铝是其中的关键工序之一,其分解率梯度与末槽分解率直接影响产品的产量和质量。分解工序是一个存在诸多不确定性、无法用数学模型描述、大滞后的复杂工业过程,传统控制方法难以奏效。本文以控制合适的分解梯度与合格的末槽分解率为目标,将专家控制与预测控制策略相结合,开发了铝酸钠溶液连续碳酸化分解过程智能控制系统。分析了铝酸钠溶液连续碳酸化分解过程机理,在此基础上通过总结长期积累的专家经验建立了专家控制模型,并利用神经网络建立的预测模型预测系统下一时刻输出,用以对专家控制模型输出反馈修正,有效地克服了大滞后因素的影响,实现了分解过程的优化控制。应用结果表明,系统稳定优化地运行,分解率合格率提高了4%,平均分解率提高了0.95%。

In alumina production using the sintering process, it is one of the key processes to produce $Al(OH)_3$ using the method of continual carbonation decomposition of sodium aluminate solutions, and the resolution ratio and the last resolution ratio directly affect the output and quality of product. It is such a long time-delay and complex industrial process, which exists much uncertainty and is too complicated to describe with mathematical models, that it can not be controlled properly by traditional methods. In this paper, aimed to control optimal resolution ratio and the last decomposition ratio, the intelligent control system for continual carbonation decomposition process of sodium aluminate solutions is exploited which combined expert control with predictive control strategy. The principle knowledge and experts' experience of continuous carbonation decomposition process of sodium aluminate solutions is analysed and applied to design an expert control model. And a neural network predicting model is set up to forecast the next output of system which feedback modified the output of expert control model. Thus, the influence of long time-delay was conquered effectively and the process of continual carbonation decomposition was optimal controlled. The practical results show that eligible ratio of decomposition ratio increases by 4%, and average value of decomposition ratio increases by 0.95%. The system is always running well.

FrB04-4 16:45-17:05
元胞自动机及其在兵力推演中的建模与仿真
Cellular Automata and Their Applications in Combat Modeling & Simulation, pp.2-587~2-591

邓方
陈杰
陈文颀
朱琳

北京理工大学
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本文在介绍元胞自动机的基本概念、主要特征及其在军事系统中的应用的基础上,提出了基于元胞自动机的兵力推演模型,并以 Matlab

为工具进行了推演仿真。仿真结果表明,利用元胞自动机建立的兵力推演模型可模拟复杂的大规模的战斗行为,能以简单的模型模拟复杂物理现象或过程,它在兵力推演中将会得到更加广泛的应用。

Cellular automata offered a promising modeling approach to simulate many complex systems. The principles and methods of cellular automata are discussed in this paper, especially their characteristics and applicability. Furthermore this paper focuses on the application of cellular automata in military system and gives the model and simulation of combat using cellular automata. In addition, cellular automata can be generalized easily in the military system.

FrB04-5 **17:05-17:25**
Derivative Feedback Control for Singular Systems, pp.2-592~2-595

Ren JunChao Northeastern Univ.
 Zhang Qingling Northeastern Univ.
 Zhang XueFeng Northeastern Univ.

A survey of derivative feedback control for singular systems is presented. Emphasis is put on the regularization of singular systems as well as eigenstructure assignment developed in recent years. Finally, some prospective topics are outlined.

FrB04-6 **17:25-17:45**

基于文氏电桥的超混沌保密通信及其 DSP 实现
Hyperchaotic Secrete Communication Based on Wien-Bridge Circuit and Its DSP Realization, pp.6-404~6-408

禹思敏 广东工业大学
 吕金虎 中国科学院

基于一个典型的文氏电桥混沌振荡器,应用非线性环状耦合的方法,我们提出了一种新的超混沌保密通信方案。具体而言,我们通过构建一个包含信号的闭合环路,对有用信息进行加密,实现发送端与接收端之间的超混沌系统的同步,最后在接收端解调出原信号。利用数字化处理技术,通过对系统的连续时间无量纲状态方程进行离散化处理,和变量比例变换,我们提出了用 DSP 技术实现该方案的一般设计原理,并给出了硬件实现结果。最后,基于 DSP 平台,我们提出了一种具有实际应用价值的语音混沌保密通信的方案。

Based on a typical chaotic Wien-bridge oscillator, we propose a novel hyperchaotic secrete communication approach by using the nonlinear ring coupling technique. In detail, we firstly construct a loop with signal, then encrypt the useful information and realize the hyperchaotic synchronization between sender and receiver, and finally demodulate the original signal at the end. By using digital processing technology, discreting state variable of continuous time equation without dimensionless and ratio transformation, we present the general design principles based on the DSP technology and some experimental results. Moreover, based on DSP platform, we propose a voice secrete communication method with very high practical value.

FrB05 15:45-17:45 Meeting Room 5

最优控制与优化 (2)
 Optimal Control and Optimization (2)
 Chair: Liu Bin Australian National Univ.
 Co-Chair: Ji Tianyao The Univ. of Liverpool

FrB05-1 **15:45-16:05**

Optimal Robust Control for Uncertain Impulsive Systems, pp.3-381~3-385

Liu Bin Australian National Univ.
 Hill David J. Australian National Univ.

This paper aims to study the optimal robust control problem for uncertain impulsive systems. By using the Lyapunov function method and algebraic inequalities, conditions are derived under which not only the uncertain impulsive system is robustly asymptotically stable and the optimal bound of the hybrid performance functional can be estimated. The results are then specialized to interval linear im-

pulsive systems with quadratic hybrid performance functional. Riccati inequality conditions are used to design feedback controllers to stabilize asymptotically the interval linear impulsive system and the optimal bound of the quadratic hybrid performance functional are derived.

FrB05-2 **16:05-16:25**

基于博弈论的传感器网络能量平衡路由
Game Theoretic Energy Balance Routing in Wireless Sensor Networks, pp.3-420~3-424

曾加 清华大学
 慕春棣 清华大学
 胡建斌 北京大学

针对无线传感器网络能耗不均匀的问题,提出了一种基于博弈论模型的能量平衡路由(GTEBR)算法。GTEBR算法通过引入仲裁机制及自信概率将不完全信息的静态博弈转换为完全但不完美信息静态博弈,采用静态博弈的方法解决问题。本文设计了适合传感器节点的解算机制,并对采用GTEBR算法后的传感器网络纳什均衡的存在性做出了证明,最后仿真实验表明,采用GTEBR算法具有良好的收敛性以及很好的性能。

A game theoretic energy balance routing (GTEBR) algorithm was proposed to avoid unevenly energy consuming in wireless sensor networks. In GTEBR algorithm, arbitration mechanism and confidence probability are introduced to convert static game of incomplete information into static game of complete but imperfect information and the method of static game is imposed to solve this problem. Moreover, the calculation method for node is put forward and the existence of Nash equilibrium of the sensor networks is proofed in this paper. Simulation results show that the GTEBR algorithm has good astringency and performance.

FrB05-3 **16:25-16:45**

Multi-resolution Morphological Operators for Electrocardiogram Signal Analysis, pp.3-425~3-429

Ji Tianyao The Univ. of Liverpool
 Lu Zhen Univ. of Liverpool
 Wu Q. H. The Univ. of Liverpool

Multi-resolution decomposition scheme has been considered as a powerful tool for signal processing. This paper proposes a multi-resolution morphological filter based on coupled wavelet, a morphological multi-resolution decomposition scheme. In addition, as an improvement of the multi-resolution morphological filter, a morphological lifting filter has been presented using the lifting scheme. Applying the proposed filters to electrocardiogram (ECG) signal analysis, which requires the removal of impulsive noise and the detection of characteristic waveforms, the results are very satisfactory.

FrB05-4 **16:45-17:05**

Using Good Nodes Set Principle to Evolution Strategy for Constrained Optimization, pp.5-722~5-726

Xiao Chixin Central South Univ.
 Cai Zi-xing Central South Univ.

Incorporating orthogonal design to enhance the crossover operator of the evolution strategy (ES) can make the resulting evolutionary algorithm more robust and statically sound. But its precision is restricted by dimension of search space. Good nodes set (GNS) is a concept in number theory. This paper presents a new evolution strategy that effectively combines GNS principle with crossover operator to handle constrained optimization problems(COPs). The proposed method has achieved the same sound results as the orthogonal method does, but not to be restricted by the dimension of the space. The simplex selected and diversity mechanism is used to enrich the exploration and exploitation abilities of the approach proposed. Experiment results on a set of benchmark problems show the efficiency of the algorithm.

FrB05-5

17:05-17:25

分布式测控网络系统的多线程技术实现方法

Implement Method of Multithreading Technique for Distributive Monitor and Control Network System, pp.3-441~3-445刘载文
段长明
许继平北京工商大学
北京工商大学
北京工商大学

针对现代楼宇机电设备多、监控分散而不能整体调度的情况,介绍分布式三级测控网络系统的设计与实现方法,包括基于RS-485总线结构、运用VC++多线程开发监控软件实现现场设备系统的集中监控与数据管理;基于B/S结构、运用WEB数据库访问技术实现远程实时监测与数据分析。提出了基于VC的ADO数据库访问技术设计开发楼宇设备数据管理与分析系统的方法。系统实现了各楼宇设备的总体运行分析、数据检索编辑、运行曲线分析、数据统计分析及报表打印等设备运行分析功能,同时采用统计数据库与历史数据库分开管理、统一表字段格式,有效解决了因系统设备多、数据量大而带来的数据管理与统计难题。

Aiming at the situation that monitoring for building equipments was separated and unable to be managed as a whole, the design and implement method of distribute three levers monitor and control network system were represented, a configuration of bus, a data management and analysis method for building devices using multithreading, data base web accessing technique were also described.

FrB05-6

17:25-17:45

On All Sets of Optimal Controls for a Control System with State Feedback, pp.2-170~2-174Jimenez Serrano Eleazar
Araki Keijiro
Kusakabe ShigeruKyushu Univ.
Kyushu Univ.
Kyushu Univ.

We claim the sets of controls for control systems modeled with a multiple and simultaneous control (MSC) approach using Controlled Dan/Petri nets+ and the net structure $\Sigma c(q)$ is the optimal set compared with Controlled Petri nets, however there are other control sets which are still optimal. In this paper we present an algorithm to find all sets of controls which are optimal, possess the MSC-logic and are modeled with a new net structure called $\Sigma xf(q)$, explain the conditions when they are not optimal and a partial order for such sets.

FrB07

15:45-17:45

Meeting Room 7

非线性系统及其控制(2)

Nonlinear System and Control (2)

Chair: Duan Zhisheng
Co-Chair: 王印松Peking Univ.
华北电力大学**FrB07-1**

15:45-16:05

五自由度无轴承异步电机的 α 阶逆系统解耦控制*Decoupling Control of the 5 Degree-of-Freedom Bearingless Induction Motor Based on α -th Order Inverse System Method*, pp.2-262~2-266刘贤兴
董磊
范文进
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针对新型五自由度无轴承异步电机这一多变量、非线性、强耦合的系统,本文采用 α 阶逆系统的方法进行动态解耦控制。首先介绍了五自由度无轴承异步电机的工作原理,分别给出混合磁轴承和无轴承异步电机的力学方程,并建立电机状态方程。然后根据状态方程分析系统的可逆性,应用 α 阶逆系统的方法实现悬浮力与旋转力之间、悬浮力之间的动态解耦。最后由线性综合方法设计系统模型的闭环控制器。仿真结果表明,系统具有良好的动态和静态性能。

A decoupling control approach based on α -th inverse system has been developed for the innovative 5 degree-of-freedom bearingless induction motor, which is multi-variable, nonlinear and high

coupling system. To start with, the working principles of innovative 5 degree-of-freedom bearingless induction motor is briefly introduced. Then the mechanical equations of 3 degree-of-freedom magnetic bearing and 2 degree-of-freedom bearingless induction motor are given. Also the state equations of the motor are set up. Secondly, the reversibility of system based on the mechanical equations is discussed. Using α -th inverse system, the control between radial force and electromagnetic torque force and radial forces control are decoupled. Last but not least, the controllers are designed respectively according to the linear system theory. The simulation results have showed that the whole control system has good dynamic and static performance.

FrB07-2

16:05-16:25

高速公路匝道单神经元自适应PID控制器

Self-adaptation PID Ramp Controller in Freeway Based on Single Neuron, pp.2-254~2-257韦彦秀
梁新荣五邑大学
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提出一种改进的单神经元自适应PID控制方法调节进入高速公路的车辆数目。首先建立了高速公路交通流动态模型,然后确定了匝道控制目标,根据非线性反馈原理设计了单神经元自适应PID匝道控制器。采用一种改进的算法对权值进行调整,最后用MATLAB软件进行系统仿真。结果表明,该系统鲁棒性强,响应速度快,具有优越的动态和稳态性能,能够达到理想的控制效果。

An improved self-adaptation PID control method based on single neuron is proposed to regulate the number of vehicles entering a freeway entrance point. The freeway traffic flow dynamic model is first built. Then the ramp control objective is determined. According to nonlinear feedback principle, a self-adaptation PID ramp controller based on single neuron is designed, and an improved algorithm is used to obtain the weight values. Finally, the controller is simulated in MATLAB software. The result shows that the controller designed has strong robustness, fast response, and good dynamic and steady-state performance. This method has a good effect on freeway ramp control.

FrB07-3

16:25-16:45

Output Feedback Asymptotic Stabilization of Nonholonomic Systems with Strong Nonlinear Drifts, pp.2-274~2-278Wu Yuqiang
Zong GuangdengQufu Normal Univ.
Qufu Normal Univ.

This paper deals with the stabilization of the nonholonomic systems with strongly nonlinear uncertainties and unknown parameters. The purpose is to design a nonlinear output feedback switching controller such that closed loop system is globally asymptotically stable. In order to make the state scaling effective, the switching control strategy based on the output measurement of the first subsystem is employed to achieve the asymptotic stabilization. The integrator backstepping technique is applied to the design of the controller. The adaptive scheme is introduced into the controller design to overcome the unknown parameters. The output feedback asymptotic stabilization is realized.

FrB07-4

16:45-17:05

基于自适应“反步”法的火电厂单元机组协调控制

Boiler-turbine Coordinated Control of Power Plant Based on the Adaptive Backstepping Method, pp.2-279~2-282王印松
田瑞丽
吕丽霞华北电力大学
华北电力大学
华北电力大学

针对火电厂单元机组中时间常数不确定的锅炉-汽轮机协调控制系统非线性模型,采用自适应“反步”法,通过引入虚拟控制变量,逐步构造出动态系统的Lyapunov函数,设计了一个综合非线性控制器,并构造了不确定参数的自适应律。该控制器保证了系统的稳定性,实现跟踪误差收敛于零并对系统的不确定具有很强的鲁棒性。仿真结

果表明, 所设计的控制器能达到比较理想的性能。

In this paper, the boiler-turbine coordinated control system is designed based on the adaptive backstepping method for the nonlinear model with the uncertainly parameters. By constructing some virtual control variables, the Lyapunov function of dynamic system are gradually designed. Finally, the non-linear controller and the parameter updating law are given. This controller not only ensures the stability of system but also could make the tracking error convergence to zero, and it has a strong robustness for the uncertainly parameters. The simulation results have proved that it is feasible.

FrB07-5 17:05-17:25
Global Synchronization of Complex Lur'e Networks, pp.2-304~2-308

Li Zhongkui Peking Univ.
 Duan Zhisheng Peking Univ.
 Huang Lin Peking Univ.

This paper concerns the global synchronization problem of a class of complex dynamical networks with each node being a Lur'e system whose nonlinearity satisfying a slope condition. The synchronization problem is reformulated in the framework of the absolute stability theory. It is shown that the global synchronization of the network can be reduced to the test of a LMI, which in turn guarantees the absolute stability of the corresponding Lur'e system whose dimension is the same as that of a single node. A circle type criterion in frequency domain is further presented, in virtue of which the synchronization of the network can be checked graphically. It is demonstrated that the synchronizability of the network can be characterized by the second largest eigenvalue of its coupling matrix. Finally, a network of Chua's oscillators is provided as a simulation example to illustrate the effectiveness of the theoretical results.

FrB07-6 17:25-17:45
 电力系统一般非线性综合切换励磁控制
Nonlinear Co-ordinated Switching Excitation Control of Power Systems, pp.2-439~2-443

刘艳红 郑州大学
 李春文 清华大学
 汤洪海 清华大学

为了同时满足电力系统电压调节及改善系统功角稳定性的需求, 基于分层控制思想完成了综合励磁控制器设计. 首先采用逆系统方法实现了系统的反馈线性化, 然后根据 Lyapunov 函数方法对包含零动态的部分线性化系统设计了切换励磁控制器. 仿真结果验证了本文方法的有效性.

A novel nonlinear excitation controller is proposed to coordinately enhance the voltage regulation accuracy and transient stability of power systems. First, a partial state feedback linearization is realized by employing inverse system method. Then, a stabilization controller is designed for the zero dynamic included system using Lyapunov function method. Simulation results verify the effectiveness of the proposed control strategy.

FrB08 15:45-17:45 Meeting Room 8
 控制设计方法 (2)
 Control Design (2)

Chair: 卢子广 广西大学
 Co-Chair: 向 婕 中南大学

FrB08-1 15:45-16:05
 一种基于数学构造的矩阵变换器调制策略
A Matrix Converter Modulation Based on Mathematical Construction, pp.4-726~4-729

粟 梅 中南大学
 余 岳 中南大学
 孙 尧 中南大学

桂卫华

中南大学

针对矩阵变换器现有调制策略复杂, 计算量大的问题, 本论文提出了一种基于数学构造的矩阵变换器调制策略. 该调制策略, 省去了以往调制策略中对扇区的计算, 算法简单, 易于理解和实现, 并且能够保证最大电压传输比为 0.866 和输入功率因素可控. 仿真和实验结果表明了这种方法的可行性和正确性.

Various modulation schemes have been proposed for its control. But the most control methodology of matrix converter operation is too complex. In this paper, a simple modulation based on mathematical construction is proposed. This modulation does not need any sector information. It is simple and easy to comprehend and implement. It can ensure maximum input power voltage transmission ratio of 0.866 and controllable input power factor. Theoretical considerations are supported by experimental results.

FrB08-2 16:05-16:25
 采用异步发电机和 PWM 整流器的 42 伏汽车发电系统的一种电压控制策略及分析模型

A Voltage Control Strategy and Analytic Models for a 42-V Automotive Power Generation System with Induction Generator and PWM Rectifier, pp.4-740~4-743

卢子广 广西大学
 谭 峙 广西大学

未来汽车需要高效、高输出功率的发电系统. 本文论述采用异步发电机和 PWM 整流器的 42 伏汽车发电系统设计和实现. 基于转子磁场定向控制方法, 导出了系统的交、直流电压控制模型. 变速时调节定子无功电流, 使发电机定子电势满足升压整流的能控条件. 调节与负载匹配的定子有功电流, 实现强抗扰、快响应的直流稳压控制. 对动态电压的主要影响因素进行详细分析, 据此提出系统化的控制器设计方法, 理论结果已得到实时仿真实验验证.

An efficient, high-power generation system is needed to meet the growing electric power demand in automobiles. This paper is concerned with the design and implementation of a 42-V automotive power generation system by using induction generator and pulse-width-modulation (PWM) boost rectifier. Based on rotor field-oriented control scheme, the control models of the ac and dc voltage of the system are developed analytically. The ac induced voltage of the generator is regulated with stator reactive current for achieving controllable condition of boost rectifier during varying speed. To improve the suppression of dynamic voltage during load-dump and jump-start charging, the dc output voltage of rectifier is regulated with stator active current matching to load. The effects on the dynamic voltage are investigated and the systematic design and analysis of the proposed method is also presented. Theoretical results of the analysis are verified experimentally with real-time simulation.

FrB08-3 16:25-16:45
 面向综合生产指标优化的烧结过程智能集成控制设计
Intelligent Integrated Optimization Control Design of Comprehensive Production Indices for Sintering Process, pp.4-750~4-754

向 婕 中南大学
 吴 敏 中南大学

针对烧结过程这一复杂、多参数耦合的高度非线性系统, 提出一种面向综合生产指标的智能集成优化控制算法. 首先集成关联分析、主元分析、神经网络等多种智能化方法, 建立基于关联分析与主元分析的综合生产指标神经网络预测模型; 然后利用多目标优化技术, 建立生产状态多目标满意优化模型, 获得优化控制目标函数; 最后将混沌搜索技术引入粒子群优化算法中, 提出基于混沌搜索的多目标粒子群优化算法, 对目标函数进行寻优, 求取最优操作参数以指导烧结生产. 实际运行结果表明, 提出的智能集成优化控制算法较好的解决了关联耦合严重、时变时滞的复杂工业过程的优化控制问题, 为流程工业生产过程的优化控制问题提供了一种有效的新思路.

The sintering process is a strong nonlinear system with complexity and multi-parameters. An intelligent integrated optimization algorithm based on comprehensive production indices is presented to

solve the optimization control problem of comprehensive production Indices. First, the neural network prediction model for the comprehensive production indices is proposed, which is synthesizing a lot of techniques, including correlation analysis, principal components analysis, and neural network and so on. And the target function was deduced using the multi-objective satisfactory optimization technology. At last, this paper incorporates chaos algorithm into the particle swarm optimization algorithm, and proposes a multi-objective particle swarm optimization algorithm based on chaos searching to calculate the optimization parameters, and the optimization guidance is introduced. The results of actual runs show that the proposed intelligent integrated algorithm provides a efficient and applied way to resolve the problem of optimization control for the complex strong correlation coupling, time-varying delay industrial process, and provides an effective and new idea to implement the global optimization control for process industry.

FrB08-4 16:45-17:05

多操纵面飞机控制分配的非线性闭环迭代结构

The Nonlinear Iterative Closed Loop Configuration of Control Allocation for Aircraft with Multiple Control Effectors, pp.4-755~4-757

杨凌宇 北京航空航天大学
钟友武 北京航空航天大学
申功璋 北京航空航天大学

针对传统线性控制分配及控制效率系数不准确带来控制分配误差, 将非线性迭代过程引入控制分配器, 提出了一种控制分配的闭环迭代结构, 并对其收敛性进行了理论和数值仿真分析, 该方法可适用于非线性性的控制分配问题, 且不增加系统计算量。仿真结果表明, 该控制分配闭环迭代结构能够有效地抑制分配的误差, 提高控制分配结果对操纵效率系数的鲁棒性。

The linear description and the inaccurate efficiency coefficients bring on the error of control allocation. The iterative closed loop configuration for control allocation was put forward and the nonlinear iterative method was introduced in the control allocation process. The convergence of this configuration was analyzed and simulated. The computational time was not increased and the method can solve the nonlinear control allocation problem. Results show that the iterative closed loop configuration can decrease the allocation error and enhance the robust of control allocation result to the efficiency coefficients.

FrB08-5 17:05-17:25

超声速巡航导弹的纵向通道控制系统设计

The Pitch Channel Slide Control System Design for Supersonic Cruise Missile, pp.4-36~4-40

陈洁 山东烟台海军航空工程学院
潘长鹏 山东烟台海军航空工程学院
顾文锦 山东烟台海军航空工程学院

讨论了超音速巡航导弹俯仰通道过载控制系统的输出跟踪问题。通过坐标转换将原系统转换为规范形, 采用输出重定义技术, 设计了积分型滑模控制律, 解决了原系统的非最小相位问题, 保证了对原系统输出的跟踪。另外, 采用了观测器解决了攻角不易测量的问题。仿真结果表明, 根据该方法设计的控制系统有比较理想的稳定性和鲁棒性。

The pitch channel output tracking of a kind of supersonic cruise missile over-load control system was considered. The systems was transformed into normal form through coordination change, then output-redefinition approach was adopted to design integral-type sliding mode control law, which resolved the non-minimum phase problem of original system, and granted the tracing of original system output. The observer was designed to establish missile attacking angle. The effectivity and robustness were verified by the simulations results.

FrB08-6 17:25-17:45

入侵检测系统性能评估中实验环境的仿真

Design and Realization of Evaluation Environment in the Perfor-

mance Analysis of Intrusion Detection System, pp.6-303~6-306

廖桂平 湖南农业大学
喻飞 江苏省计算机信息处理技术重点实验室
沈岳 湖南农业大学
张林峰 湖南农业大学
徐成 湖南大学

入侵检测系统的评估和开发都需要一个仿真网络环境, 一个功能完整的入侵检测系统评估环境不需大的改动就可以直接用作入侵检测系统的测试。介绍了入侵检测评估的相关工作, 讨论了对入侵检测系统进行评估时的主要评价指标, 提出了一个入侵检测系统的评估系统, 对评估环境中的网络流量仿真、主机使用仿真和网络攻击仿真等几个关键技术问题进行了深入研究。

With the deeply research on intrusion detection techniques and the widely use of intrusion detection products, the study of evaluation techniques of intrusion detection systems became important. In the paper, relative works of the evaluation of intrusion detection systems was introduced. The primary aspects of intrusion detection systems in an evaluation were discussed. An evaluation system for intrusion detection systems was proposed. In the system, a supervisor module controls the whole system. The supervisor module schedules the traffic control module and the attack emulation module. The data in the evaluation environment are recorded and input to the evaluation module. The functions such as emulation of network traffic and host usage, emulation of attacks and evaluation report generation are implemented.

FrB09 15:45-17:45 Meeting Room 9

运动控制
Motion Control

Chair: 李世华 东南大学
Co-Chair: Dong Ling Fang Concordia Univ.

FrB09-1 15:45-16:05

巨型水压机液压力位置保持系统迭代控制的仿真研究

Simulating of Hydraulic Holding System of Large-Scale Forging Press Based on Iterative Learning Control, pp.5-23~5-26

周育才 中南大学
刘少军 中南大学
刘忠伟 中南大学
邓奕 中南大学
黄明辉 中南大学

本文以 3 万吨模锻水压机动梁位置保持系统为例, 针对模锻水压机加工过程的重复性、初始加工精度要求较严、批次加工数量不大的特点, 提出了采用 PD 控制器构造迭代控制的初始控制信号方法, 利用迭代控制实现前馈控制用于抑制周期性的偏载扰动, 利用 PD 控制器作反馈控制用于增强系统的鲁棒性, 仿真结果表明该方法收敛速度快, 且能保证初始加工精度, 对于提高动梁位置保持精度效果明显。

In this paper a new control strategy adopting opening loop ILC combined with PD control is stated for large-scale forging press which have such characteristic as process repetition strict initial process needed and a small quantity in every batch, based on analyzing hydraulic position holding system of moving beam on 30,000t huge water press; and a new method directly using PD control output as initial control output is stated. Experiments result indicated that this method has high constringency speed and can ensure initial process precision, and has distinctness effect for enhance moving beam position holding precision.

FrB09-2 16:05-16:25

H_∞ Adaptive Variable Universe Fuzzy Control for Autonomous Vehicles, pp.5-82~5-86

Chen Li-Song Tianjin Univ.
Wang Jiang Tianjin Univ.
Li Nuo Tianjin Univ.

In the paper, an attempt is made to create the bridge between

two important design techniques, i.e., H_∞ control design and fuzzy control design, so as to supply H-infinity control design with more intelligence and fuzzy control design with better robust performance. By Lyapunov method, the overall closed-loop system is shown to be stable. In the conventional adaptive fuzzy control system, the approximate error is not eliminated completely, so the accuracy of control is limited. In the study, the effect of both fuzzy logic approximate error and external disturbance on the tracking error is attenuated to a prescribed lever by adequately selecting the weight factor. The simulation results of lateral control of autonomy vehicle are given to confirm the control algorithm is feasible for practical application.

FrB09-3 **16:25-16:45**
Wave Variable Sliding Mode Control Design for Bilateral Tele-Operation Systems Using Haptic Interfaces, pp.5-58~5-62

Dong Ling Fang Concordia Univ.
Khorasani Khashayar Concordia Univ.

Wave transformation is an attractive method for tele-operation systems subject to significant time delays. The proposed method can maintain passivity of the communication channel regardless of the amount of delay. However, this method can potentially introduce position tracking errors. The position tracking performance can become seriously unsatisfactory when the delay is time varying. Sliding mode control is an effective robust technique that is particularly useful when one considers tracking control problems with presence of uncertainties and disturbances. The control objective is to force the system dynamics to approach a sliding surface and to remain on it for all future time in order to eliminate or minimize tracking errors. In this paper, a randomly time varying delay is considered in the tele-operation system. A sliding mode controller is designed to ensure a precise position tracking control of the slave side to the master's command in a bilateral tele-operation system operating in a virtual environment using a haptic interface.

FrB09-4 **16:45-17:05**
永磁同步电机的二阶自抗扰控制算法
A Two-order Active Disturbance Rejection Control Algorithm for Permanent Magnetic Synchronous Motor, pp.5-68~5-71

刘志刚 东南大学
李世华 东南大学

用自抗扰控制 (ADRC) 技术设计永磁同步电机 (PMSM) 调速系统的控制器时, 通常根据速度输出方程将速度环控制器设计成一阶自抗扰控制器。这种设计利用了速度调节器的输出 (即电流 PI 调节器的给定) 来近似代替实际的 q 轴定子电流。一阶自抗扰控制器无法对这种近似进行补偿, 使得闭环系统难以获得更为优异的性能。本文针对这个问题, 通过对速度输出方程的分析, 提出一种新的二阶自抗扰调速控制解决方案。仿真结果表明, 该方案使得闭环系统具有更强的抗扰性能, 而且具有更平缓的速度响应和更小的超调。

When designing the controller by using active disturbance rejection control (ADRC) techniques for the permanent magnetic synchronous motor (PMSM) speed-regulation system, the speed controller is designed to be a one-order ADRC according to the speed output equation. This design employs the output of the speed regulator, i.e., the input of the current regulator, to approximately replace the real q-axis stator current. The one-order ADRC can not compensate this approximation, which makes it difficult for the closed loop system to obtain excellent performance. Considering this problem, a new two-order ADRC scheme is proposed in this paper based on the analysis of speed output equation. Simulation results indicate that under this scheme the closed loop system can have stronger anti-disturbance ability, more smooth speed response and less overshoots.

FrB09-5 **17:05-17:25**
永磁同步电动机非线性负载的神经网络自适应控制

The Neural Network Adaptive Control for the Nonlinear Load of the Permanent Magnet Synchronous Motor, pp.5-72~5-76

李诺 天津大学
王江 天津大学
张荣华 天津大学

针对 PMSM 伺服控制系统中不确定非线性因素引起的电磁转矩波动, 以及伺服系统要求快速响应平滑跟踪的关键问题, 本文提出了一种基于神经网络补偿的 PMSM 鲁棒平滑跟踪控制的新的设计方法, 实现了 PMSM 伺服控制系统的快速鲁棒平滑跟踪控制。本文给出了永磁同步电动机及非线性负载的数学模型, 给出了神经网络反步控制和二阶平滑轨迹跟踪滤波器的设计方法, 将所提出的算法利用 DSP 实现交流伺服电机控制, 实验结果证明了所提方法的正确性和有效性。

To solve the electromagnetic torque ripple caused by uncertain nonlinear factor of the Permanent Magnet Synchronous Motor (PMSM) and improve the quick response and the smooth trajectory tracking of the servo system, a robust smooth trajectory tracking method based on Neural Network compensation is designed to the servo control system in this paper. Based on the mathematical model of the PMSM and its nonlinear load, a Neural Network backstepping control method and two-order nonlinear smooth trajectory filter is presented in this paper. Finally, the validity and effectiveness of this control method are verified through the practical DSP experiments applied into AC servo control systems.

FrB09-6 **17:25-17:45**
交叉耦合控制在目标稳定跟踪平台中的应用
Cross-Coupled Control for Three-Axis Turntable Target Tracking System, pp.5-77~5-81

刘治刚 北京理工大学
王军政 北京理工大学
赵江波 北京理工大学

交叉耦合控制 (CCC) 是运用多轴运动控制系统中能有效提高跟踪精度一种方法, 通过轨迹误差传递函数 (CETF) 建立无耦合控制下跟踪误差与加入交叉耦合控制器跟踪误差之间的关系, 将多轴控制系统转化为单输入单输出系统。本文将交叉耦合控制方法引入到三轴稳定跟踪系统, 设计出两轴交叉耦合控制器。仿真分析和实验表明, 该方法比常规 P 控制算法能有效地提高目标轨迹跟踪精度。其中, 俯仰向跟踪误差降低了 35%, 方位向跟踪误差降低了 31%。

Cross-Coupled Control (CCC) is an efficient method for decreasing contouring error, which has been used widely in multi-axes motion systems. The contour error transfer function (CETF), constituted by the response of contouring error between with and without the multi-axis CCC, was introduced to simplify the MIMO system to SISO system. In this paper, The CCC algorithm was introduced to the three-axis stable tracking system, and a biaxial CCC controller was built. Analyses and experiments results suggest that the CCC controller raised target tracking accuracy compared with traditional P controller. In which, the pitch direction tracking error decreased 35%, and the yaw direction error decreased 31%.

FrB10 **15:45-17:45** Meeting Room 10
通讯网络系统 (2)
Communication Network Systems (2)

Chair: 胥布工 华南理工大学
Co-Chair: Zhu Youzhi Chinese Acad. of Sci.

FrB10-1 **15:45-16:05**
Fair Congestion Control for FAST TCP, pp.5-630~5-633

Lu Quan Wuhan Univ.
Qiu Junping Wuhan Univ.

FAST TCP is an important TCP congestion control algorithm for high-speed long-distance networks. But the overestimate of the round trip propagation delay in FAST TCP will cause unfairness. This paper proposes a new congestion control algorithm which regulates the window size using the packet marking probability of the

router to overcome the unfairness of FAST TCP. The simulation results show that it can improve fairness. Its stability is also analyzed.

FrB10-2 16:05-16:25

基于粒子群优化的信号交叉口交通流预测模型

Traffic Flow Forecasting Model of Signalized Intersections Based on Particle Swarm Optimization, pp.6-38~6-40

赵建玉
贾磊
陈月辉
张勇

济南大学
山东大学
济南大学
济南大学

本文以城市道路网络中典型的两相邻交叉口为研究对象,针对城市道路交叉口有信号灯控制的特点,提出了一种基于粒子群优化算法的交通流模糊神经网络预测模型.该模型将模糊理论与前向神经网络技术相结合,通过粒子群优化算法对网络权值和激励函数进行优化.仿真研究的结果表明,该模型方法有效;与BP网络模型的实验对比表明,该模型实用性更强.

This paper's research object is two typical adjacent intersections of city road network. A fuzzy neural network model based on particle swarm optimization to forecast the traffic flow is developed, aiming at the characteristic of the city road intersection having signal lamp control. The model comprises a fuzzy cluster module and several feed-forward neural network modules with a particle swarm optimization algorithm to optimize the weights of the NN and parameters of its activation functions. The simulation results show that the model is effective. Compared with BP NN, the model is more practical.

FrB10-3 16:25-16:45

基于3G的实时通信系统的设计与实现

Design and Implementation of Instant Message System Based on 3G, pp.5-656~5-660

熊永华
吴敏
贾维嘉
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中南大学
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香港城市大学
香港城市大学

本文总结了实时通信系统的通用组网结构,针对现有的实时通信系统尚未实现PC到3G(第三代移动网络)手机视频通信的现状,创新性地利用普通3G modern卡开发了从IP核心网到香港WCDMA标准3G无线网的网关,设计了一种简化的SIP(Session Initial Protocol)协议,实现了由PC到3G手机的实时语音和视频通信系统.运行结果表明通信质量满足多媒体会话的要求.本系统在2006年12月的世界电信展上展出,受到多方关注,并被多家报纸所报导.

Video communications from personal computers to 3G mobile phones have still not been implemented in the existing instant message systems. This paper discusses the general network architecture for instant message systems and innovatively presents a gateway from IP core network to WCDMA 3G mobile network in Hong Kong and devises a sort of protocols based on reduced Session Initial Protocol. Moreover, the article designs and implements a new instant message system that puts audio and video communications between personal computers and 3G mobile phones into practice. The running results testify that communications qualities meet the requirements of multimedia session. The system is exhibited at the ITU TELECOM WORLD 2006 and gets much attention, furthermore, it is reported by many newspapers.

FrB10-4 16:45-17:05

基于MATLAB的车载CAN网络模拟技术

Simulation Technique of In-vehicle CAN Network Based on MATLAB, pp.5-661~5-665

徐小娟
刘志远

哈尔滨工业大学
哈尔滨工业大学

车载网络模拟系统是车载网络设计和性能评测的开发测试平台.本文对车载网络模拟系统的要求进行了分析,提出了一种基于MATLAB的CAN网络模拟系统的实现方法.该方法能有效解决网络节点的功

能、性能模拟,具有调整配置灵活,适应性强的特点,可满足不同车型网络结构、网络信息的模拟.实验结果表明,本文给出的方法是可行和有效的.

Network simulation system is a development platform for the design and evaluation of the In-vehicle network. In this paper, the requirement of network simulation system is proposed and a technique for CAN network simulation system based on MATLAB is presented. This technique not only can effectively implement the function and performance simulation of each network node, but also can simulate various network topologies and messages of vehicles. Experiment results are given to verify that the simulation technique proposed in this paper is feasible and effective.

FrB10-5 17:05-17:25

端对端网络时钟漂移补偿算法研究及其实现

On End-to-End Network Clock Offset Compensation Algorithm and Its Implementation, pp.5-666~5-670

贾允毅
胥布工
王世华
刘步春

华南理工大学
华南理工大学
华南理工大学
北京邮电大学

针对端对端网络时钟同步中的时钟漂移问题,首先提出了一种精确测量端对端时钟漂移的算法;接着分析了传统线性补偿方法,并提出了一种用最小二乘来求取补偿直线的算法;最后提出了动态非线性预估补偿方法及其实现算法,并通过实验证明这种方法与传统线性补偿方法相比能更好地补偿时钟漂移问题,从而说明该方法的优越性、有效性和可行性.

This paper addresses the problem of clock offset in end-to-end network time synchronization. Firstly, an algorithm for measuring the end-to-end clock offset is proposed. Secondly, the traditional linear-compensation method is analyzed and an algorithm to obtain the compensation line using least-squared algorithm is proposed. Finally, a new method of dynamic non-linear predicting compensation and its realization algorithm are proposed. Through experiments, it shows that the method of dynamic non-linear predicting compensation could compensate clock offset better than linear-compensation method. The superiority, validity and feasibility of the new method are proved.

FrB10-6 17:25-17:45

Design of History Database for Networked Control Systems, pp.5-292~5-296

Zhu Youzhi Inst. of Automation, Chinese Acad. of Sci.
Peng Peng Inst. of Electronics, Chinese Acad. of Sci.
Zheng Geng Inst. of Automation, Chinese Acad. of Sci.

History database is used to facilitate the high-performance storage and retrieval of history data which is very valuable in areas like process and manufacturing industries. Networked control systems(NCS)are different from traditional control systems in that they have network inside their control loops. This paper introduced the design of history database which is a part of a novel NCS implementation platform-NetCon system. System architecture is designed for the history database. After that a configurable two stage history data compression/decompression algorithm is introduced for the store and restore of history data. The first stage compression is the preprocess step and the second stage offers some universal lossless byte flow compression algorithms. In order to enable an efficient data retrieval, the storage structure of history data is designed.

FrB11 15:45-17:25 Meeting Room 11

建模、辨识与信号处理(2)
Modeling, Identification and Signal Processing (2)

Chair: Zhao Wen-Xiao Chinese Acad. of Sci.
Co-Chair: 徐辰华 中南大学

FrB11-1 **15:45-16:05**
 广义随机系统观测融合 Kalman 滤波器
Measurement Fusion Kalman Filters for Descriptor Stochastic Systems, pp.2-775~2-778

石莹 黑龙江大学
 对于基于 Kalman 滤波的多传感器数据融合,有集中式观测融合和加权式观测融合两种方法。本文考虑了广义随机系统的观测融合状态估计问题,给出了基于 Kalman 滤波方法的两种多传感器观测融合状态滤波器。通过数值例子验证了算法的有效性;并在数据融合所用的传感器带有相同观测阵的情形下验证了两种观测融合方法是功能等价的,即用两种方法得到的 Kalman 滤波器在数值上是相等的。

Centralized measurement fusion and weighted measurement fusion are two main methods for multi-sensor data fusion based on Kalman filtering. The measurement fusion state estimation problem was considered for descriptor stochastic systems. Two kinds of multi-sensor measurement fused state Kalman filters were proposed. The effectiveness of the proposed algorithms was demonstrated by numerical examples. And the functional equivalence between two fused methods was verified under the assumption that the sensors for fused data fusion have identical measurement matrices, i.e. the Kalman filters obtained by two methods are numerically equal.

FrB11-2 **16:05-16:25**
 基于优化相空间重构的多变量混沌时间序列预测
Prediction of Multivariate Chaotic Time Series Based on Optimized Phase Space Reconstruction, pp.3-169~3-173

王一颀 大连理工大学
 韩敏 大连理工大学

本文采用了一种基于优化相空间重构的多变量混沌时间序列的预测方法。主要思想是设定多变量混沌时间序列的各个变量的嵌入维数和延迟时间的范围,以预测评价函数作为评判最优嵌入维数和延迟时间的标准,选择出优化的相空间重构参数并获得优化的相空间重构,以此作为神经网络的输入,获得最佳的预测结果。通过对 Lorenz 系统和实际的二维时间序列的仿真,证明了此方法的有效性。

In this paper, a new method is applied for predicting multivariate chaotic time series which based on optimized multivariate phase space reconstruction. The details of the methodology are: the ranges of the dimension and the delay of every variable are set firstly, and the least prediction error indicators for selecting the optimal parameters is employed as the criterion. Then the phase space reconstruction with the optimal parameters is used as the input of the neural network, in the end, the best result of the prediction is obtained. Simulations of the Lorenz system and the real world time series show that the methodology proposed is efficient.

FrB11-3 **16:25-16:45**
 带未知随机系统偏差的最优与自校正信息融合滤波器
Optimal and Self-Tuning Information Fusion Filters for Systems with Unknown Stochastic System Bias, pp.3-177~3-181

白锦花 黑龙江大学
 马静 黑龙江大学
 孙书利 黑龙江大学

对带未知随机系统偏差的多传感器随机系统,基于矩阵加权、对角阵加权和标量加权三种加权融合估计算法,分别给出了分布式信息融合 Kalman 状态滤波器和系统偏差滤波器。当噪声统计信息未知时,利用相关函数给出了分布式噪声统计辨识算法,进而提出了分布式自校正信息融合状态滤波器和自校正信息融合系统偏差滤波器。仿真例子验证了算法的有效性。

Based on three fusion estimation algorithms weighted by matrices, diagonal matrices and scalars, distributed information fusion Kalman filters for system state and bias are given for stochastic systems with unknown stochastic system bias, respectively. When the noise statistical information is unknown, a distributed identification algorithm is given by using correlation functions. Further,

distributed self-tuning information fusion filters for system state and bias are presented. Simulation example shows the effectiveness of algorithms.

FrB11-4 **16:45-17:05**
 铅锌烧结过程产量质量的神经网络预测方法
A Neural Network Method for Quantity-quality Prediction in Lead-zinc Sintering Process, pp.3-202~3-206

吴敏 中南大学
 徐辰华 中南大学

针对铅锌烧结过程的强非线性、时滞等特点,基于神经网络建模的思想,提出一种变学习率的烧结块产量质量 BP 神经网络 (BPNN) 预测方法。首先深入机理分析和工况参数相关性研究,确定产量质量的影响因素和模型的输入变量;然后采用基于变学习率的 BPNN,建立产量质量预测模型;最后,将该方法与普通 BP 方法进行比较。实验结果表明,采用改进的学习方法训练 BP 网络具有较快的收敛速度和较高的模型精度,较好地解决了铅锌烧结过程烧结块的产量质量建模问题。

Based on some features in the lead-zinc sintering process, such as strong non-linearity and a large time delay, a variable-learning-rate-based back propagation neural network (BPNN) is proposed to predict quantity and quality in the sintering agglomeration. First, the factors influencing quantity and quality are determined by analyzing the correlation of operation parameters. Then, the quantity-quality predictive models of agglomerations are established applying a BPNN based on the variable-learning-rate method. Finally, compared with usual BP training algorithm, this algorithm provides a better convergence rate and the obtained quantity-quality predictive models possess a higher accuracy. Actual results show that the proposed predictive method settles the modeling problem of the quantity and quality in the lead-zinc sintering process.

FrB11-5 **17:05-17:25**
 Identification for Hammerstein Systems Using Extended Least Squares Algorithm, pp.3-241~3-245

Zhao Wen-Xiao Chinese Acad. of Sci.

The extended least squares (ELS) algorithm is applied to identify the Hammerstein system, where the nonlinear static function $f()$ is expressed as a linear combination of basic functions with unknown coefficients. Strong consistency of the estimates is established and their convergent rates are obtained as well.

Poster Session PFRa
July 27, 14:30-16:00

Chair: 张纪峰 中国科学院
 Co-Chair: 郁文生 中国科学院
 Co-Chair: 薛安克 杭州电子科技大学

PFRa-1
 Delay-dependent Robust Passive Control for Uncertain Systems with Time-varying Delays, pp.2-19~2-22

Qiu Jiqing Hebei Univ. of Sci. & Tech.
 Gao Zhifeng Hebei Univ. of Sci. & Tech.
 Shi Peng Univ. of Glamorgan
 Yang Hongjiu Hebei Univ. of Sci. & Tech.

In this paper, the problem of robust passive control for uncertain systems with time-varying delays is considered. Based on Lyapunov-Krasovskii functional approach, a new robust passive control criteria is proposed, which is dependent on the size of time delays. We have also designed a state feedback controller which guarantees the passivity of the closed-loop systems for all admissible uncertainties. Finally, Two numerical examples are given to illustrate the feasibility and effectiveness of our developed approach.

PFRa-2
 基于过剩需求估计的动态资产配置策略
Dynamic Asset Allocation Strategy Based on Estimated Excess

Demand, pp.2-35~2-39甘敏
彭辉
梁亮中南大学
中南大学
中南大学

用一个离散时间微观结构模型研究金融市场背后隐含的两个变量: 过剩需求和市场流动性. 基于这个模型, 利用卡尔曼滤波和极大似然法估计出这两个变量. 与传统的金融模型不同, 我们把过剩需求作为市场被高估或低估的决定因素. 基于估计的过剩需求(而非对价格的预测)信息提出了一种简单的动态资产配置策略. 选取了香港股票市场中的长江实业作为实证对象进行建模与执行资产动态分配, 结果表明提出的建模及其分配策略可以得到良好的效果.

This paper used a discrete time microstructure model studying the hidden excess demand and market liquidity of financial market which are two unobservable state variables. Based on the model, the estimates of the two immeasurable state variables may be obtained using the Kalman filter and the maximum likelihood method. Contrast to conventional financial model, we apply the excess demand to determine whether the market is overvalued or undervalued. A simple trading strategy for dynamic asset allocation, based on the estimated excess demand instead of the prediction for price, is proposed. Case studies on Cheung Kong from Hong Kong stock market show the proposed modeling and allocation strategy provide satisfactory control performance.

PFRa-3

执行器失效不确定时滞系统的指数稳定保性能可靠控制
Guaranteed Cost Reliable Control with Exponential Stabilization for Uncertain Delay Systems Against Actuator Failure, pp.2-44~2-48

滕青芳
范多旺兰州交通大学
兰州交通大学

针对一类含有时变时滞的不确定参数线性系统, 研究了在执行器发生故障情况下系统指数稳定保性能可靠控制器设计问题. 系统中的参数不确定性满足广义匹配条件, 时变时滞及其变化率有界, 并假设故障执行器元件的输出为零. 系统的性能指标是含有指数项的积分二次型函数. 经过适当的状态变换, 将原系统的指数稳定保性能可靠控制问题转化为另一个等价系统的保性能可靠控制问题. 根据 Lyapunov 稳定性理论, 得到了系统存在指数稳定保性能可靠控制器应满足的一个矩阵不等式. 为了便于数值求解, 论文将该矩阵不等式转化为线性矩阵不等式(LMI). 进一步, 论文又给出了在指数稳定条件下使系统性能上界最小的最优保性能可靠控制器设计方法. 利用论文方法设计的指数稳定保性能可靠控制器能够使时滞系统对于任意允许的不确定性以及执行器失效都保持鲁棒可靠指数稳定, 并且使系统满足保性能指标要求.

The problem of guaranteed cost reliable control with exponential stabilization is investigated for time-varying delayed uncertain systems against actuator failure. In the considered systems, the parameters uncertainties satisfy generalized matching conditions, and the time-varying delay and its derivative are bounded. All the output of the actuator failures is assumed to be zero. The cost function of the systems is given in terms of integral quadratic function containing index exponent. By means of state variables transformation, the problem of guaranteed cost reliable control with exponential stabilization is reduced to an equivalent problem of guaranteed cost reliable control. Based on Lyapunov stability theory, a sufficient condition for the existence of guaranteed cost reliable controller with exponential stability is derived and transformed to a linear matrix inequalities (LMI). Further, the approach of optimal guaranteed cost reliable control is given for time-varying delayed uncertain systems under the condition of exponential stabilization. The resultant controller then designed enables the closed-loop system to tolerate actuator failures and to retain exponential stability while to possess the performance index of guaranteed cost despite any outages within a prespecified subset of actuators.

PFRa-4**基于灰色系统理论的数字控制系统系数量化误差研究**

The Research of Coefficient Quantization Error in Digital Control System Based on Gray System Theory, pp.2-62~2-65

王亮
汪秉文
郭一平华中科技大学
华中科技大学
华中科技大学

利用灰色系统理论, 研究系数量化误差对控制系统性能的影响. 其基本思路就是将数字控制系统参数视为灰色数, 然后灰色矩阵等方法研究控制系统. 通过典型例子的分析表明, 灰色系统理论是对系数量化效应一种更为直接有效的描述, 可以提供研究量化数字控制系统稳定性等特性的有效方法.

This paper studies the quality of control system with coefficient quantization error by gray system theory. Our basic idea is to regard the coefficient of digital control system as gray number and analyze the given system by gray matrix and other gray methods. Through some representative examples, we could find the gray could give a more effective and precise description for quantization effect. It gives an easy method to analyze the stability and other quality of digital system with quantization effect.

PFRa-5

基于状态空间模型的多时域预测控制系统的闭环特性
On Closed-loop Property of State-space Model Based Multi-horizon Predictive Control System, pp.2-66~2-70

孙鹤旭
梁涛
雷光明河北工业大学
河北工业大学
河北工业大学

本文研究基于状态空间模型的经典预测控制算法, 采用有限时域加权和输出反馈校正, 并采用了多预测时域以分别处理快慢不同的输出. 对其闭环特性进行了分析, 揭示了该算法与一种特殊的极点配置算法的一致性, 给出了该算法稳态无差的条件.

The closed-loop property of the state-space model predictive control with multi-horizon and feedback correction is studied. It adopts finite horizon performance index, feedback correction and adopts multi-prediction horizon to deal with outputs with different settling time. The analysis to the closed-loop system shows that it is equivalent to a certain kind of pole-placement algorithm. Also, the condition for zero steady error is given.

PFRa-6

线性奇异时滞系统的干扰解耦
Disturbance Decoupling for Linear Singular Systems with Time Delay, pp.2-71~2-75

冯俊娥
崔鹏山东大学
山东大学

利用吴消元法研究了线性奇异时滞系统的输入-输出干扰解耦问题. 输入-输出扰解耦问题即输入-输出传递函数的零化问题, 是一类多项式方程组的求解问题, 对于多项式方程组求解问题, 吴方法给出了一套机械化算法. 本文利用吴消元法讨论了线性奇异时滞系统在多种反馈情形下的解耦问题, 给出了问题可解的充要条件, 并且举例说明本文方法的正确性.

The paper discussed the problem for disturbance decoupling of linear singular systems with time delay via wu elimination method. The problem of input-output disturbance decoupling is that of zero-ization of transfer function which can be transformed into solving problem of multipolynomial equations. Based on algebraic geometry, the Wu method provides a mechanical algorithm for solving the problem of input-output disturbance decoupling via several feedback cases. Necessary and sufficient conditions for decoupling problems were given. Two examples were presented.

PFRa-7

仿真技术在企业物流系统规划中的应用
Application of Simulation to the Logistics System Planning of Enterprises, pp.2-76~2-80

赵刚

上海海事大学

张贺

上海海事大学

本文结合实际问题,建立了企业物流系统规划的综合模型,并针对其中的核心模块,如库存控制、运输配送和配送中心选址等,给出了相应的仿真模型和算法。最后通过实例,验证了模型和算法的有效性。

The paper puts forward the general model for the enterprise logistics system and simulate the core of it ,for example: storage system, distribution system and so on. The result of simulation indicates that model and algorithm constructed is reasonable and effective.

PFRa-8

Control System Development of the One-axis Hydraulic Road Simulator Using QFT, pp.2-141~2-146

Kim Jin wan

Chonnam National Univ.

XUAN DONG JI

Chonnam National Univ.

Zhang Jing yi

Chonnam National Univ.

Kim Young Bae

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This paper presents the one-axis hydraulic road simulator control technology for reproducing the random input signal to implement the real road data. The simulator consists of the hydraulic pump, servo valve, hydraulic actuator and its control equipments. The force control system using QFT is utilized to control the simulator effectively and illustrates a tracking performance of the closed-loop controller with low order transfer function $G(s)$ and pre-filter $F(s)$ for a parametric uncertain plant. Tracking specification is satisfied with upper and lower bound tolerances on the steep response of the system to the reference signal. The efficacy of the QFT force controller is verified through the numerical simulation, in which combined dynamics and actuation of the hydraulic servo system are tested. The experimental works show that the proposed algorithm works well for the one-axis Hydraulic road simulator.

PFRa-9

时延网络控制系统的协同设计方法研究

The Integrated Design of Control and Scheduling for Networked Control System, pp.2-175~2-179

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本文搭建的虚拟平台上对多任务的网络控制系统调度和嵌入 LQG 控制算法进行了仿真。研究了对网络控制系统的调度与控制协同设计新技术进行了探索。讨论了系统采样周期对网络控制系统的影响。以优化控制系统的性能为目标,以网络的可调度性为条件,结合系统控制和调度算法,对网络控制系统进行静态性能指标估计和动态调度仿真相结合。结果表明:该方法既满足了控制系统的性能,又优化了网络的调度,提高了网络的资源率。

Based on existent results on control network performance and scheduling in protocol layer, the paper analyzes the scheduling algorithm of networked control systems in application layer, and structure multi-task networked control systems for scheduling simulation in virtual platform. In addition, this paper explores technologies for integration of control and scheduling design. The influence of sampling period to NCS is discussed. Based on control and network scheduling, an optimized model and sampling period selection algorithm are proposed. An example shows that the algorithm satisfies performance requirement for NCS, optimizes network scheduling, and improves network efficiency.

PFRa-10

平方可积扰动下线性系统二次鲁棒最优控制

Robust Quadratic Optimal Control for Uncertain Linear Systems with Square-integral Perturbation, pp.2-185~2-189

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在假定扰动为平方可积的条件下,讨论了不确定线性系统二次指标下的最优控制问题。依据受约束二次泛函极值问题的有关结论,将约

束最优问题化为无约束的等价优化问题,得到了最优控制与最差干扰下的状态反馈形式解。

The problem of robust quadratic optimal control for uncertain linear systems with Square-integral perturbation is discussed. Using the result of Second order functional differential, the unconstrained Optimization Problems can be solved as Constrained Optimization Problems. The state feedback solution of optimal control is given under the worse perturbation.

PFRa-11

供热锅炉控制决策管理系统的研究

On Control Decision Management System for Heating Boilers, pp.2-205~2-209

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大量的供热锅炉运行现场依然是粗放管理,能耗较高以及品质较差,对已有的大量数据尚缺乏分析与充分利用。控制决策管理系统是通过测控环节真实的记录手动与自动的操作及结果,履行“警察”的督管职能;按照工艺要求以及管理侧重设计与分配一组权重系数指标计算得出运行结果的综合考评成绩,完成“考官”的公平评判功能;采用数据挖掘等工具得出优化目标值,并分析差距指出具体参数的改进方向,提供“教师”的分析指导作用。以此为操作者和管理者都提供运行与决策的依据,通过“人机和谐”切实提高企业的管控一体化水平,不失为企业进步的有效途径。

It still appears to be rough management,high resource consuming,unsatisfactory heating quality,as well as short of sufficient analysis and utilization about the large amount of data that we have got from most heating boiler systems.In this paper,we propose a Control Decision Management System (CDMS).It uses measurement and control units to record manual or automatic operations and results truly and reliably to carry out its supervision function as a "policeman".It designs a group of weigh modulus index and calculates a comprehensive grade of operating results according to technical demands and management emphasis to implement a equally judging function as an "examinant".It makes use of data mining to achieve the optimal value and accordingly gives improving direction of specific parameters by analyzing the difference to accomplish analyzing and guiding function as a "teacher".All these functions provide operation and decision support for operators and managers and promote the integration level of management and control by "human-machine harmony" which should be an efficient way for enterprise progress.

PFRa-12

时变多面体系统的有限时间稳定性分析

The Analysis of Finite-time Stability for Time Varying Polytopic Systems, pp.2-210~2-214

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本文着重研究了时变多面体系统在有限时间内的稳定性分析问题,给出了系统有限时间稳定的三个等价性条件。为了便于在实际中方便实现系统设计,文章进一步给出了一个有限时间稳定的 LMI 充分性判据。考虑系统受外界输入扰动的影响,时变多面体系统的有限时间有界的概念和判别的充分性 LMI 不等式条件也在文中给出。数值算例验证了理论方法的有效性。

The problem of finite-time stability for time varying polytopic systems is concerned in this paper. Three equivalent conditions for FTS is proposed. To facilitate the systems design, a sufficient LMI criterion on the FTS is further given. For the influence of the input disturbance, we also give the definition of FTB and a sufficient LMI criterion. A numerical example is employed to illustrate the effect of the proposed approach.

PFRa-13

Impulsive Synchronization of Typical Hopfield Neural Networks, pp.2-270~2-273

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This paper is mainly concerned with the issues of impulsive control for synchronization of Hopfield neural networks. By using stability theory of impulsive dynamical systems, some simple yet generic criteria are derived ensuring the robust synchronization of Hopfield neural networks. Moreover, the approaches developed here further extend the techniques presented in recent literature. To this end, the theoretical results are applied to a typical delayed chaotic Hopfield neural networks and an autonomous chaotic Hopfield neural network, and numerical simulations also demonstrate the effectiveness and feasibility of the proposed technique.

PFRa-14

State Observers for Nonlinear Dynamic Systems, pp.2-287~2-291

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This note considers the problem of observer design for a class of nonlinear system. A new state observer design methodology for linear time-varying systems is presented. Furthermore, we show that the same methodology can be extended to a class of nonlinear systems. Some sufficient conditions are obtained, which could guarantee the error of state estimation to converge to zero asymptotically. An example is given to demonstrate the effectiveness of the proposed methodology.

PFRa-15

具有未知死区和增益符号的自适应神经网络控制

Adaptive Neural Network Control with Unknown Dead-Zone and Gain Sign, pp.2-299~2-303

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研究一类具有未知非对称死区和未知控制增益符号的 SISO 非线性系统的自适应控制问题。根据滑模控制原理, 并利用 Nussbaum 函数的性质, 提出了两种自适应神经网络控制器的设计方案。通过引入示性函数, 提出一种简化死区模型, 取消了死区模型的倾斜度相等的条件。通过引入逼近误差的自适应补偿项来消除建模误差和参数估计误差的影响。理论分析证明了闭环系统是半全局一致最终有界。

The problem of adaptive control for a class of SISO nonlinear systems with unknown non-symmetric dead-zone and unknown control gain sign is studied in this paper. Based on the principle of sliding mode control and the property of Nussbaum function, two design schemes of adaptive neural network controller are proposed. By introducing characteristic function for the dead-zone model in the systems, a simplified dead-zone model is developed. The approach removes the condition of the equal slope with defined region. The adaptive compensation term of the approximation error is adopted to minimize the influence of modeling errors and parameter estimation errors. By theoretical analysis, the closed-loop control system is proved to be semi-globally uniformly ultimately bounded.

PFRa-16

RBF-ARX Modeling and Predictive Control Strategy Applied to a Liquid Level System, pp.2-342~2-346

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The main objective of this paper is to show in the first place that the RBF ARX modeling technique can be used to model a dynamic nonlinear SISO liquid level system with higher precision and then to demonstrate that when the model obtained is taken as predictor of a model predictive controller (MPC) one may obtain an enhanced control performance. The RBF ARX model is in fact a locally expanded Taylor ARX model with Gaussian Radial Basis Function

(RBF) network style coefficients depending of the working point; it can be estimated off line to avoid any online uncertainty. It is built to globally describe the behavior of nonlinear dynamic system and exhibit an easy and advantageous means of obtaining a local linearization of any working point. The RBF ARX model based MPC (RBF ARX MPC) is a predictive control strategy based on RBF ARX model. It doesn't require online but offline parameters optimization in which the nonlinear parameters estimation depends on the Levenberg-Marquardt Method (LMM) and the linear one on the Least-Square Method using Singular Value Decomposition (SVD).

PFRa-17

A Fault-tolerant Controller for Unknown Nonlinear System Based on Neural Networks, pp.2-351~2-356

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A new neural-network-based fault-tolerant controller for nonlinear system is proposed. First a neural-network (NN) model is built for the unknown nonlinear system. The NN model is only trained during the initial period when the system is faultless. Then a fault-tolerant controller is designed. It consists of two parts, a main controller and a compensator. The main controller is designed for high performance. Using the residual signal generated from the differences between the nonlinear system and NN model, a NN-based compensation loop is constructed. Two controllers can be designed separately. The stability of the closed-loop is proved. The simulation results show the faulty system can be well compensated.

PFRa-18

Simulation Study on Tracking Control of Mobile Robot Based on Cascaded Adaptive Approach, pp.2-399~2-403

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Considering a general kinematical case of mobile robot, with an offset from intersection of rear wheel axis and symmetry axis, new error dynamics are derived. Using cascaded system approach, a tracking controller is constructed. The κ -exponential convergence of tracking error dynamics, in combination of closed-loop controller, is guaranteed by means of cascaded system theory. Additionally, extending the result into dynamics model by adaptive approach. Simulation study validates the effectiveness and feasibility of the proposed controller both in kinematics and dynamics models.

PFRa-19

Generalized Point Wise Min-Norm Control Based on Control Lyapunov Functions, pp.2-404~2-408

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A new nonlinear controller design method based on Control Lyapunov Functions, called generalized point wise min-norm controller, is presented in this paper, which is a generalized version of Freeman's point wise min-norm controller in 1996. And the continuity of the new controller is proved using the set valued analysis theory. The greatest improvement of the new controller, comparing with the Freeman's controller, is its greatly improved designing flexibility from the induced guide function. And it is shown that the new control method can be used together with some other controller design method with special performance index by the concept of guide function, especially those that the closed loop stability cannot be ensured sufficiently. Finally, an example is given combining with a linearized controller to both enlarge the large scale stability and preserve the local performance of that.

PFRa-20

一类线性耦合复杂混沌动力网络的实用同步准则

A Practical Criterion on Synchronization of Linear Coupling Chaotic Complex Dynamical Network, pp.2-409~2-414

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本文研究并建立了一类典型的线性耦合复杂动力网络出现完全同步的实用判定准则。文中建立的定理适用于一类线性耦合复杂混沌动力网络的“内联矩阵”为任意对角阵的一般情形，推广了已有文献中出现的相关结果。通过对具有规则网络结构、确定性小世界、半随机小世界、确定性无标度，及 BA 无标度网络结构的 Lorenz 混沌动力网络动力学的数值模拟研究进一步验证了本文所给条件的正确性。

In this paper, a practical synchronous criterion of linearly diffusively coupled ordinary differential equations are constructed in with Lyapunov stability theory. The main theorem in this brief paper has extended some corresponding results in the literature. Meanwhile, taking Lorenz Chaotic dynamical network as an example, numerical experiments on some typical linear coupling chaotic dynamical networks, including the regular network, deterministic small-world network, deterministic scale-free network, NW small-world network, BA scale-free network, are carried out to verified the effectiveness of the proposed new theorem.

PFRa-21

Prevention of Limit Cycle for Nonlinear Control Systems with Parametric Uncertainties, pp.2-467~2-472

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A new method is proposed to synthesize robust stabilizing controllers for preventing the generation of limit cycle of control systems with parametric uncertainties both in the linear plant and non-linearity. Boundaries for the generation of limit cycle and boundaries for asymptotic stability are portrayed. The region for prescribed limit cycle behavior and the region for asymptotic stability are located. The overlapped region of the admissible parameter region for each Kharitonov polynomial is called the Kharitonov region. The Kharitonov region constitutes all of the feasible controller gain sets to achieve robust prevention of limit cycle. Finally, two illustrative examples are given.

PFRa-22

Control Location Selection Strategy for Power System Emergency Control, pp.2-518~2-522

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This paper analyzes the difficulties of emergency control and points out comparability of stability margin and transition of instability mode are the keys of emergency control. Then a revised normalized stability margin and a hidden mode identification method are proposed to solve these problems. Based on these work, an algorithm for control location selection is given. The cases of New-England system verified that the proposed algorithm can find the appropriate location for emergency control. It can work not only in same instability mode situation, but also in transferred instability mode situation.

PFRa-23

PSO-based Parameter Estimation of Nonlinear Systems, pp.2-533~2-536

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A technique based on particle swarm optimization is proposed for improving the accuracy of parameter estimation of nonlinear systems. The effectiveness of the particle swarm optimization algorithms is compared with different genetic algorithms in terms of parameter accuracy. Simulation results of two kinds of process systems will be illustrated to show that the more accurate estimation

of unknown system parameters can be achieved by using the proposed technique.

PFRa-24

具 Modular 结构的环状复杂网络模型及其同步能力

A Modified Modular Ring Network and Its Synchronizability, pp.2-547~2-552

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本文首先建立了一类改进的、具 Modular 结构的环状复杂网络模型，通过理论分析指出：随机添加 Modules 间连线对于建立具有短特征路径长度的网络最为有效。进一步，研究了不同类型的 Modular 环状网络同步能力与 Modules 内连线密度、Modules 间连线密度，以及网络中拥有 Modules 数目间的关系；通过细致的数值模拟发现：通常 Modules 内连线密度对该类混沌动力网络的同步能力影响很小，但 Modules 间连线密度对该类动力网络的同步能力影响却十分显著。

In this paper, a modified modular ring network model is proposed and discussed. The theoretical analysis indicates that, it is most effective for building a modular ring dynamical network with shorter characteristic path length via adding shortcuts randomly. Step forward, the synchronizability of this type of ring modular network are compared. Synchronizability of modular ring networks consist of different kinds of modules with different interior connection density, different inner module connection density are discussed in detail. Numerical experiments further show that, the synchronizability is influenced heavily by the inter module connection density, and little affected by the inner module density of connections.

PFRa-25

基于加权网络的 Internet 流量模型

Internet Bandwidth Model Based on Weighed Networks, pp.2-563~2-567

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基于 Internet 链路之间的不同带宽，建立了一个 Internet 网络结构的泛化模型，生成的网络模型是一个一般化的加权网络。通过理论推导，得到了网络节点的链路的权重（带宽）、节点的强度（服务能力）、节点的连接度（负载）的时变方程，以及节点强度的概率分布。通过对理论结果的分析，可知 BBV 模型和 BA 模型都可以作为本文泛化模型的特例。

Based on the bandwidths of the lines in Internet, an Internet structure evolution model is presented to create a general structure with weighted scale-free network. From the theoretical calculations, we obtain the variable equations of weighted value, strength and degree, and the strength distribution. By analysis on the results, the BBV model and the BA model can be deduced from our evolution algorithm.

PFRa-26

Synchronization of Networked Systems and Laplacian-Spectrum Modification, pp.2-573~2-576

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In this paper, synchronization-related problems of networked systems are considered. Simple necessary conditions are given with help of the estimated bounds of the eigenvalues of the coupled Laplacian. These conditions are easy to check since we mainly choose maximum and minimum vertex degrees and other easily obtained network parameters. Moreover, the effects of adding/removing edges of the original network topology on synchronization is also considered. Suggestions about edge addition/removal to improve the synchronization situations in networked systems are given.

PFRa-27

Reachability Realization for a Class of Switched Impulsive Control Systems by Means of Periodic Switchings, pp.2-669~2-673

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This paper studies reachability realization for a class of switched impulsive control systems. Periodic switching sequences are designed so that the reachable subspace of switched impulsive control systems is expressed in terms of the reachable state sets of the designed switching sequences. The result presents a relationship between the reachable subspace and the reachable state sets of periodic switching sequences.

PFRa-28

基于网络展开法研究标识之间的可达关系

Reachable Relation of Markings Analysis Using Net Unfolding, pp.2-685~2-689

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状态可达性问题是离散事件系统领域中一个核心问题,该领域中大多数问题最终可以简化成可达性问题。本文研究某些标识之间的可达关系。文中首先给一种有限前缀,然后在有限前缀的基础上判断某些配制之间的可达关系,最后通过这些配制之间的可达关系判断与这些配制相对应的标识之间的可达关系。

Reachable relation of markings analysis using net unfolding Reachability of states is one of the key problems in the area of discrete event system. Most problems of discrete event system can be reduced to reachability problem. Reachable relation of some markings is discussed in this paper. First a new finite prefix is proposed, and then reachable relation of some configurations is judged based on the finite prefix. Finally, reachable relation of some markings is judged according to reachable relation of some configurations.

PFRa-29

分层异构控制系统的构件化设计和交互作用语义描述

Component-oriented Design and Interaction Semantics Description of Hierarchical Hybrid Control System, pp.2-697~2-701

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针对异构控制系统设计的复杂性,本文分离控制软件计算功能成分与交互行为成分,提出了一种异构控制软件构件化设计方法。采用层次化思想实现软件构架,管理异构控制模型,实现构件与构架复用。引入“管理器”的概念来管理构架,并讨论如何从交互作用语义符号框架角度将一组原子构件的计算成分组合为支持异构模型的复合构件机制。在分布式实时平台上实现了一个简化的构件化分层异构控制软件系统验证方法的可行性和适应性。

Complex control system is heterogeneous and imposes great challenges for control system design. This paper presents a component-oriented design methodology that reduces complexity by separating data-related computational parts and interaction among components. Frameworks are composed hierarchically to manage heterogeneous models and achieve component and framework reuse. We introduce a notion of supervisor to manage the framework and discuss how to aggregate individual component's computation into a well-defined composite computation from a view of interaction semantics denotational framework. A simplified component-oriented hierarchically hybrid control system in a distributed real-time platform is implemented to prove the feasibility and flexibility of our methodology.

PFRa-30

脉冲切换随机系统的稳定性分析与鲁棒稳定化

Analysis of Stability and Robust Stabilization for Impulsive Switched Stochastic Systems, pp.2-712~2-715

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在许多物理,生物,工程与信息科学的实际系统中,其动态过程由于在某些时刻发生突然的变化而显示出脉冲的动态行为,本文研究了一类在切换时刻具有脉冲行为的切换随机系统的稳定性及鲁棒稳定化问题,首先应用多 Lyapunov 函数的方法对系统的稳定性进行分析,给出了系统在任意切换律下依概率稳定的充分条件,进一步运用线性矩阵不等式(LMI)法对系统的稳定化以及鲁棒稳定化问题进行分析和设计,得到了系统的状态反馈增益矩阵和脉冲增益矩阵的求解方法。

Many practical systems in physics, biology, engineering, and information science exhibit impulsive dynamical behaviors due to abrupt changes at certain instants during the dynamical processes. In this paper, problems of stability analysis and robust stabilization are investigated for switched stochastic systems which exist impulses at the switching instants. Multiple Lyapunov techniques are used to derive sufficient conditions for stability in probability of the overall system with arbitrary switching law. The conditions are in linear matrix inequality form and can be used to solve the problems of stabilization and robust stabilization.

PFRa-31

炼油生产装置调度模型与算度研究

On Scheduling Model and Algorithm of Production Units of Refinery, pp.2-748~2-752

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炼油生产装置及其相互之间的结构复杂性,使得炼油生产装置调度问题成为难题,要获得生产装置调度优化方案是很困难的,本文以装置总加工成本最小化为目标,在满足各种约束的条件下,综合考虑了装置的运行及库存,以调合组份量为装置生产目标,建立了炼油生产装置调度模型,为了得到优化调度方案合理安排生产,使用一种基于启发式的数学规划算法,仿真结果验证了它的有效性。

The production unit scheduling problem is very difficult since complex structures among production units. To get the minimum of total process cost of units, satisfy the main constraints and consider running and storage of units, take the blending components I for production targets of units, the production unit scheduling model is developed. A heuristic-based mathematical programming algorithm is introduced to obtain the optimum solution of such model to arrange production reasonably. The results of an example illustrate that it is effective.

PFRa-32

Adaptive State-Feedback Stabilization for High-Order Stochastic Nonlinear Systems with Time-Varying Control Coefficients, pp.2-757~2-761

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Xie Xue-Jun Qufu Normal Univ.

This paper investigates the adaptive state-feedback stabilization problem for a class of high-order stochastic nonlinear systems with unknown lower and upper bounds for time-varying control coefficients. Under some weaker and reasonable assumptions, a smooth adaptive state-feedback controller is designed, which guarantees that the closed-loop system has an almost surely unique solution, the equilibrium of interest is globally stable in probability and the states can be regulated to the origin almost surely.

PFRa-33

随机反应扩散系统部分变元的依概率稳定性

Stability in Probability of Partial Variables for Stochastic Reaction Diffusion Systems, pp.2-779~2-783

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由于随机反应扩散系统无相应的 Itô 微分公式,所以一直以来都未能将研究随机常微分系统稳定性之有效方法—Lyapunov 函

数法推广到随机反应扩散系统,为克服这一困难,本文视所考虑的系统解关于空间变量的积分为相应的随机常微分方程的解,在积分号下对所构造的 Lyapunov 函数运用 Itô 微分公式,讨论了 Itô 型随机反应扩散系统部分变元依概率稳定性的基本理论,给出了 Itô 型随机反应扩散系统部分变元依概率稳定性的若干定义,建立了 Itô 型随机反应扩散系统部分变元依概率稳定和依概率渐近稳定的判别准则,获得了与常微分系统部分变元稳定性理论相对应的结论。

Stochastic ordinary differential equations and stochastic functional differential equations have recently been studied intensively by means of Lyapunov function. However, it is a pity for stochastic reaction diffusion equations that this useful technique seems to find no way out due to the empty of its own Ito's formula. To get over this difficulty, we will regard the integral of the considered trajectory with respect to spatial variables as the solution of the corresponding stochastic ordinary differential equations, via employing Ito's formula under integral operator instead of directly applying Ito's formula to Lyapunov functions in the case of stochastic ordinary differential equations, to aim at investigating stability in probability of partial variables for Ito stochastic reaction diffusion equations. Some sufficient conditions for stability and uniform stability in probability of partial variables are given and this paper is ended up with an example illustrating the obtained results.

PFRa-34

具 Markov 参数的中立型 Ito 微分系统的指数稳定性
Exponential Stability of Ito Differential Systems of Neutral Type with Markov Switching, pp.2-789~2-793

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本文针对一类具 Markov 参数的中立型 Ito 微分系统,构造了随机 Lyapunov-Krasovkii 泛函,并应用了 Ito 微分公式沿系统对其求微分,再利用线性矩阵不等式的性质和广义积分公式,给出了此类系统均方指数稳定的充分条件,并给出了该条件下此类系统收敛指数的估计式。最后,数值算例说明了此方法的有效性。

Ito differential systems of neutral type with Markov switching are discussed in this paper. By constructing stochastic Lyapunov-Krasovskii functional candidate, and applying differential formula to compute the derivative of such functional candidate along the solution to such systems, we give the sufficient condition for the exponential stability in mean square for such systems in linear matrix form using the generalized Ito formula, and the estimation for convergence exponential is also obtained. And numerical example is given to show the effective of this method.

PFRa-35

Impulsive Decentralized Stabilization of Stochastic Large-scale Systems, pp.2-794~2-797

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In this paper, impulsive control problem of stochastic large-scale systems is considered. By employing the piecewise Lyapunov's idea, we obtain the criteria on the stability and global exponential stability in mean square of impulsive stochastic large-scale systems. The criteria don't require the stability of corresponding stochastic systems and is easily applied to stabilize large-scale systems by utilizing impulsive control inputs. An example is given to illustrate the effectiveness of the results.

PFRa-36

K-exponential Stabilization of Uncertain High-order Nonholonomic Chained Systems, pp.3-19~3-22

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In this paper we address the problem of K-exponential stabilization for a class of uncertain high-order nonholonomic chained systems.

This particular class of nonlinear systems is an extension of a nonholonomic system in chained form that has received considerable attention in the past few years. Using input/state scaling and integrator backstepping methods, we construct noncontinuous feedback law and give out the switching strategy, such that the related closed-loop systems K-exponential stable.

PFRa-37

惯性轮倒立摆的时滞状态反馈镇定
Stabilization of the Inertia Wheel Pendulum by Time-Delayed State Feedback, pp.3-23~3-27

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通过坐标变换和初始设计,将惯性轮倒立摆转化为存在高阶非线性前馈型系统,然后设计控制律抑制高阶非线性。该控制律中部分状态允许适度小的饱和限制与时滞。通过表明闭环系统不会有限逃逸且于有限时间后收敛为渐近稳定的动态,证明了闭环系统的全局渐近稳定性。仿真验证了设计的有效性。

Through coordinate changes and an initial control design, the inertia wheel pendulum is transformed into a feedforward-type system with higher order nonlinear terms, and then a controller is suggested to attenuate the higher order terms. Partial state variables in the controller admit moderate small saturation restriction and time delay. The global asymptotic stability of the closed-loop system is proven by showing that it has no finite escape time and converges to an asymptotically stable dynamics in finite time. Simulation results show that the proposed design is effective.

PFRa-38

无速度传感器感应电机自适应观测器的稳定性分析与设计
Stability Analysis and Design of Adaptive Observer Based on Speed Sensorless Induction Motor, pp.3-28~3-32

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分析了感应电机低速发电工况下现有采用极点配置的自适应观测器存在不稳定区域的原因,得出了自适应观测器在全速范围内稳定的条件。在此基础上提出了一种改进的速度自适应律和观测器增益矩阵选取方案。应用 Lyapunov 稳定性理论,得到了基于自适应观测器的速度辨识自适应律;观测器的增益矩阵通过求解两个双线性矩阵不等式得到。在 MATLAB/SIMULINK 环境下,对基于自适应观测器的无速度传感器感应电机直接转矩控制进行了仿真。仿真结果表明本文给出的自适应观测器在全速范围内具有良好的稳态和动态性能,并具有很好的鲁棒性。

By analyzing the existence of unstable regions of the present adaptive observer using pole-placement technique in regenerating mode at low speeds, conditions that ensure the adaptive observer stability at full speed regions are got. An improved speed adaptive law and a novel method to choose the gain of the observer are proposed based on observer. By using the Lyapunov stability theory, speed identification adaptive law is got. The gain of the observer can be obtained by solving two bilinear matrix inequalities. The simulation model of speed sensorless induction motor using direct torque control based on observer is built in the Matlab/Simulink. Simulation results show that the adaptive observer has good steady and dynamic performances and good robustness.

PFRa-39

Robust Stabilization for a Class of Discrete-time Systems with Delays via Delta Operators Approach, pp.3-49~3-53

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In this paper, the problem of robust state feedback control using delta operator approach for a class of linear fractional uncertain systems with time delays are investigated. Based on Lyapunov-Krasovskii functional in delta domain, a new sampling-period dependent state feedback controller is presented in terms of linear matrix inequalities (LMIs). The proposed method can unify some previous related continuous and discrete systems into the delta operator systems framework. Numerical examples are given to illustrate the effectiveness of the developed techniques.

PFRa-40

Robust Stabilization of Networked Control Systems: an LMI Approach, pp.3-59~3-63

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This paper transforms the robust stabilization problem of a class of discrete-time networked control systems (NCSs) subject to nonlinear perturbations under the effects of delays and data packet dropout to a constrained convex optimization problem. Such NCSs are modelled as discrete-time nonlinear systems with time-varying input delays. A sufficient condition is established in terms of a linear matrix inequality (LMI) which guarantees stability of the NCS and at the same time maximizes the nonlinearity bound. In addition, our result is extended to NCSs transmitted in multiple-packet manner using modified techniques.

PFRa-41

Stable Region Analysis of Networked Control Systems with Uniform Quantization, pp.3-80~3-83

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In this paper the effects of quantization in an important class of networked control systems called model-based networked control systems (MB-NCS) are considered. The MB-NCS architecture uses an explicit model of the plant in the controller in order to reduce the network traffic, while attempting to prevent excessive degradation. That is, the data transmitted represent areas within a region where the state of the plant and model are known to be. Simulation examples are used throughout to illustrate the main results.

PFRa-42

图像的实值离散 Gabor 变换及其快速算法
2D Real-valued Discrete Gabor Transform and Its Fast Algorithms, pp.3-148~3-151

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提出了一种图像的实值离散 Gabor 变换 (RDGT), 其 Gabor 基函数为余弦函数调制的时移窗函数。研究了基于离散余弦变换 (DCT) 的二维实值离散 Gabor 变换系数快速算法及由变换系数重建原图像的快速算法 (即 RDGT 逆变换), 所提出的变换与二维 DCT 在图像编码方面的性能比较表明, 在图像识别与理解, 纹理分割与区分方面, 所提出的变换是一非常好的预处理工具。

A 2D real-valued discrete Gabor transform (RDGT) for image representation is presented in this paper. The Gabor basis functions of the proposed transform are time-shifting windows modulated by cosine waves. Fast algorithms for the computation of the proposed transform coefficients and for the reconstruction of the original image from the coefficients are developed based on 2D discrete cosine transform (DCT). The image coding performance and difference between 2D RDGT and 2D DCT show that the proposed transform is an excellent preprocessing tool for image recognition, image interpretation, texture segmentation, and texture discrimina-

tion.

PFRa-43

Set Membership State Estimation for Nonlinear Systems in the Presence of Bounded Disturbances, pp.3-196~3-201

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In this paper an extended set membership state estimation algorithm for nonlinear discrete-time system in the presence of bounded disturbances is presented. The convergence analysis for nonlinear system is derived from Lyapunov method. It is shown that the estimation error remains bounded if the nonlinear system is uniformly observable and the initial error is sufficiently small as well as the noise terms are small enough. The simulation results illustrate the effectiveness of the proposed approach.

PFRa-44

基于 Laplace 图谱特征的图像内容认证
A Novel Image Content Authentication Algorithm Based on Laplace Spectra Feature, pp.3-265~3-269

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提出一种新的基于 Laplace 图谱特征的图像内容认证方法。从原始图像中选取特征点, 并增加密码点, 由这些点构成图并提取该图的 Laplace 谱作为图像的特征, 量化后作为水印信息嵌入原图。验证时计算验证图的 Laplace 谱并提取水印中嵌入的 Laplace 谱。若二者一致即通过认证, 否则认为图像经过篡改。实验表明, 该算法可有效检测出恶意篡改及其发生的位置。

A novel image content authentication algorithm based on Laplace spectra was proposed. Outstanding feature points are extracted from the original image and a cipher point is inserted. A relational graph is then built, and the Laplace spectra of the graph are calculated to serve as image features. The Laplace spectra are quantized then embedded into the original image as a watermark. In the authentication step, the Laplace spectra of the authenticating image are calculated and compared with that of the watermark embedded in the authenticating image. If both of the spectra are identical, the image passes the authentication test. Otherwise, the tamper is found. The experimental results show that the proposed authentication algorithm can effectively detect the event and the location when the original image content is tampered viciously.

PFRa-45

基于 DCT 的实值离散 Gabor 变换域中瞬变信号的表示
Gabor Representation for Transient Signals via DCT-based Real-valued Discrete Gabor Transform, pp.3-310~3-313

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基于 DCT 的实值离散 Gabor 变换 (RDGT) 是作者先前提出的用于对非平稳信号进行联合时频分析的一种快速变换方法。基于 RDGT, 本文提出了一种快速的瞬变信号 Gabor 表示算法, 该算法能够有效地在联合时频域中区分多个具有不同频率和不同到达时间的被白噪声污染的瞬变信号。文末还给出了一些实验来验证算法的有效性。

A fast algorithm for the Gabor representation for transient signals is presented, via the fast DCT-based real-valued Gabor transforms proposed in our previous papers for joint time-frequency analysis of nonstationary signals. The proposed algorithm is capable of separating transient signals with different frequencies, various arrival times, and additive white noises. Numerical examples are given to demonstrate the efficiency of the algorithm.

PFRa-46

基于输出快采样数据的确定性系统最小二乘盲辨识方法
Least Squares Based Blind Identification Algorithms for Deterministic Systems From Multirate Sampled Data, pp.3-333~3-336

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利用输出比输入快速采样方法研究确定性系统的盲辨识问题,提出了一种基于最小二乘的辨识方法.该方法通过选择适当的快采样率,只要对系统的模型参数或者输入信号两者其一进行归一化,仅仅利用快采样得到的输出信号就可以完成系统模型参数的辨识.文中具体地讨论了两种不同归一化条件下快采样系统模型的盲辨识方法,并给出了仿真例子,仿真结果证明了该方法的有效性.

This paper discusses the blind identification problem for deterministic systems by sampling the output with a higher frequency than that of the input and presents a least square based identification algorithm. By properly choosing the sampling rate and normalizing the model parameters or the input signals, the system parameters can be estimated only from the fast output measurements. Further, we derive two blind least squares identification methods under the two normalized conditions, respectively. The simulation results validate the algorithms proposed.

PFrA-47

Set Membership Parameter Estimation for Linear Systems Subject to Bounded Disturbances, pp.3-337~3-340

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In this paper we present a novel and useful set-membership parameter estimation approach for linear systems with unknown but bounded disturbances. The proposed algorithm is performed by the use of a modified bounding ellipsoid technique so that the estimated parameters are consistent with the measurements and the noise constraints. Convergence analysis of the algorithm is performed which shows that the estimation error is bounded and non-increasing. An example has been provided to clarify the algorithm.

PFrA-48

基于单纯形法液压同步控制参数的最优化

Optimization of the Hydraulic Synchronous Control Parameters Based on Simplex Method, pp.3-527~3-530

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300MN 模锻水压机是目前我国,也是亚洲最大的模锻水压机,对我国的国民经济和国防建设作出了巨大贡献.液压同步控制系统是水压机的重要组成部分,其死区值、回程系数与补偿流量直接关系到同步控制系统的精度及稳定性.本文在分析动梁受力模型的基础上,采用收敛速度较快的单纯形法,对以上三个参数进行寻优. Simulink 仿真结果表明,在保持系统稳定的前提下,合理选择以上参数,能大幅度提高同步控制系统的动精度和响应速度.

300MN die forging hydraulic press is the biggest die forging hydraulic press in our country, even in Asian, has made the tremendous contribution to our country's national economy and the national defense development. The hydraulic synchronous control system is the important constituent of the hydraulic press, its blind area value, the return coefficient and the compensative flow relate the precision and the stability of the synchronous control system directly. This article, in the foundation of analysis of the moving beam's stress model, uses the simplex method which the rate of convergence is quickly, carries on the optimization to above three parameters. The simulation result indicated that, under the maintenance of the system stable, chooses above parameters reasonably, can improve the moving precision and the response speed of the synchronous control system substantially.

PFrA-49

带非线性扰动不确定多时变时滞系统输出反馈 H_∞ 鲁棒控制
Output Feedback H_∞ Robust Control for Uncertain Multiple Time-varying Delays Systems with Nonlinear Perturbations, pp.3-590~3-

594

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本文研究了带非线性扰动的不确定多时变时滞系统的输出反馈 H_∞ 鲁棒控制.其中时滞是时变的,不确定满足泛数有界,而非线性扰动满足不等式约束.利用不等式技巧和 Lyapunov-Krasovskii 泛函,建立了使得系统镇定的条件.并且通过示例表明了结果的有效性

Output feedback robust H-infinity stability for uncertain systems with multiple time-varying delays and nonlinear perturbations is studied. The delay is time varying. The uncertainties are norm bounded, and the nonlinear perturbations meet linear constraints. Based on Lyapunov-Krasovskii functional, two new delay-dependent results are presented in terms of matrix inequalities technique and nonlinear dealing method. In the end, a example is given to illustrate that the presented method is effective.

PFrA-50

一类不确定 Markov 跳变时滞系统的鲁棒输出跟踪控制
Robust Output Tracking Control for Markovian Jump Time-delay Systems with Uncertain Mode Transition Rates, pp.3-545~3-548

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讨论了一类具有模态转移率不确定性的 Markov 跳变时滞系统的鲁棒输出跟踪控制问题.利用松弛矩阵方法,提出保证系统随机稳定且满足给定 H_∞ 跟踪性能的充分条件.该条件和控制器的优化设计方案可归结为一组线性矩阵不等式(LMI)的可解性问题.此外还给出了系统模态转移率的允许摄动上界数值条件.

The robust output feedback control problem is studied for a class of Markovian jump time-delay systems with uncertain switching probabilities. Sufficient conditions on the stochastic stability with prescribed Hinf tracking performance are proposed using a slack weighting matrix method. The conditions and the optimal design of the controller are formulated as a set of direct linear matrix inequalities(LMIs). Further more, the tolerable bound of the perturbation of the mode transition rates is also presented.

PFrA-51

基于虚拟仪器的三相直线感应电机静态测试系统
The Static Testing System of Three-phase Linear Induction Motor Based on Virtual Instrument, pp.6-281~6-285

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虚拟仪器是计算机技术、现代测试技术和电子仪器技术综合发展的产物,是一种新型的、前景良好的测量仪器.相比普通旋转电机,三相直线感应电机静态测试时推力和法向力的测定比较特殊.本文以 PC 机为主控单元,采用了 NI 公司的 PCI-6229 数据采集卡,以 LabVIEW 为软件开发平台设计和实现的三相直线感应电机静态测试系统,简化了系统硬件结构,提高了系统的可靠性,从而保证了各参数测试的精确度和精确性.

Virtual Instrument (VI) is an outcome with the development of computer technique, modern measuring and testing technique, and electronic instrument technique. It is a new vivid kind of measuring instrument with well outlook. Compared to the testing system of conventional rotary motor, the one of three-phase linear induction motor (LIM) is quite different with the measuring of thrust and normal force. By virtual of the static testing system of 3-phase LIM developed by using PC as the CPU, based on PCI-6229 board, LabVIEW as the software developing platform, not only the structure of the system hardware have been simplified, but also the reliability of the system have been improved considerably so that the measuring precision and stability of all parameter could have been ensured.

Poster Session PFrB
July 27, 16:30-18:00

Chair: 林宗利 Univ. of Virginia
Co-Chair: 田玉平 东南大学
Co-Chair: 侯钟生 北京交通大学

PFrB-1

模型不确定非线性随机系统的鲁棒性能准则设计

Robust Performance Rule Design for Stochastic Nonlinear Systems with Model Uncertainty, pp.2-798~2-801

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本文对于一类模型不确定非线性随机系统,用耗散性的观点发展了鲁棒性能准则理论。特别地,将确定性非线性系统理论中的耗散性概念引入到模型不确定随机非线性系统中,并以此作为基础来发展 H_∞ 理论。讨论耗散特性之后,在精确模型随机非线性系统基础上,本文建立了模型不确定系统 L_2 增益和某个 HJI 不等式的可解性的关系。由于 HJI 偏微分方程难于求解,本文考虑了模型参数满足某种适当匹配条件的系统的鲁棒性能准则问题。在这种情形下,可以绕开求解 HJI 方程得到该系统的 H_∞ 控制律。

This paper develops the theory of robust performance rule from the view of dissipation to deal with a large class of stochastic nonlinear systems with model uncertainty. In particular, we introduce the notion of dissipation associated with deterministic nonlinear systems to the uncertain stochastic nonlinear systems, and utilize it as a basis for the development of H_∞ control. After discussing the properties of dissipation, on the basis of exact stochastic nonlinear systems, we establish the connection between the L_2 gain of the uncertain stochastic nonlinear systems and the solution to a certain HJI inequality. Owing to the difficulty of the HJI partial differential equation, we consider the robust performance rule problem of the model satisfying some proper matching condition. In the situation, we can obtain the H_∞ control law of the system without solving the HJI equation.

PFrB-2

线性离散时滞重复过程的稳定化控制器设计

Stabilizing Controllers Design of Discrete Linear Repetitive Processes with Time-Delay, pp.3-38~3-42

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本文针对线性离散时滞重复过程研究稳定化控制器的设计问题。基于线性矩阵不等式处理方法,导出了系统稳定性条件,且等价于一个线性矩阵不等式的可解性条件。利用这一线性矩阵不等式的可行解构造出一个稳定化控制器。进一步,将这一稳定化控制器的设计方法推广到一类具有范数有界时变参数不确定性的线性离散时滞重复过程。最后通过一个仿真例子验证了该方法的有效性。

This paper addresses the problem of designing a feedback controller stabilizing discrete linear repetitive processes with time-delay. A stability condition of such a process is derived, and it is equivalent to the feasibility of a certain linear matrix inequality(LMI). The solutions of this LMI, if exist, are then used to construct a feasible stabilizing controller. Furthermore, the result of the stabilizing controller is extended to a class of linear discrete state delay repetitive processes with norm-bounded time-varying parameter uncertainty. Simulation results are presented to verify the effectiveness of the proposed design method.

PFrB-3

基于最小二乘支持向量机的 Hammerstein-Wiener 模型辨识

Identification of Hammerstein-Wiener Model with Least Squares Support Vector Machine, pp.3-260~3-264

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提出了一种利用最小二乘支持向量机辨识 Hammerstein - Wiener 模型的方法,该方法借鉴最小二乘支持向量机求解思路,通过增加共线性约束条件将 Hammerstein - Wiener 模型的辨识问题转换为有约束优化问题,从而辨识出 Hammerstein - Wiener 模型的参数,有效地提高了 Hammerstein - Wiener 模型的计算效率。

A identification method for Hammerstein-Wiener model using least squares support vector machine is proposed. With the solving idea of least squares support vector machine, the identification problem of Hammerstein -Wiener model is converted to the constrained optimization problem by adding constraint so that the parameters of Hammerstein-Wiener model are identified and the computing efficiency of Hammerstein-Wiener is improved.

PFrB-4

一种基于模型输出最小熵的动态系统参数辨识方法

A Method of Parameter Identification for Dynamic Systems Based on Model Output Minimum Entropy, pp.3-112~3-114

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参数辨识在模型建模中具有重要的地位,当测量数据的概率分布已知时,可以采用极大似然法来估计未知参数,实际问题很难满足这一假设。对于一般的动态系统,在系统输出概率分布未知的情况下,提出了基于系统输出最小熵的参数辨识方法。该方法采用模型输出的概率密度函数的熵为目标函数,通过使该熵最小的方法来优化模型参数。为了降低估计模型输出概率密度函数的计算量,提出了以另外一种目标函数形式。以 HIV/AIDS 三维模型为例进行了仿真试验,仿真结果表明了该方法的有效性。

Parameter estimation is important in mathematical modeling. The Maximum Likelihood method can be used when the probability density function of observation is known. However, this assumption may not be satisfied in practice. To deal with this problem, a new parameter estimation method for dynamic systems is proposed using the entropy of probability density function for system output viable and two performance functions are also given. To illustrate the effectiveness of this method, HIV/AIDS model is taken as an example to evaluate simulation and results are encouraging.

PFrB-5

A Robust Optimization Model for Multi-objective Operation of Supply Chain under Uncertain Market, pp.3-346~3-350

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A multi-objective operation model is proposed in this paper to deal with a multi-product, multi-period supply chain consisting of a supplier and a producer. In this supply chain, the amount of raw materials supply and their prices, ultimate products demand and their prices are uncertain. The uncertainties of prices are described by the uncertain intervals; the supplies and demands are described as a scenario set with certain probability. The model is constructed as a multi-objective programming problem to satisfy several conflict objectives, such as the operating coordination of supply chain, making the maximum profit of all participants as much as possible, and robustness of decision to uncertain markets. The result of a numerical example shows that the model we proposed is robust.

PFrB-6

Optimal Dynamic Pricing Strategies with Two Differentiated Products, pp.3-370~3-374

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Investigating the nature and magnitude of two competitive interaction among differentiated products is important for developing effective marketing strategies. A supply chain system with a man-

ufacturer and two competitive retailers was considered here. The manufacturer produces two differentiated products, who sells the two products to two different competitive retailers respectively, and the two competitive retailers then sell the two products to end consumer in each period. A combination of game theory and dynamic systems concept is used here. The game theory is used to analyze strategic interactions among firms in this supply chain system, dynamic system concept is employed to analyze the evolving equilibrium of the supply chain over time.

PFRB-7

用蚁群算法求解不定期船调度问题

Solving the Tramp Ship Dispatching Problem Using ACA, pp.3-403~3-407

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文章以中海油运与中石化签订的原油 COA 合同为背景, 采用符合实际的船舶调度优化模型, 详细论述了如何利用蚁群算法求解优化模型的过程, 最后则为算例及总结。实例表明利用蚁群算法求解 COA 合同下的船舶调度方案优化不仅速度快, 而且优化方案可媲美传统线性规划。

Abstract: In the context of the COA signed by Sinopetrol and CSTANKER, this paper try to optimize ship schedule through ACA. Based on the practical operation, the ship scheduling of COA is formulated, And then, we try to solve the model through ACA. Finally, we schedule a real problem through the program. And it is proven that the schedule made by the program is as perfect as the one made by the traditional linear programming.

PFRB-8

Kernel-based Nonlinear Fit with Total Least Square (TLS) Method, pp.3-430~3-434

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In this paper, on the basis of linear fit in the total least square(TLS) method sense, we proposed a method of nonlinear fit in the TLS method sense via kernel representation. Namely, by using an appropriate kernel function, the problems of nonlinear fit can be transformed to the problems of linear fit without paying the computational penalty. The experimental results show that the algorithm presented in this paper is available.

PFRB-9

基于滚动优化的钢铁企业电力优化调度算法

Rolling Optimal Scheduling Algorithm for Iron and Steel Corporation Power System, pp.3-474~3-478

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大型钢铁企业是高耗电企业。企业的大幅度冲击性负荷具有与区域电力系统显著不同的特征, 对所在地区电网的运行造成严重的影响。本文提出将关口平衡作为钢铁企业电力调度的主要目标, 建立了一种基于滚动优化调度算法。该方法以预测控制基本理论为指导, 将预测模型、滚动方法的优势与钢铁企业电力调度的实际情况相结合, 在以企业实际数据进行的仿真中获得了良好的关口平衡效果。为应对预测模型失真的情况, 本文还提出了带补偿的滚动优化方法, 并在仿真中验证了加入补偿对平衡效果的改善。

Large-scale Iron & Steel Corporation is an electricity intensive corporation. Its high fluctuation type load with random pulse is quite different from the load pattern of a large region, and has great influence to regional power grid it belonged. In this paper, the gateway balance between the corporation and power grid is chosen as new

object of power scheduling, and a rolling optimal scheduling algorithm is proposed. Further to deal with random error of real-time load forecast model, a compensated rolling optimal scheduling algorithm is suggested. The algorithms are tested on real data, and prospective results are obtained.

PFRB-10

一种改进的 PSO 算法

A Modified Particle Swarm Optimization Algorithm, pp.3-479~3-483

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粒子群算法是一种新的基于群体智能的启发式全局优化算法, 算法简单、快速、容易实现, 具有良好的优化性能, 目前在很多领域得到了应用。但是在求解高维多峰函数寻优问题时, 算法容易陷入局部最优, 也就是通常称的“早熟现象”。本文从收敛速度和搜索能力两方面考虑出发对算法进行了改进, 提出了一种改进粒子群算法 (MPSO)。改进算法有很强的搜索能力, 可以很好的避免算法的早熟现象, 通过试验的仿真结果表明, 该算法具有更好的优化性能。

Particle Swarm Optimization is a new heuristic global optimization algorithm based on swarm intelligence. The algorithm is simple, easy to implement and has good performance of optimization. Now it has been applied in many fields. However, when optimizing multidimensional and multimodal functions, the basic particle swarm optimization is apt to be trapped in local optima, which is called premature. This paper proposes a modified optimization method (MPSO), which considers for convergence speed and search capacity. This modified algorithm has stronger exploitation ability, so it can prevent premature well. Simulation results show that this modified algorithm performs better performance. It is used in segmentation of infrared image The experimental results show that the modified PSO not only realizes the image segmentation well, but also improves the speed greatly.

PFRB-11

Further Results on Robust Stability/Stabilization of Uncertain Linear Delayed Systems, pp.2-84~2-88

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A comprehensive discussion on the potential conservatism of a descriptor model transformation approach is given and the stability/stabilization of time-delay systems are reconsidered by using an integral inequality recently established. A refined delay-dependent stability condition, which includes the one by the descriptor model transformation approach as a special case, is derived. Neither any model transformation nor any bounding technique for cross terms is employed. Then, based on the new stability conditions combining with the matrix decomposition technique, a new stabilization criterion is obtained. Finally, some numerical examples are given to demonstrate the efficiency of the proposed method.

PFRB-12

Delay-Dependent Dynamical H^∞ Control of Linear State-Delayed Systems, pp.3-568~3-573

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This paper provides a linear matrix inequality (LMI) approach to delay-dependent observer-based stabilizing and Hinf controller design for linear state-delayed systems. The resulted delay-dependent criteria for the existence of controllers are presented by two independent LMIs via constructing a proper Lyapunov functional. The benefits of the proposed method lie in: (1) The feedback-gain and the observer-gain can be computed simultaneously; (2) The delay-bound or the hinf performance bound can be

optimized; (3) The result obtained is less conservative than the previous work existing in the literature. A numerical example illustrates the potentiality of our claim.

PFRB-13

Delay-dependent Guaranteed Cost Control for Nonlinear Neutral Systems with Mixed Delays, pp.3-574~3-577

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This paper considers the delay-dependent guaranteed cost control for a class of nonlinear neutral systems with mixed delays. Based on the parameterized neutral model transformation method, we obtain improved delay-dependent sufficient condition for existence of the guaranteed cost controller in terms of LMIs. Finally, two numerical examples are presented to show the effectiveness and less conservativeness of our proposed method.

PFRB-14

Robust Strictly Dissipative Control for Singular Systems with Time-delay and Parameter Uncertainties, pp.3-578~3-582

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This paper focuses on the problem of robust strictly dissipative (RSD) control for singular systems with time-delay and norm-bounded parameter uncertainties. An LMI-based quadratically stable and strictly dissipative sufficient condition is given for control-free singular systems. Memorial state-feedback-based and dynamic output-feedback-based RSD control are presented for singular systems with time-delay and norm-bounded parameter uncertainties. The existence conditions of memorial state-feedback-based and dynamic output-feedback-based RSD control are given in terms of LMIs. A numerical example is provided to demonstrate the validity of the methods.

PFRB-15

Robust Landing Control and Simulation for Flying Wing UAV, pp.3-600~3-604

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The object of this paper is to design a robust longitudinal landing controller for a flying wing UAV, taking into account both actual ground effect and some typical atmospheric conditions. In order to track the desired trajectory even when the UAV is under influence of uncertainties and disturbances, a mixed H₂/H_∞ robust control method is adopted in this paper. The H₂ part is to meet excellent dynamic responds; the H_∞ part is to minimize the affection of the disturbance to the performance output. The feedback control gain involved in the method is derived by linear matrix inequality (LMI) approach. Finally, the robust controller derived from this paper is simulated by a nonlinear numerical flight simulator, the results compared to those of classical PID controller show that, the robust landing controller can meet the performances better.

PFRB-16

基于 LMI 的状态多重时滞大系统时滞相关分散鲁棒控制
Time-dependent Decentralized Robust Control Based on LMIs of Large-scale Systems with Multiple State Delays, pp.3-605~3-608

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摘要: 对一类状态多重时滞大系统, 应用 Lyapunov-Krasovsii 泛函和 LMI 方法, 研究其分散鲁棒稳定化的鲁棒控制器设计问题, 给出了其可分散状态反馈镇定的时滞相关鲁棒稳定的充分条件, 在此基础上, 通过求解一凸优化问题, 提出了具有较小反馈增益的分散稳定化

状态反馈控制器的设计方法。

Abstract: This paper studied the design of decentralized robust stabilization controller for large-scale systems with multiple state delay by means of Lyapunov-Krasovsii functional and a linear matrix inequality (LMI) approach. A time-dependent robust stability sufficient condition for the decentralized state feedback stabilization was derived. A convex optimization problem with LMI constraints was formulated to design a decentralized state feedback controller with smaller gain parameters, which enabled the closed-loop system robust asymptotically stably.

PFRB-17

基于分离算子的鲁棒可靠跟踪控制器设计
Separator-based Design of Robust Reliable Tacking Controller, pp.3-630~3-634

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针对多胞模型描述的不确定系统, 并考虑执行机构多通道内同时发生故障的情况, 研究系统鲁棒可靠跟踪控制器的设计问题。基于无结构二次型分离算子, 可获得保守性更低的可靠跟踪控制器的存在条件。为进一步降低控制器设计的保守性, 还将采用依参数分离算子来提高设计的自由度。另外可靠跟踪控制器的存在条件可归结为一组线性矩阵不等式 (LMI)。最后, 仿真结果验证了所提出的设计方法的有效性和优越性。

Allowing for simultaneous occurrence of multiple actuator faults in signal channels, the problem of robust reliable tracking controller design for a class of uncertain systems with polytopic type uncertainty is investigated. Based an unstructured quadratic separator, a less conservative condition for the existence of a reliable tracking control is derived. In order to reduce the design conservatism, a parameter dependent formation is introduced in construction of the quadratic separator, which can give rise to the improvement in degree of freedom for controller synthesis. In addition, the condition mentioned above can be reduced to linear matrix inequalities (LMI). Finally an example is given to demonstrate the effectiveness and superiority of presented robust reliable tracking controller.

PFRB-18

Time Delay Force Control for Vehicle Active Suspension System, pp.3-640~3-645

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This paper presents the simulation results of a force tracking controller for a quarter-car suspension system. The active suspension system is decomposed into two loops. At the main loop, the desired force signal is calculated by using a standard LQ design process. The Time Delay Control (TDC) technique is then used to design the force controller such that the desired force signal is achieved in a robust manner when actuator or other plant uncertainties are present. The ADAMS controls module is used to render joint simulation between ADAMS and MATLAB, of which the results showed that the TDC strategy is reasonable and feasible in isolating the road vibration effectively.

PFRB-19

一类非仿射非线性系统的 H_{∞} 控制
 H_{∞} Control of a Class of Non-affine Nonlinear System, pp.3-646~3-650

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本文将仿射非线性系统的 H_{∞} 控制方法推广至一类非仿射非线性系统。主要方法是利用反函数组理论, 将非仿射非线性系统转化为仿射非线性系统, 在控制输入满足一个不等式的假设下, 利用仿射非线性系统的 HJI 不等式得到非仿射非线性系统存在 L₂ 增益且渐近稳定

的充分条件, 而且本文给出了非仿射非线性系统的状态反馈控制。By employing the inverse function theory, a class of Non-Affine Nonlinear System was converted into Affine Nonlinear System. Under the assumption that the input satisfy a inequality, a sufficient condition such that the class of Non-affine Nonlinear Systems is asymptotically stable and has limited L2-gain was provided according to the Hamilton Jacobi-inequality subject to the Affine Nonlinear System. Moreover, a state feedback control law was presented.

PFRB-20

一类时滞大系统的分散自适应输出反馈控制
Decentralized Adaptive Output Feedback Control for a Class of Time Delay Large-scale Systems, pp.3-712~3-715

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研究了一类含不确定参数和多时变时滞互联项大系统的分散自适应输出反馈稳定问题。假定互联项满足匹配条件且每个子系统的标称系统是严格反馈正实的。通过估计不确定参数矩阵的界设计出了一种分散自适应输出反馈控制器, 并证明了此控制器使得闭环系统全局指数一致收敛到一个有界球。最后给出一个仿真例子说明结论的有效性。

The problem of decentralized output feedback adaptive stabilization for a class of large-scale systems subject to uncertain parameters and multiple time-varying delays in the interconnections. The interconnections are assumed to satisfy the matching conditions and the nominal system of each subsystems is strictly feedback positive real. By estimating the unknown bounds of the uncertain parameter matrices we propose a decentralized output feedback adaptive controller, which can guarantee the closed-loop system to converge, globally, uniformly and exponentially, to a bounded ball. Finally, an illustrative example is given to demonstrate the validity of the results.

PFRB-21

基于自适应评价设计的一种控制算法
A Control Algorithm Base on Adaptive Critic Designs, pp.3-716~3-719

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本文主要是研究自适应评价设计 (ACD) 中的在线学习控制方法, 该方法称为执行依赖双启发式动态规划 (ADDHP)。文中阐述了自适应评价设计的原理, 构建了一个在线学习控制器, 并且详细地介绍了控制算法中有关评价网络和执行网络的学习过程。通过了车载平衡杆的实验, 表明了在线学习控制算法的适用性。

This paper focuses on studying a class of on-line learning control based on Adaptive Critic Designs. It can be classified as Action-Dependent Dual Heuristic Programming (ADDHP). The principle of Adaptive Critic Designs is introduced. We design an on-line learning controller, and provide details about the learning of Critic Networks and Action Network used in the present algorithm. In our simulation study, we employ the cart-pole balancing problem to show the applicability of the on-line learning control algorithm.

PFRB-22

一种多速率预测控制
A Kind of Multi-rate Predictive Control for Time-delay Systems, pp.3-734~3-737

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In this paper, we establish the input-output predictive models containing time delays for a class of dual-rate systems that the control is applied at a slower rate than the available measurements of the plant output signal, and a new dual-rate predictive control algorithm for time-delay systems is presented. Furthermore, the robust stability of the closed-loop system is analysed using linear matrix

inequalities (LMI) method. A simulation example illustrates the efficiency of the arithmetic.

PFRB-23

具有未知载荷参数的漂浮基双臂空间机器人姿态、关节运动的自适应控制方法
Adaptive Control Schemes of Free-floating Dual-arm Space Robot System in Joint Space, pp.3-761~3-765

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本文讨论了载体姿态受控、位置不受控情况下, 具有未知载荷参数的漂浮基双臂空间机器人系统关节运动的自适应控制问题。系统运动学、动力学分析结果表明, 结合系统动量守恒关系及系统总质心定义得到的系统动力学方程, 可以表示为一组适当选择的系统组合惯性参数的线性函数。以此为基础, 针对双臂空间机器人末端爪手持载荷参数未知的情况, 设计了漂浮基双臂空间机器人姿态、关节协调运动的自适应控制方案。提出的控制方案具有不需要反馈、测量漂浮基的位置、移动速度及移动加速度的显著优点。系统数值仿真, 证实了方法的有效性。

In this paper, we propose an adaptive controller for a space robot system with unknown payload parameters. The dynamic equations of dual-arm space robot system are derived through the Lagrangian formulation. The obtained dynamic equation can be represented by a group of inertial parameters. Based on the results and considered unknown payload parameters, we design an adaptive controller for the robot system to track the desired trajectory. And the numerical simulation is carried out, which confirms the controller proposed is feasible and effective.

PFRB-24

具初始修正的时滞系统迭代学习控制
Iterative Learning Control for Time-delay Systems with Initial Rectifying Action, pp.3-777~3-781

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本文针对一类具有相对阶的时滞系统, 讨论带有初始修正的迭代学习控制算法, 给出这类学习系统的输出极限轨迹, 以及当实际输出收敛于此极限轨迹时的充分条件。理论分析表明, 该学习算法可以在指定时刻之后实现对给定期望轨迹的完全跟踪。

This paper addresses the problem of iterative learning control for time-delay systems with well-defined relative degree. Initial rectifying action is introduced in a conventional learning algorithm, and convergence conditions of the rectified learning algorithm are derived, in the presence of initial shifts, ensuring that the system output converges uniformly to a pre-specified trajectory. In particular, the system output converges to the desired trajectory jointed smoothly with a piece of transient trajectory.

PFRB-25

基于变结构神经模糊控制的 ASVG 控制器的研究
Design of ASVG Controller Based on Variable Structure Neural Network Fuzzy Control, pp.3-782~3-785

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对新型静止无功发生器 (ASVG) 采用双闭环智能控制, 提出了一种外环为常规的 PI 控制、内环为变结构神经网络模糊控制的控制方法。在内环控制中利用被选择的观测信号作为模糊控制器的输入/输出信号, 采用 MATLAB 中的模糊控制工具箱快速地获得初始化的模糊控制规则; 应用一种变结构神经网络算法对初始化的模糊规则进行调整, 提高模糊控制规则的自学习和自适应能力。仿真分析结果表明: 该控制方法应用于 ASVG 控制系统能提高控制器的综合性能, 增强对电力系统稳定性的控制。

A intelligent integrated control method of double close loop is used

for advanced static var generator (ASVG). The outer loop based on traditional PI control and the inner loop based on variable structure neural network fuzzy control are presented. Observed signals are firstly collected to input and output signals of FLC for inner loop, and initial fuzzy rules are fast obtained by fuzzy toolbox of MATLAB; A kind of variable structure neural network algorithm is adopted to adjust fuzzy rules, and improves the ability of self-studying and self-adjusting in fuzzy control rules. The result of simulation shows: the method which is applied in ASVG controller can improve comprehensive ability of the controller and strengthen control effect to the power system.

PFRB-26

一类非线性系统的周期学习控制

Periodic Learning Control for a Class of Nonlinear Systems, pp.3-796~3-800

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何熊熊 浙江工业大学

针对一类具周期参数不确定性的严格反馈非线性系统给出了一种周期学习控制方案,通过系统周期参数化解决了参数周期已知情形下的跟踪控制问题。控制器设计采用 Backstepping 递推设计方法,给出的学习律具微分-差分形式,回避了在控制器设计过程中对参数估计值的导数计算。证明了闭环系统内所有信号有界,且跟踪误差渐近收敛。

In this paper, periodic learning control is presented to deal with the problem of trajectory tracking of a class of nonlinear systems with time-varying parametric uncertainties. The system undertaken is assumed to be in the form of strict-feedback and the unknown parameters are periodic with known periodicity. Backstepping approach is utilized for the controller design and the developed learning law is a differential-difference learning law, which avoids the difficulty in obtaining derivatives of parameter estimations. This design has the advantage of ensuring tracking, while the boundedness of all the signal in the closed loop is guaranteed.

PFRB-27

An Adaptive Tracking Method for Non-holonomic Wheeled Mobile Robots, pp.3-801~3-805

Yue Liyong South China Univ. of Tech.
XIE WEI South China Univ. of Tech.

In this paper, an adaptive control rule for trajectory tracking of a wheeled mobile robot is proposed in the case that the un-modeled dynamic in actuator is considered. Usually the adaptive controllers ignored the dynamic in actuator and assumed the wheels torques as the input of the robot system. This method proposed here estimates the parameters in the dynamic model and the actuator model, and using these parameters an adaptive controller is designed based on back stepping method. The adaptive control rule can not only increase the response speed, but also avoid slippage. The simulation results show the effectiveness of the proposals.

PFRB-28

一类具有未知控制方向的不确定非线性系统自适应控制

Adaptive Control of a Class of Uncertain Nonlinear Systems with Unknown Control Directions, pp.3-835~3-839

于双和 大连海事大学
赵永生 大连海事大学

针对一般的具有未知控制方向的参数化严格反馈不确定非线性系统,基于 Backstepping 方法和 Nussbaum 增益函数,本文提出了一种新的非线性自适应控制算法。利用增广李雅普诺夫函数法证明系统的一致渐近稳定性。针对“大庆 232”号油船的航向保持控制中的仿真结果验证了理论分析的正确性和算法的有效性。

A kind of novel nonlinear adaptive control strategy is proposed for the general parameterized strict feedback uncertain nonlinear systems with unknown control directions. The proposed control

scheme is based on the Backstepping algorithm and Nussbaum gain function. The uniformly asymptotical stability is proved by utilizing the augmented Lyapunov function. The simulation results on the course keeping control of "Daqing 232" tank ship validate the theoretical analysis and the algorithmic effectiveness.

PFRB-29

Exponential Stability of Delayed High-order Hopfield-type Neural Networks with Diffusion, pp.4-83~4-86

Lou Xuyang Southern Yangtze Univ.
Cui Baotong Southern Yangtze Univ.

This paper considers a generalized model of high-order Hopfield-type neural networks with time-varying delays and reaction-diffusion terms. By using the method of Lyapunov function and Halanay's inequality, we investigate the global exponential stability of high-order Hopfield-type neural networks with time-varying delays and reaction-diffusion terms. A sufficient condition for ensuring global exponential stability of these networks is derived, and the estimated exponential convergence rate is also obtained. As an illustration, an numerical example is worked out using the results obtained.

PFRB-30

On the Optimum Method of Feedforward Multi-Layer Neural Network, pp.4-87~4-90

Hu Ying Dalian Maritime Univ.
Huang Jin Dalian Maritime Univ.

Defining network average error as optimum objective function, weights and thresholds as design variable, which are rationally sorted, a new kind of real conjugate terraced optimum algorithm is studied. Compared with BP algorithm, the compute time is reduced and the precision is improved. A computing program about weights and threshold, based on high precision conjugate gradient optimum algorithm of multi-layer neural network, is put forward and programmed. The selecting method of rational construct is also pointed out. Through an application instance, its advantage and applying prospect is validated.

PFRB-31

New Exponential Stability Criterion for Delayed Cellular Neural Networks, pp.4-100~4-103

Liu Xinge Central South Univ.
Ou Xiaobo Central South Univ.
Tang Meilan Central South Univ.

Without assumption of the boundedness of the activation functions, using Lyapunov-Krasovskii functional together with homeomorphism map and linear matrix inequality techniques, a new condition for (i) existence (ii) uniqueness and (iii) global exponential stability of equilibrium point, of a class of time-varying delay cellular neural networks. Our result strengthens and improves the previous results. Numerical example is given to illustrate the effectiveness and improvement of our proposed criterion.

PFRB-32

基于模糊 CMAC 的水下灵巧手指轨迹控制
Finger Tracking Control of Underwater Dexterous Hand Based on Fuzzy CMAC, pp.4-121~4-124

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黄筱调 南京工业大学
何晋 云南民族大学

由于水下灵巧手工作环境的特殊性,及其动力学模型高度非线性、强耦合的特点,使其轨迹控制器的构建成为难点。为了提高水下灵巧手精细作业能力,采用一种模糊 CMAC 构建手指的轨迹控制系统。建立了模糊 CMAC 的神经网络结构,并推导了该网络各层输入输出的计算式。采用 BP 算法对联想强度以及高斯隶属函数中的中心和宽度进行训练。最后对灵巧手指的轨迹控制系统进行仿真研究,结果显示手指能跟踪预定轨迹,稳定性好、位置精度高,可应用于水下灵巧手

控制系统。

Design of tracking controller is difficult due to the particularity of the work environment for the underwater dexterous hand, high nonlinearity and strong coupling of the dynamic model. A fuzzy CMAC was adopted to establish the tracking control system for improving the fine performance capacity. The neural network structure of the fuzzy CMAC was designed, and the input and output formula of each layer was deduced. Based on BP arithmetic, the associative strength, core and width of Gaussian membership function were obtained through training. In final, the simulation of the finger tracking control system was carried out, the results indicate that the finger can follow the scheduled track, the stability is good, the position precision is high, and the control system can be used in the underwater dexterous hand.

PFrB-33

Wavelet Neural Network Disturbance Observer-based Adaptive Robust Tracking Control for Servo System, pp.4-149~4-155

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Qiao Jihong Beijing Tech. & Business Univ.
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This paper presents an adaptive robust control approach of the nonlinear systems using a wavelet neural network disturbance observer (WNDOB). The proposed WNDOB based on multiresolution analysis theory is used to estimate external disturbance and internal parameter uncertainties. Novel update and control laws are proposed to guarantee that all the signals in the closed-loop control system are uniformly ultimately bounded (UUB) in the sense of Lyapunov. In addition, a robust compensator is designed to improve the tracking performance. Finally, a computer simulation example is presented to illustrate the effectiveness and the applicability of the suggested method.

PFrB-34

New Results for Globally Asymptotic Stability and Instability of Recurrent Neural Networks, pp.4-162~4-166

Zhang Yutian Wuhan Univ. of Sci. & Tech.
Luo Qi Nanjing Univ. of Information Sci. & Tech.

This paper presents four new theorems of globally asymptotic stability and instability for a general class of continuous-time recurrent neural networks with variant delay. With weaker conditions and less restrictive activation function, the obtained stability results improve and extend existing ones. Discussion and examples are given to illustrate and compare the new results with the old ones

PFrB-35

Novel Stability Analysis of High-order Cohen-Grossberg Neural Networks with Time-varying Delays, pp.4-176~4-180

JI Yan Southern Yangtze Univ.
Cui Baotong Southern Yangtze Univ.

This paper addresses global asymptotic stability and global exponential stability for high-order Cohen-Grossberg neural networks with time-varying delays. Some novel global stability criteria of the system is derived by using the method of Lyapunov functions and linear matrix inequality(LMI). An example is given to illustrate the effectiveness of our results.

PFrB-36

遗传对角回归神经网络在伺服系统中的应用

Application of Genetic Diagonal Recurrent Neural Network to Servo System, pp.4-186~4-189

杜延春 山东大学
李贻斌 山东大学
王桂月 山东经济学院

对角回归神经网络的学习速率和结构选取都是采用经验法。遗传对

角回归网络就是应用遗传算法对它的学习速率和网络结构进行优化,用优化的结果来构成一个新神经网络,并给出了具体的算法。将这个遗传对角回归神经网络用于伺服系统控制器设计,仿真结果表明,这种方法设计的控制器具有较高的控制精度。

The learning rate and the structure of the diagonal recurrent neural network (DRNN) are selected by the experiential method. The core of the genetic algorithm DRNN (DRNN) is the optimization of the DRNN learning rate and structure by the genetic algorithm. This optimized results composes new neural network. At the same time, the detailed step is abstained. Finally, this GA-DRNN is applied to the design of the servo system controller, Simulation results show that compared with controller based on DRNN, the controller based on GA-DRNN possesses higher precision.

PFrB-37

Estimation of Stator Resistance and Temperature Measurement in Induction Motor Using Wavelet Network, pp.4-203~4-207

Huang Weili Hebei Univ. of Engineering
Huang Weijian Hebei Univ. of Engineering
Liu Lin Beijing Univ. of Aeronautics & Astronautics

To complete induction motor thermal protection, a novel stator resistance estimation approach for stator winding temperature monitoring based on wavelet network and parameter identification is presented. By the use of wavelet network that accurately localizes the characteristics of a signal in the time frequency domains, the occurring instants of the signal change can be identified by the multi-scale representation analysis. The stator and rotor resistance are calculated using mathematical model and the motor speed is estimated by use of wavelet network, and then the temperature is obtained according to the principle that the metal resistance depends on its temperature. The improved least squares algorithm (LSA) transform is used to fulfill the network structure and parameter identification, and then the mapping relationship between the stator voltage, stator current, power factor angle and the rotor speed is determined using the wavelet network. The simulation results demonstrate that the proposed method is effective for temperature monitoring of asynchronous motor.

PFrB-38

Power Quality Disturbances Detection and Classification Using Complex Wavelet Transformation and Artificial Neural Network, pp.4-208~4-212

Liu Hua Hebei Univ. of Engineering
Wang Yuguo Hebei Univ. of Engineering
Zhao Wei Hebei Univ. of Engineering

This paper presents a novel power quality disturbance detection and classification method of distribution power system based on complex wavelet transform (WT) and radial basis function (RBF) neural network. The complex supported orthogonal wavelets is employed to extract the feature information of disturbance signal, and finally proposed to explore several novel wavelet combined information (CI) to analyze the disturbance, superior to real wavelet analysis result. The feature obtained from WT coefficients are inputted into RBF network for power quality disturbance pattern classification. The power quality disturbance classification model is established and the synthesized method of recursive orthogonal least squares algorithm (ROLSA) with improved Givens transform is used to fulfill the network structure parameters. By means of choosing enough samples to train the recognition model, the type of disturbance can be obtained when signal representing fault is inputted to the trained network. The simulation results demonstrate that the complex WT combined with RBF network are more sensitive to signal singularity, and found to be significant improvement for acquiring signal feature information.

PFrB-39

Adaptive NN Control of a Class of Nonlinear Systems with Unknown Control Direction, pp.4-213~4-216

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Huang Shengjie Nanjing Univ. of Sci. & Tech.
Luo Qi Nanjing Univ. of Information Sci. & Tech.

In this paper, Adaptive neural-network(NN) control which is combined with the technique of variable structure control(VSC) is presented for a class of nonlinear system with unknown control directions. In the course of design, the procedure of the adaptive NN controller design is firstly applied via backstepping approach; then, the control directions were rectified by defining the shifting conditions of the VSC. All the signals in the closed loop are guaranteed to be semiglobally uniformly ultimately bounded and the output of the system is proven to converge to a small neighborhood of the desired trajectory. Simulation results demonstrated the effectiveness of the approach.

PFRB-40

序列最小优化算法在电力系统短期负荷预测中的应用
The Application of Sequential Minimal Optimization Algorithm in Short-term Load Forecasting, pp.6-314~6-317

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翟永杰 华北电力大学
韩璞 华北电力大学

本文提出了一种基于序列最小优化算法(SMO)理论的电力系统短期负荷预测方法。该方法引入限定记忆思想,进行适当参数选择并改进了SMO算法。SMO算法的特点是在保证收敛的情况下把支持向量机中的二次规划问题分解为一系列子块问题来解决。而改进的SMO算法能够使块数据的长度始终保持不变,并且经实验证明,该算法能够使短期负荷预测具有很好的预测精度。

A new approach based on sequential minimal optimization(SMO) Algorithm for the electric power system load forecasting was presented. The proposed algorithm introduced the conception of limited memory, selected proper kernel parameters and improved SMO algorithm. SMO algorithm decomposes the QP problem in SVM into a series of sub block data to ensure the convergence. The Improved SMO algorithm can keep the length of the block data has remained unchanged and it provides the excellent forecasting accuracy proved by the result of the experiment.

PFRB-41

Real-time Digital Simulation of Control System with LabVIEW Simulation Interface Toolkit, pp.6-318~6-322

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Yang Sheng China Three Gorges Univ.
LIU Ping China Three Gorges Univ.

In this paper, the virtual instruments software LabVIEW and its Simulation Interface Toolkit are introduced at first. With visualization technology, LabVIEW can simulate an industry plant with better effect. The LabVIEW Simulation Interface Toolkit (SIT) provides a seamless integration between MATLAB/Simulink software and LabVIEW. A method is presented to implement real-time digital simulation with no hardware-in-the-loop and a pure software real-time digital simulation example of a lever process control system using LabVIEW Simulation Interface Toolkit is given. It can get better effect in teaching or training of industry process control system with minimal cost.

PFRB-42

An Improved Fourth-order PDE for Noise Removal with Dissipation Reduction, pp.6-332~6-334

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Yu Wensheng

Chinese Acad. of Sci.

In this paper we present a method that can reduce the dissipation during fourth-order PDE diffusion processing which is used for noise removal without blocky effect. PDE-based method has been a successful tool for image restoration. But most of PDE methods have a common problem that is the processed image looks like cartoon image. In order to overcome the blocky effect introduced by second order PDE, Yuli You proposed a fourth order PDE method which seeks to minimize a function proportional to the absolute value of the Laplacian operator of the image. But we found that this method can also introduce dissipation during the diffusion process. In order to reduce the dissipation effect, we consider revising the diffusion coefficient. And what we think is to introduce the gradient operator into the diffusion coefficient. This method can reduce the dissipation effect during the denoising process. From the experiment we can see that the dissipation is reduced.

PFRB-43

微分代数系统的无源性在励磁系统中的应用
Passivity for Differential-algebraic Systems with Application to Excitation System, pp.6-335~6-337

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张庆灵 东北大学理学院

本文提出了微分代数系统无源的定义以及KVP特性的定义。利用类似微分几何理论的方法,通过引入微分代数系统的M导数,利用微分代数系统无源性定义以及KVP特性的等价定理。最后针对微分代数模型的励磁系统构造了存储函数,使得系统无源而保持内部稳定。M导数的方法可以看作是L导数方法的延伸。文中所获得的结果,使微分代数系统的无源性理论在电力系统中得以实现。

In this paper, Passive definition of differential algebraic systems and KVP property definition were proposed. Similar to methods of differential geometry theory, equivalent theorem between differential algebraic systems passivation and KVP property was used by introducing M derivative. In the end the storage function was constructed for excitation system with differential algebraic model. M derivative method can be considered as extension of L derivative method. Results were obtained, which make passivity theory for differential algebraic system realized in power systems.

PFRB-44

学习者情绪空间定义及应用
The Research of Emotion Cognition Model and Its Application, pp.6-356~6-361

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基于情绪的维度空间理论,本文提出用趋避度及专注度方法对学习者的学习兴趣情感状态进行识别。根据趋避度和专注度确定了学习者二维情绪模型,对学习者的情绪空间给出了定义并给出了情绪运算的相关定义。最后将情感识别的结果应用于E-learning系统,为实现E-learning系统的人性化和智能化提供了有效的支持

Affective computing is becoming a new research hotspot. Based on the theory of emotional dimensionality, this paper presents a method using approach-withdrawal and careness to recognize learners' emotional state of learning. Finally the realization is introduced that the solution has been applied to the E-learning system to cope with the emotion and cognition of the student interest

PFRB-45

A New Control Approach of Output Probability Density Functions for Dynamic Stochastic Systems Using Parzen Window Estimate, pp.6-362~6-367

Yang Chengzhi Kunming Univ. of Sci. & Tech.

A new control approach is proposed for the control of output probability density function (PDF) for dynamic stochastic systems with unknown prior probability. The Parzen window estimate of PDFs using the kernel function is used to represent the output PDFs of

the dynamic stochastic system. This is then followed by a easy programming and a numeral control solution for the output distribution of the system using output PDFs tracking concept. A nonlinear quadratic optimization is performed using the PDFs minimum variance formula as a index performance to measure system characteristics. the Lyapunov stability analysis of this control strategy introduced in this note is performed to show the asymptotic stability of the closed loop system under some conditions.

PFRB-46

The Application of Soft-Sensor Technology in Measuring Water Boiling Point, pp.6-372~6-376

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Zhong Chongquan	Dalian Univ. of Tech.
Yang Suying	Dalian Univ. of Tech.
Yan Ming	Dalian Univ. of Tech.

In the process of calefying water, the speed of calefying water varies when the quantity is different. Taking the speed of calefying water as a detecting signal, in the process of calefying water, a maths model of calefying water is established to differentiate the quantity of water for the purpose of replacing sensor through using subsection optimal slope mean to measure water boiling point. In accordance with the characteristic of the varying rate of temperature declining in the course of water boiling , a calculating formula of small quantity of water and a comparing table of large quantity of water linear relevant parameters are established by analyzing experient data. The experiments prove that under the condition of the given low configure hardware, the optimal measuring result can be acquired by applying soft-sensor technology.

PFRB-47

基于 ASP.NET 和 OPC 技术的远程监控系统的研究与实现
On Remote Monitor and Control Based on OPC and ASP.NET, pp.6-384~6-387

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针对工业过程中的远程监控问题, 论文提出一种基于 ASP.NET 和 OPC 技术实现信息集成和 Web 服务的方案. 提出的方案以一个以太网上的水箱控制系统的远程监控为例, 利用 OPC 技术建立上位机与 PLC 之间的通讯, 采用 OPC 技术和 VC++ 创建实时数据库系统, 读取 OPC 服务器的数据以及控制变量, 在 ASP.NET 中采用 ADO.NET 技术对实时数据库进行动态数据访问以及对历史数据进行实时查询. 试验结果表明, 监控系统运行良好, 实时性好, 采用 ASP.NET 和 OPC 技术能够有效实现工业过程的远程监控.

Aiming at the remote monitor and control in industry, the paper presents a scheme to integrate information and Web services based on OPC (OLE for Process Control) and ASP.NET technology. The proposed scheme took the remote monitor and control of a water tank system on the Ethernet as an example, which utilized the OPC technology to set the communication between PC and PLC, and established the RTDB (Real-time Database System) to read the data and control variable from OPC Server by programming with VC++. It used ADO.NET technology to dynamically visit the real-time data based on ASP.NET and inquiry the history data from RTDB. The experiment result shows that the monitor and control system works better and obtains more real-time. It proves that the scheme can realize Web monitor and control effectively.

PFRB-48

用例驱动的角色访问控制安全授权设计与研究
Use Case-Driven Role Based Access Control Security Authorization, pp.6-392~6-394

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Mahammed Jalloh

Central South Univ.

角色访问控制模型是目前主流的访问控制安全模型. 传统的角色访问控制模型建模时存在与系统需求分析脱节的问题, 导致建立的安全模型不能满足用户的要求. 文章利用用例模型的概念和角色访问控制模型的特征, 提出了一种用例驱动的方法用来定义系统模型中角色的权限. 该方法通过扩展的用例以及形式化的顺序图, 将用例模型与角色访问控制模型相结合. 而且与传统的在系统开发后期建立安全模型相比, 在系统开发早期依据用例模型得到安全模型, 能够及早的发现安全问题, 预防安全体系的缺口. 该方法完全符合最小权限原则.

Role Based Access Control is the most popular access control model recently. In tradition there exists a problem that the Role Based Access Control model is not accord well with the system demanding analyse. And it can not guarantee that the security model could meet the users' demands. This paper introduces a method which describes the design and definition of the Role's rights in system modeling based on Use-Case driven RBAC. It considers the concept of Use Case based on RBAC characteristics which combines the Use-Case model with RBAC model by extending the Use Case and formalizing the scenario map. Comparing with traditional systems that incorporate Use Case design model at the end of system design, this method is designed from the beginning of the security design process, so it could identify security problems earlier in the system design to prevent gaps in the security system and meet the Least Privilege Rule.

PFRB-49

无轴承永磁薄片电机试验平台及驱动系统设计
The Design of Experiment Platform and Driving System for Bearingless Permanent Slice Motors, pp.6-395~6-399

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朱焜秋	江苏大学
孙永波	江苏大学
郝晓红	江苏大学

无轴承永磁薄片电机具有磁轴承和永磁同步电机优点, 具有重要研究意义. 论文阐述了无轴承永磁薄片电机工作原理, 采用转子磁场定向控制策略, 设计了无轴承永磁薄片电机解耦控制系统; 针对无轴承电机驱动电路的要求, 基于带电流滞环控制 CRPWM 功率驱动电路原理, 开发了相应的硬件驱动系统. 研究结果表明: 采用了该驱动电路与 DSP 相结合的数控试验平台, 满足无轴承电机驱动与控制的要求.

The bearingless permanent slice motor has much excellence of magnetic bearings and bearingless motors, and has important research value. In the paper the basic operation principle of the bearingless permanent slice motor has been introduced. The decoupling control between radial suspension forces and torque is designed according to the control strategy of rotor magnetic field oriented. Based on the basic principle of CRPWM, hardware driving system is developed for bearingless motors. The research results have shown that platform including the driving system and DSP board can demand the performance of driving and control for bearingless permanent slice motor.

PFRB-50

Autonomous Construction of Reliable Multi-agent Systems, pp.6-449~6-451

Zhang Libin	South-Central Univ. for Nationalities
Zhu Qianyu	South-Central Univ. for Nationalities
Wang Wei	Tongji Univ.

Trust mechanism always has two popular architectures: centralized fashion and distributed fashion. However, those two architectures are not well suited for multi-agent system since they cannot achieve the trust management autonomy. To achieve the trust management autonomy, the paper presents an autonomous reliable construction model based on Bayesian method. The presented model adopts the Bayesian method to evaluate the trust value of each agent. Ev-

ery agent can implement trust management autonomously. The simulation experiment results prove that the autonomous trust construction is effective.

PFRB-51

A Design of Vision-based Location Control System for Steel Rolling Mill, pp.6-452~6-455

Chen Wei	Wuhan Univ. of Sci. & Tech.
Fang KangLing	Wuhan Univ. of Sci. & Tech.
Liu Xinhai	Wuhan Univ. of Sci. & Tech.

This paper describes a closed loop control system based on machine vision in the position control of the hot billet of steel. It is based on an industrial camera as a visual sensor that provides the position information of the steel billets in the heating kiln, and is used to detect the moving billets. To meet the requirement of a robust, real-time detection of moving billet, this paper uses the simply background subtraction model to detect the moving billets. The difference gray profile project is applied to detect the edge of the billet, and the effect is well. In the practical application, the video control system has obtained good control performance under the industrial environment

PFRB-52

Improvement of Vehicle Handling and Stability by Integrated Control of Four Wheel Steering and Direct Yaw Moment, pp.4-730~4-735

Wu Jianyong	Shanghai Jiaotong Univ.
Tang Houjun	Shanghai Jiaotong Univ.
Li Shaoyuan	Shanghai Jiaotong Univ.
Fang Wan	Shanghai Jiaotong Univ.

This study proposes a new vehicle integrated robust model matching controller (R-MMC) that cooperates four wheel steering and direct yaw moment control to improve the vehicle handling performance and stability. The design frame work of the R-MMC is based on linear matrix inequalities (LMIs) in this study. Since vehicle sideslip angle measurement is difficult to achieve in practice, a LMI-based sliding mode observer (SMO) that requires only vehicle yaw rate as the measured input is also developed. The performance and robustness of the SMO and the integrated controller are demonstrated under critical steering maneuvers and road surface conditions. Simulation results reveal the satisfactory tracking ability of the SMO, and the superior improved vehicle handling performance, stability and robustness of the integrated control vehicle.

July 28, 2007

SaA01 13:30-15:30 Meeting Room 1
Invited Session: Complex Systems: Analysis and Control (II)

Chair: Hu Xiaoming Royal Inst. of Tech.
Co-Chair: Jiang Zhong-Ping Polytechnic Univ. of New York

SaA01-1 13:30-13:50

Non-smooth Agent-based Dynamics of Strategic Bidding with Linear Supply Function, pp.6-742~6-746

Xue Ancheng Chinese Acad. of Sci.
Hong Yiguang Chinese Acad. of Sci.

In the studies of strategic bidding solutions for multiple players to compete in a centralized electricity market, the existence of multiple/single market equilibria has been verified and analyzed with specific system constraints for the market optimization. In this paper, the dynamics resulting from line capacity constraints on a two-agent strategic bidding is focused on in light of linear supply function model in centralized electricity markets. Global attractors for this non-smooth bidding model in different cases are analyzed in order to help the two generators make bidding regulation.

SaA01-2 13:50-14:10

Parameter-Dependent Robust H_∞ Model Reduction for Discrete-Time Switched Polytopic Linear Systems, pp.6-747~6-751

Qiu Jianbin USTC & CityU Joint Advanced Research Center
Feng Gang City Univ. of Hong Kong
Yang Jie Univ. of Sci. & Tech. of China

This paper investigates the problem of parameter-dependent robust H_∞ model reduction for a class of discrete-time switched linear systems with polytopic parameter uncertainties. Based on a switched parameter-dependent quadratic Lyapunov function (SPDQLF) combined with Finsler's Lemma, a novel sufficient condition for robust H_∞ performance analysis is first proposed and in turn the reduced-order models are synthesized. It is shown that by using a new linearization technique incorporating a bounding technique, the matrices for the reduced-order models can be obtained by solving a set of linear matrix inequalities. Finally, a numerical example is provided to illustrate the effectiveness and less conservatism of the proposed approaches.

SaA01-3 14:10-14:30

Observer Based Leader-Following Formation Control Using On-board Sensor Information, pp.6-752~6-755

Gustavi Tove Royal Inst. of Tech.
Hu Xiaoming Royal Inst. of Tech.

In this paper leader-following formation control for mobile multi-agent systems with limited sensor information is studied. The control algorithms developed require only information available from on-board sensors, and in particular, the measurement of the leader speed is not needed.

SaA01-4 14:30-14:50

Stabilization of Power Systems by Switched Controllers, pp.6-756~6-760

Li Zhengguo Inst. for Infocomm Research, Singapore
Yang Guang-Hong Northeastern Univ.
Wen Changyun Nanyang Technological Univ.
Xie Wenxiang Seagate

An interesting application of switched control is provided in the field of power systems with either temporary fault or permanent fault. Such a power system is modelled by a switched linear system. A switched controller is design to stabilize the overall system and to improve the transient performance of the closed-loop system.

SaA01-5 14:50-15:10

Consensus of Multi-agent Systems with Higher Order Dynamics, pp.6-761~6-765

Wang Jinhuan Chinese Acad. of Sci.
Cheng Daizhan Chinese Acad. of Sci.

This paper considers the consensus problem of multi-agent systems, where each agent has n-th order dynamic mode. Three cases are considered. First of all, the agents are assumed to be lined up as a chain. Each agent can obtain the information from the agent ahead of it. Secondly, assume each agent can obtain the information from its neighbors and the adjacent graph with fixed or varying topology is connected. Thirdly, we consider a nonlinear case. Under certain assumption, it can be transformed into a linear case. In different cases we prove that the consensus can be achieved by local-information-based decentralized controls. Some existing results become particular cases of our general result.

SaA01-6 15:10-15:30

Complex Hybrid Systems: Stability Analysis for Omega Limit Sets, pp.6-766~6-769

Cai Chaohong Univ. of California, Santa Barbara
Goebel Rafal -
Sanfelice Ricardo Univ. of California, Santa Barbara
Teel Andrew Univ. of California

This paper focuses on the asymptotic stability properties of omega limit sets for complex hybrid dynamical systems, which are commonly found in systems and engineering. It spells out specific stability results that follow when a hybrid dynamical system has certain structure, e.g., when it admits a decomposition resembling a cascade of hybrid dynamical systems.

SaA02 13:30-15:30 Meeting Room 2
Invited Session: Design and Analysis of Networked Control Systems

Chair: Liu Guoping Univ. of Glamorgan
Co-Chair: Xia Yuanqing Beijing Inst. of Tech.

SaA02-1 13:30-13:50

Networked Control Systems with Different Control Inputs, pp.6-539~6-543

Xia Yuanqing Beijing Inst. of Tech.
Chen Jie Beijing Inst. of Tech.
Zhou Lin Beijing Inst. of Tech.

In this paper, both theoretical and experimental analysis of networked control systems with different control inputs are presented. Based on the networked predictive control methods, the effects of network transmission delay and data dropout are overcome. Due to the different ways of control input u , the stability of the different resulting closed-loop systems is also discussed in the paper. Both real-time simulations and practical experiments are presented to the difference between control inputs.

SaA02-2 13:50-14:10

Improved Stabilization Method for Networked Control Systems, pp.6-544~6-548

Wu Min Central South Univ.
He Yong Central South Univ.

This paper investigates the controller design problem for networked control systems (NCSs). By considering the relationship between the network-reduced delay and its upper bound, an improved stability criterion for networked closed-loop system is proposed without ignoring any terms in the derivative of Lyapunov-Krasovskii functional. As a result, a state feedback controller design method is established using a modified cone complementary linearisation (CCL) algorithm with a new stopping condition. A numerical example is given to demonstrate the effectiveness and the benefits of the proposed method.

SaA02-3 14:10-14:30

Design and Simulation of Fuel Cell Networked Predictive Fuzzy

Control Systems, pp.6-549~6-554Tong Shiwen
Liu GuopingChinese Acad. of Sci.
Univ. of Glamorgan

Networked control of PEM fuel cell is worth studying because PEM fuel cell as an electricity generation device can be used in the environment that not suit for people's direct manipulating, such as deep-sea, air space and other dangerous places. However, data packet loses and random delay both in forward communication channel and in backward communication channel can highly degrade the control performance. This paper proposed a novel networked predictive fuzzy control strategy, which can effectively compensate for these kinds of network data packet loses and random delay. Simulations in the control of PEM fuel cell demonstrated the good performance of this method.

SaA02-4 14:30-14:50**System Architecture Design of Supervisory Software for Networked Control Systems**, pp.6-555~6-560Zhu Youzhi Inst. of Automation, Chinese Acad. of Sci.
Zheng Geng Inst. of Automation, Chinese Acad. of Sci.
Liu Guoping Univ. of Glamorgan

The supervisory software makes it possible to monitor the running status of various physical devices which may be geographically distributed among a wide range of areas, thus becomes very useful in fields like the process industry, electrical industry and so on. This paper introduces the system architecture design of the supervisory software which is a part of a practical implementation platform for networked control systems (NCS). Three different architectures of the software are presented. The first one is for small-scale applications in which the supervisory software can communicate with devices directly. The second one is for medium-scale applications within a local area network (LAN) where many users may want to access the system contemporarily. The last one is for large-scale, Internet-wide or web-based applications which offers a further choice and greater conveniences for users.

SaA02-5 14:50-15:10**网络化控制系统及其在火控系统中的应用研究****Networked Control System and Its Application in Fire Control System**, pp.6-561~6-564陈晨 北京理工大学
陈杰 北京理工大学
张娟 北京理工大学

随着网络技术及应用研究的不断发展,在对控制系统进行研究时,需要开发网络环境下的控制理论与方法。网络化控制系统实现了资源共享、减少了系统布线、提高了系统的可诊断性和可维护性。网络化火控系统是防空作战形式不断发展的产物。本文将网络化火控系统看作是一个闭环反馈控制系统,分析了网络化火控系统的组成和体系结构,介绍了各节点的功能与工作过程。由于数据经过网络传输不可避免的带来时延、拥塞等问题,本文阐述了补偿网络时延的必要性与方法,并说明了网络调度算法的目的与手段。对网络化火控系统进行了效能评估,仿真测试结果表明系统的作战效能有所提高。

With development of network technology and applications, it is necessary to develop new theory and method for control systems which operate through data network. Networked control system shares the resource, reduces system wiring and increases the convenience of system diagnosis and maintenance. Renovation of the air defense campaign modality results in networked fire control system. According to closed-loop control system, research on the networked fire control system is performed. Composing and configuration of the networked fire control system is analyzed, and functions and working process of each node is explained. At the same time, the network-induced delay, congestion and other peculiarities of networked control system may degrade the performance of closed-loop system. Necessity and methods of compensating the

network-induced delay is illuminated, and objective and technology of network scheduling is made out. Some simulations of the effectiveness evaluation have done to the networked fire control system and the result of the simulation shows that the effectiveness of the system goes up.

SaA02-6 15:10-15:30**Design and Implementation of Networked Predictive Control Over Wireless IP Networks**, pp.6-565~6-570Dong Zhe Chinese Acad. of Sci.
Liu Guoping Univ. of Glamorgan
Tao Yuegang Chinese Acad. of Sci.

This paper presents a new predictive control scheme for networked control systems. The scheme mainly consists of a control prediction generator with on-line identification, and a network delay compensator. It can overcome random transmission delay and data dropout in both forward and feedback channel without synchronization and delay measurement. The off-line and real-time simulation is detailed. Also, the method is applied to a DC motor control system over wireless IP network. The results demonstrate the performance of the proposed scheme.

SaA03 13:30-15:30 Meeting Room 3

系统理论与控制理论 (2)

System Theory and Control Theory (2)

Chair: Guo Yuqian Nanyang Technological Univ.
Co-Chair: 康宇 中国科学院**SaA03-1** 13:30-13:50**线性系统可区分性的一些性质****Properties on the Distinguishability of Linear Systems**, pp.2-721~2-723

楼红卫 复旦大学

在混杂控制系统的研究中,可区分性扮演着非常重要的角色。但是在现有文献中,关于可区分性的性质的研究还很不深入。我们在本文中给出线性控制系统可区分性的定义和一个充分必要条件。

Distinguishability takes a crucial rule in studying observability of hybrid system. However, properties of distinguishability has not been studied deeply in the literature. We will give a definition of distinguishability of linear control systems and present a necessary and sufficient condition in this paper.

SaA03-2 13:50-14:10**一类二维 Markov 跳跃非线性时滞系统的镇定控制****Stabilization Control for a Class of Two-Dimensional Markovian Jumping Nonlinear Systems with Time-delays**, pp.2-702~2-706赵平 中国科学院
康宇 中国科学院

本文研究了一类二维 Markov 跳跃非线性时滞系统的镇定控制问题,给出了 Markov 跳跃非线性时滞系统解的存在唯一性的一个充分条件,以及系统依概率全局渐近稳定的判别准则。通过构造适当形式的 Lyapunov 函数,采用积分反推方法给出了一类二维 Markov 跳跃非线性时滞系统的无记忆状态反馈控制器。证明了在该控制律的作用下,闭环系统平衡点依概率全局渐近稳定。

In this paper, stabilization control problem for a class of two dimensional Markovian jumping nonlinear systems with time-delays is investigated. A sufficient condition of existence and uniqueness of the solution process to Markovian jumping nonlinear systems is given. And, a criterion for asymptotical stability in probability is obtained. Through properly constructing Lyapunov function and using the backstepping method, a memoryless state-feedback controller is designed. It is shown that the equilibrium of the closed-loop system is globally asymptotically stable in probability.

SaA03-3 14:10-14:30**Mid-frequency Disturbance Rejection of HDD Systems**, pp.4-56~4-60

Guo Yuqian
Wang Youyi
Xie Lihua

Nanyang Technological Univ.
Nanyang Technological Univ.
Nanyang Technological Univ.

In this paper, we investigate mid-frequency disturbance rejection of hard disk drive servo systems. Generalized first-order reset element (GFORE) is proposed and used to construct a reset phase lead controller. The proposed phase lead controller is then used to compensate the phase lag caused by mid-frequency narrow band compensator without changing the gain property of the overall system. At last, the proposed reset compensator is applied to mid-frequency disturbance rejection of hard disk drive systems. Simulation results show that it can provide large open-loop gain around crossover frequency without degrading the transient response.

SaA03-4 **14:30-14:50**
Complete Parametric Approach for Output Regulation Problems of Matrix Second-Order Systems via Full Information Feedback, pp.2-195~2-199

Teng Yu Harbin Inst. of Tech.
Wei Yi-Yin China Aerospace Sci. & Industry Corp.
Duan Guang-ren Harbin Inst. of Tech.

Output regulation problems of matrix second-order systems directly in the matrix second frame work are studied. It is given that the solvability of output regulation problems equals to the solvability of matrix equations. Moreover, complete parametric expressions for feedback gain matrices are established. A numerical example demonstrates the effect of the proposed method.

SaA03-5 **14:50-15:10**
Optimization of Semi-Markov Switching State-space Control Processes for Network Communication Systems, pp.2-707~2-711

Jiang Qi Univ. of Sci. & Tech. of China
Xi Hongsheng Univ. of Sci. & Tech. of China
Yin Baoqun Univ. of Sci. & Tech. of China

Motivated by optimization of network communication systems, this paper presents an event-driven semi-Markov switching state-space control process with hierarchical dynamic architectures. First, the semi-Markov kernel of the switching control process is constructed, and the sensitivity formula for performance derivatives under average criterion is derived. Then, an online optimization algorithm that combines policy gradient estimation and stochastic approximation is proposed. This analytic model is with constructional flexibility and scalability, and the proposed optimization algorithm is adaptive and with less computational cost. Finally, as an illustrative example, the load balancing problem in a streaming media server cluster is formulated and addressed.

SaA03-6 **15:10-15:30**
Robust Tracking of Interconnected Systems with Uncertainties and Delays, pp.2-745~2-747

倪茂林 北京控制工程研究所
李果 北京控制工程研究所

对于变参数时滞互联大系统, 本文给出一种鲁棒跟踪控制器设计方法。时滞可同时存在于系统状态和控制中, 按照本文方法设计的分散控制器, 可以保证系统渐近跟踪预先设定的参考输出。仿真实例验证了方法的有效性。

An approach to the design of robust tracking controllers is proposed for a class of large-scale interconnected linear uncertain systems with time-delays. The systems may contain time-delays in both states and controls. With the decentralized controller, the closed-loop system will asymptotically track the reference output. Numerical simulations have demonstrated the effectiveness of the approach proposed.

SaA04 **13:30-15:30** Meeting Room 4
Complexity and Complex System Theory (2)

Chair: 陈增强 南开大学
Co-Chair: 楚天广 北京大学

SaA04-1 **13:30-13:50**
Movement Control of Multi-Agent System with Multiple Leader Based on Potential Function, pp.2-616~2-619

王莉 南开大学
陈增强 南开大学
刘忠信 南开大学
袁著社 南开大学

提出了一种基于势函数的、能够有效的对具有多 leader 的多智能体系统的运动进行控制的方法。系统的智能体分为 leader 和 follower 两种, leader 智能体能够感知环境信息并受目标的吸引, 而 follower 智能体仅受其邻居信息的影响。为使系统达到预期目标, 本文通过选择适当的与环境 and 目标相关的势函数, 对两种智能体分别设计了控制律, 并进行了稳定性分析和仿真验证。

A new control method based on potential function is presented, which can effectively control the movement of multi-agent system with multiple leaders. The system includes two kinds of agent: leader and follower. Leader has the knowledge about the environment and is attracted by the object, but follower is only affected by the information about the neighbor. To make the system to the anticipation, proper potential functions related to the environment and the object is chosen, and different control law is designed for the two kinds of agents, and stability analysis and simulation are made in the end.

SaA04-2 **13:50-14:10**
Aggregation and Pattern Formation of Multi-Agent Systems, pp.2-606~2-610

Chen Zhifu Peking Univ.
Chu Tianguang Peking Univ.

This paper considers a type of multi-agent systems. The interactions among the individual agents are assumed to be universally repulsive and selectively attractive, so as to realize desired pattern formations in the systems by choosing appropriate coupling topologies. Specifically, it is shown that the system with symmetric couplings always displays convergent dynamics to steady-state formations. Whereas in asymmetric case the system exhibits more complex behavior, such as self-organized oscillations. It is also demonstrated numerically how to arrived at typical formations in a multiagent system by assigning specific form of attractive coupling structures.

SaA04-3 **14:10-14:30**
Swarm Dynamics and Coordinated Control, pp.2-611~2-615

楚天广 北京大学
陈志福 北京大学
王龙 北京大学
谢广明 北京大学

群体行为是自然界和社会中常见的现象, 探讨群体合作行为的机制和工程应用具有重要的意义。本文从系统与控制的角度讨论当前群体动力学与协调控制研究中的基本问题, 评述文献中常见的群体系统模型, 分析群体系统的动态行为和系统关联拓扑结构之间的关系, 以及时变拓扑与连通性、通信时滞、以及外部作用的影响等。给出在非对称耦合、时滞等情况下, 系统的聚集 - 振荡复杂行为的数值仿真结果。

Swarming behavior is ubiquitous in nature and society. It is of both theoretical and practical importance to investigate the underlying principles and mechanism of coordination and cooperation emerging in swarms. This paper discusses the basic issues in this di-

rection in the field of systems and control. We review some swarm models commonly studied in the literature, analyze the roles and effects of connection topology on swarm dynamics, as well as the effects of variable topologies, communication delays, and exogenous influences etc. We also give some numerical simulation results to demonstrate complex aggregation-oscillation behavior of swarms in the cases of asymmetric coupling and delayed communication.

SaA04-4 **14:30-14:50**
A New Method to Enhance the Network Synchronizability, pp.6-377~6-380

Dai Kun Shanghai Jiaotong Univ.
Wang Xiaofan Shanghai Jiaotong Univ.
Li Xiang Shanghai Jiaotong Univ.

In this paper, we propose one method to enhance the synchronizability of complex networks which do not hold the positive correlation between the BC (betweenness centrality) and degree of nodes, and observe other topology characteristics of the network affected by the method. Our numerical simulations prove the method can effectively enhance the network synchronizability. We find the BC of the edge which has the highest BC can affect the network synchronizability.

SaA04-5 **14:50-15:10**
Hopf Bifurcation Analysis in the Lorenz-type System, pp.2-601~2-605

Yang Qigui South China Univ. of Tech.
Liu Mengying South China Univ. of Tech.

Using the first Lyapunov coefficient with precise symbolic computation, Hopf bifurcation analysis of the Lorenz-type chaotic system has been investigated with whole parameter space completely in this paper.

SaA04-6 **15:10-15:30**
An Improved Population-Based Incremental Learning Algorithm, pp.5-741~5-744

张庆彬 燕山大学
吴惕华 燕山大学
刘波 燕山大学

基于群体的增量学习算法 (PBIL) 是一种将遗传算法和竞争学习相结合的新型进化优化算法。本文针对 PBIL 算法仍然存在的问题, 将精英策略引入 PBIL 算法, 提出了一种对当前种群最优解集和至今算法最优解同时进行学习的改进 PBIL 算法。通过对测试函数的实验表明, 改进算法具有比标准 PBIL 算法更好的优化性能。

The Population-Based Incremental Learning (PBIL) is a novel evolutionary algorithm combined the mechanisms of the Genetic Algorithms with competitive learning. In this paper, an elitism-based PBIL algorithm which learns the selected best solutions in current population and the optimal solution found so far in the algorithm at same time is proposed. Experimental results show that the proposed algorithm out-performs the standard PBIL.

SaA05 **13:30-15:30** Meeting Room 5
最优控制与优化 (3)
Optimal Control and Optimization (3)

Chair: 曹卫华 中南大学
Co-Chair: 张荣 重庆大学

SaA05-1 **13:30-13:50**
Optimal Stopping Time and Pricing of Exotic Option, pp.3-456~3-459

Yang Bing Shandong Univ. at Weihai

The purpose of this paper is to develop a general framework to analyze the optimal stopping problem relevant to the exotic option and the game option. In general, the pricing of the American style path-dependent option is equivalent to solving an optimal stopping prob-

lem. We turn the optimal stopping problem relevant to the American style path-dependent option into a constrained nonlinear programming in a infinite dimensional Banach space, and prove that the existence of the optimal stopping time of the optimal stopping problem relevant to a class exotic option (American option, Asian option, lookback option). 1

SaA05-2 **13:50-14:10**
Multi-objective Optimization of Reactive Power Dispatch Using a Bacterial Swarming Algorithm, pp.3-460~3-464

Lu Zhen Univ. of Liverpool
Li Mengshi The Univ. of Liverpool
Tang Wenjia The Univ. of Liverpool
Wu Q. H. The Univ. of Liverpool

This paper presents a novel optimization algorithm for solving reactive power dispatch problem. The problem is formulated as a nonlinear constrained multi-objective optimization problem with real power losses and voltage stabilities to be optimized simultaneously. This problem is handled by a Bacteria Swarming Algorithm (BSA) proposed in this paper. The BSA has been evaluated on an IEEE 30-bus test system and the results demonstrate its capabilities of generating superior solutions to the conventional weighted sum-based methods.

SaA05-3 **14:10-14:30**
Optimal Controls for a Class of Impulsive Systems with Hybrid Quadratic Performance, pp.3-465~3-468

Zhou Yuan Fudan Univ.

In this paper we derived the necessary and sufficient conditions of optimal controls for impulsive systems with hybrid quadratic criterion. The linear time-variant systems we consider have impulsive at some fixed time. We find both open-loop and closed-loop optimal controls. By the solution of impulsive Riccati equation, we find expressions for optimal control, optimal trajectory and optimal value.

SaA05-4 **14:30-14:50**
A Limit Property for the Optimal Control of a Replacement Problem with Maintenance under Uncertainty, pp.3-484~3-488

张荣 重庆大学

Dogramaci 与 Fraiman (2004) 发现了多阶段、不确定环境下设备维护与更新最优控制策略的一个重要性质, 并据此给出了计算其最优控制量的一个十分巧妙的算法。本文证明此最优控制量具有的一个极限性质, 即: 当每个阶段的时间长度趋于无限小时, 此问题的最优控制量不可微。这说明, 无论设备更新多敏捷, D-F 问题的最优控制量与 Kamien 与 Schwartz(1971) 关于单阶段设备维护与更新的最优控制量不一样。

An important property for the replacement decisions with maintenance under uncertainty is found and accordingly, a smart computation algorithm is created to find the optimal solution to the multi-stage optimal control problem (Dogramaci and Fraiman, 2004). This paper gives a proof for a limit property of this optimal control, i.e., the optimal control for the D-F problem is nondifferentiable at the points where the replacement opportunities are available. That is to say, the optimal control of the D-F problem is different from the K-S problem no matter how nimble an organization is.

SaA05-5 **14:50-15:10**
An Optimization Method Based on Integrated Predictive Models and Expert Reasoning Strategies for Mix Proportions in Lead-zinc Sinter, pp.3-489~3-493

王春生 中南大学
吴敏 中南大学

曹卫华

中南大学

摘要: 针对传统铅锌烧结配料方法成本高和准确率低的问题, 提出基于烧结块成分集成预测模型与专家推理策略的烧结配料优化综合集成方法。首先, 在建立专家经验机理模型和神经网络模型的基础上, 利用信息论中熵值的概念, 提出了一种既可保证预测精度又能满足配料计算对数据完备性要求的铅锌烧结块成分预测智能集成模型; 其次, 以成本最小为目标建立烧结配料优化模型, 采用专家推理优化策略和定性定量综合集成方法, 将上述模型综合集成, 从而实现烧结配料的优化, 仿真结果验证了该方法的有效性。

To deal with the problem of high cost and low accuracy existed in traditional methods of lead-zinc sinter mix proportions, a methodology based on integrated prediction models of agglomerate composition and expert reasoning strategies is proposed in this paper. First, based on the expert experience mechanism model and neural network model, an intelligent integrated model is presented to assure the composition prediction precision of Pb-Zn agglomerate and to meet the requirements of the data completeness by blending computation. Then, the sinter proportion optimization model is established with the objective of minimizing the costs. Finally, the proportions are optimized through expert reasoning optimization strategies and an integrated synthesis methodology. The simulation results demonstrate the validity of this methodology.

SaA05-6 **15:10-15:30**

基于鲁棒离散优化建模方法的电梯群控调度策略
On Elevator Group Scheduling Strategy Based on Robust Discrete Optimization Modeling Method, pp.3-507~3-511

宗 群
王维佳
孙志明

天津大学
天津大学
天津大学

本文在对电梯群控调度关键问题的分析基础上提出了基于鲁棒离散优化方法的电梯群控调度策略。阐述了鲁棒离散优化建模和模型转化理论, 并建立起电梯群控调度问题的鲁棒离散优化模型。结合电梯群控虚拟仿真环境, 设计了电梯群控鲁棒优化调度算法, 并进行仿真验证。通过与其他调度算法的比较, 证明了鲁棒离散优化调度算法在不同交通流下具有较强的适应能力。仿真结果表明, 鲁棒离散优化调度方法可以解决交通流预测误差的影响, 很好地改善电梯群控调度性能。

In this paper, we consider the problem of applying Robust Discrete Optimization theory (RDO) on the elevator group scheduling system. The RDO modeling and model transformation theory are discussed. The RDO model of the elevator group scheduling is established via the RDO theory. Utilizing the virtual simulation environment of elevator group scheduling, the RDO scheduling algorithm is implemented. Simulation results are presented to demonstrate the performance of the proposed RDO algorithm. Advantages of this algorithm over other algorithms are also discussed.

SaA06	13:30-15:30	Meeting Room 6
模糊系统与模糊控制 (1)		
Fuzzy System and Fuzzy Control (1)		

Chair: Wang Renming China Three-Gorges Univ.
Co-Chair: 吴 涛 安徽大学

SaA06-1 **13:30-13:50**

Improved Performance of Permanent Magnet Synchronous Motor by Using Particle Swarm Optimization Techniques, pp.4-326~4-330

Wahsh Said Electronics Research Inst.

This paper presents a modern approach of speed control for PMSM using Particle Swarm Optimization (PSO) algorithm to optimize the parameters of the PI- Controller. The overall system simulated under various operating conditions and an experimental setup is prepared. Comparison between different controllers is achieved, using PI controller which is tuned by two methods, firstly manually

and secondly using PSO technique. The system is tested under variable operating conditions. The simulation results showing good dynamic response with fast recovery time and good agreement with experimental one.

SaA06-2 **13:50-14:10**

一种模糊构造性神经网络及其应用
A Kind of Fuzzy Constructive Neural Network and Its Application, pp.4-217~4-221

吴 涛
陈黎伟
毛军军
张 铃

安徽大学
安徽大学
安徽大学
安徽大学

由 Vapnik 等提出的支持向量机 (SVM) 理论, 成功地解决了分类器的构造问题, 对线性可分的二分类样本可由支持向量决定的最优超平面分开, 而对非线性可分的二分类样本, 可通过选择适当形式的核函数和参数, 使其在特征空间中线性可分。但 SVM 方法需要求解二次规划, 对多分类问题, 需要构造 SVM 决策树, 复杂度较高。交叉覆盖算法用超平面切割超球面而成的球形领域作神经元构造神经网络, 分类能力强, 运行速度快, 较好地解决了一些难解问题, 但有覆盖数较多和存在拒识样本的不足。本文在分析 RBF 核函数性质的基础上, 将覆盖算法、模糊集与 SVM 相结合, 给出一种新的构造性神经网络。实例显示与传统分类方法、SVM 方法和一般覆盖网络相比, 这种算法都是高效的。

Support vector machine (SVM) has been studied and applied extensively for its high accuracy, but it must construct SVM decision tree to classify sample sets with multiclass for it just be applicable for binary classification and solve a quadratic programming problem to gain optimal hyperplane either in sample spaces or in feature spaces; Alternative covering algorithm which designs neural networks with spherical domains has the advantages of fast performance, some hard solving problems have been solved using this algorithm. In this paper, a new kind of structural learning algorithm which combining covering design algorithm, fuzzy set and SVM is put forward, instances show that this kind of networks has the virtue of both covering design algorithm and SVM.

SaA06-3 **14:10-14:30**

Active Suspension System Based on LMS Adaptive Fuzzy Algorithm, pp.4-412~4-415

Sun Jianmin Beijing Inst. of Civil Engineering & Architecture
Yang Qingmei Beijing Union Univ.

An adaptive fuzzy control algorithm with rectification factor is brought up. Because the algorithm can adjust the rectification factor of fuzzy controller with the Least Means Squares (LMS) method, it not only can reflect the advantage of fuzzy logic in nonlinearity system but also can improve the disadvantage of common fuzzy control method strongly depending on the experience. Contrasting with common fuzzy algorithm, there is no membership function choice of fuzzy subset for input and output of controller. For vehicle model, vehicle performance in road signal is studied. Its results show the adjustable fuzzy controller can reduce the acceleration of the sprung mass by a factor of 20. According to the experiment study of vehicle model, the results further prove that the algorithm can effectively control the vibration of vehicle system.

SaA06-4 **14:30-14:50**

Delay-dependent LMI Conditions for Stability and Stabilization of T-S Fuzzy Systems with Time-delay, pp.4-416~4-419

Wang Renming China Three-Gorges Univ.
Pan Juntao China Three-Gorges Univ.

This paper studies the stability and stabilization problem for a class of nonlinear continuous models with time-delay through Takagi-Sugeno (T-S) fuzzy model approach. New sufficient conditions for stability and stabilization are presented in terms of LMIs which are based on PDC control laws and matrix translation properties. Illus-

trative examples are given to show the effectiveness and merits of the present result.

SaA06-5 14:50-15:10

基于协同进化算法的焦炉火道温度模糊优化控制

Fuzzy Optimization Control of the Temperature for the Heating Process in Coke Oven Based on Co-evolution, pp.4-420~4-424

雷琪
吴敏

中南大学
中南大学

针对焦炉火道温度控制常用的模糊控制器的设计中,难以获得完善的隶属度函数和规则库的问题,提出了基于协同进化的模糊控制方法。通过对模糊控制参数的分析,确定协同进化算法由两类种群组成:模糊控制规则种群和隶属度函数参数种群,其适应度函数同时考虑模糊控制系统的性能及其解释性,采用两种群合作计算的策略,获得隶属度函数和模糊控制规则,设计了火道温度优化控制器。算法的实际应用效果验证了方法的有效性。

Fuzzy control method is often used in the flue temperature control, but it is difficult to get perfect membership function and rule base. To this problem, this paper present a fuzzy control method based on the co-evolution. Through the analysis of the control parameters, two species including the membership parameter specie and fuzzy rule specie are determined in the co-evolution algorithm. Both performance and interpretability of the controller are considered in the fitness function and cooperative strategy of the two species is used to get the membership function and fuzzy rules and design the flue temperature optimization controller. The application shows that the method is effective.

SaA06-6 15:10-15:30

基于逆系统方法和模糊逻辑的导弹自动驾驶仪设计

Nonlinear Autopilot Design Based on Inversion System and Fuzzy Logic, pp.2-357~2-360

李海军
黄显林
班晓军

哈尔滨工业大学
哈尔滨工业大学
哈尔滨工业大学

本文中将军用自动驾驶仪的性能指标转变为期望特性的形式,基于动态逆系统理论和导弹系统的双时标特性设计了非线性的弹体纵向控制器。进一步选取弹体马赫数为调节变量,设计了基于 Mamdani 型模糊控制器的导弹自动驾驶仪。仿真表明在导弹的飞行包线内,所设计的自动驾驶仪能够满足指标要求,并且在弹体气动参数发生摄动时,系统具有良好的性能鲁棒性。

The design specifications of the missile autopilot can be described by the expected behavior and in this paper one kind of nonlinear longitudinal controller is proposed based on dynamic inversion theory and multi-scales property of missile system. Further more, choosing Mach as a scheduling variable, the autopilot based on a Mamdani fuzzy controller is synthesized. Numerical simulations show the missile autopilot can achieve the performance goals and good robust performance over the whole flight envelope with uncertainty of aerodynamic parameters.

SaA07 13:30-15:30 Meeting Room 7

非线性系统及其控制 (3)

Nonlinear System and Control (3)

Chair: Sun Yimin

Tsinghua Univ.

Co-Chair: Chen Tianshi

Chinese Univ. of Hong Kong

SaA07-1 13:30-13:50

Input-to-state Stabilization of Feedforward Systems with Dynamic Uncertainties, pp.2-385~2-389

Chen Tianshi
Huang Jie

Chinese Univ. of Hong Kong
Chinese Univ. of Hong Kong

This paper studies the disturbance attenuation problem for a class of feedforward systems subject to dynamic uncertainty. Two versions of small gain theorems with restrictions adapted from [Teel, 1996] are employed to establish the global attractiveness and local

stability of the closed loop system respectively.

SaA07-2

13:50-14:10

Attitude Control Based on the Lie-group Structure of Unit Quaternions, pp.2-326~2-331

Han Da peng
Wei Qing
Li Zexiang

National Univ. of Defense Tech.
National Univ. of Defense Tech.
The Hong Kong Univ. of Sci. & Tech.

This paper focuses on a new approach for the attitude control problem. The control laws exploit the Lie-group structure of unit quaternions. Stability analysis relies on an appropriate Lyapunov function. Set point control and tracking control are investigated respectively. Using this approach, not only design and analysis are simplified, but also global approximate exponential convergence is guaranteed. The control laws are demonstrated to be effective by simulation results.

SaA07-3

14:10-14:30

非线性微分代数系统的耗散 Hamilton 实现

Dissipative Hamiltonian Realization of Nonlinear Differential Algebraic Systems, pp.2-452~2-456

刘艳红
李春文

郑州大学
清华大学

基于 Hamilton 函数方法对非线性微分代数系统进行分析 and 综合的关键步骤之一是完成系统的耗散 Hamilton 实现. 本文首先对非线性微分代数系统的常值耗散 Hamilton 实现问题进行研究,给出了常值耗散实现的条件、步骤以及构造方法. 对不能直接完成耗散实现或者耗散实现不具有期望形式的非线性微分代数系统,讨论了通过反馈控制完成 Hamilton 实现的条件,并分析了闭环系统的稳定性。

Hamiltonian function method is important in the analysis and synthesis of nonlinear differential algebraic systems (NDAS), where the key process is to complete the dissipative Hamiltonian realization (DHR) of the considered system. In this paper, we will discuss the DHR problem of NDAS. First, a sufficient condition is given to complete the constant DHR. The construction of constant DHR of NDAS is discussed as well. Then, for NDAS which does not possess a desired DHR, the feedback controller is designed to re-assign the structure of DHR. The asymptotical stability of the closed loop system is also analyzed.

SaA07-4

14:30-14:50

Globally Asymptotical Controllability of Nonlinear Systems, pp.2-347~2-350

Sun Yimin
Mei Shengwei

Tsinghua Univ.
Tsinghua Univ.

In this paper, we will investigate the globally asymptotical controllability for a class of affine nonlinear systems and give their sufficient condition by using the recent developed methods in [1]-[3]. In addition, by two examples, we further illustrate the methods could have more extensive applications.

SaA07-5

14:50-15:10

A Novel Observer-based Output Feedback Sliding Mode Control for Uncertain Discrete-time Systems, pp.4-31~4-35

Li Juntao
Jia Yingmin
Du Junping
Yu Fashan

Beihang Univ.
Beihang Univ.
Beijing Univ. of Posts & Telecommunications
Henan Polytechnic Univ.

This paper is devoted to the problem of output feedback sliding mode control for uncertain discrete-time systems. To this end, a hybrid state and disturbance observer is proposed, and the corresponding observation errors are estimated. Based on the observed states and disturbances, an output feedback controller is designed to achieve quasi-sliding mode, in which the matching and linear boundary conditions for uncertainties are removed. A numerical example is included to illustrate the obtained results.

SaA07-6 **15:10-15:30**

广义下三角非线性系统的自适应输出跟踪
Adaptive Output Tracking of Nonlinear Systems in General Lower-Triangular Form, pp.2-231~2-234

王冰 河海大学
 季海波 中国科学技术大学
 奚宏生 中国科学技术大学

研究一类广义下三角非线性系统的自适应输出跟踪问题。这类系统包括一些重要的下三角形式，并且对下三角结构加以拓展。文中系统分为两种情况：多项式下三角结构和函数下三角结构。应用 Lyapunov 稳定性理论和改进的幂积分方法加以设计，使得闭环系统具有全局稳定性并达到了实际输出跟踪。通过实例和仿真验证了设计方法的有效性。

This paper investigates the problem of adaptive output tracking for a class of nonlinear systems in general lower-triangular form, which not only encompasses some important lower-triangular systems, but also expands the normal lower-triangular form to a more general case. The systems are classified into two cases: polynomial lower-triangular form and function lower-triangular form. Based on Lyapunov stability theory and modified power integrator approach, the adaptive controllers are designed to ensure the global stability property and practical output tracking. Examples and simulations are provided to show the effectiveness of design method.

SaA08 13:30-15:30 Meeting Room 8
 控制设计方法 (3)
 Control System Design (3)

Chair: 刘希民 济南大学
 Co-Chair: 廖力清 中南大学

SaA08-1 **13:30-13:50**

基于 DSP 的飞机防滑刹车交叉双冗余度控制器的设计与实现
Design and Realization of the Digital Aircraft Anti-skid Braking Controller of Crossing Dual Redundancy Based on DSP, pp.6-426~6-429

刘建良 中南大学
 安剑奇 中南大学
 廖力清 中南大学

本文介绍的基于高速嵌入式 DSP 的双冗余度数字电传式防滑刹车控制器可以大幅度的提高飞机防滑刹车控制系统的可靠性和安全性。文章阐述了交叉双冗余度飞机防滑刹车控制器的系统设计思想，冗余度管理方法和硬件系统的实现，并运用马尔科夫模型进行了可靠性与安全性计算。系统刹车效率高，达到了预期的设计目标。关键词：双冗余度设计，防滑刹车，DSP 控制器

Based on the high speed inserted chip of DSP, the digital telex anti-skid controller with dual-redundancy introduced in this essay can significantly improve the present system. This essay expounding this anti-skid brake controller with the crossing dual-redundancy will involve its thought of system design, the management of redundancy and its realization of hardware system. In addition, the Malkof model is used to calculate its security and reliability. This system is efficient for braking, and achieves the anticipated design goal.

SaA08-2 **13:50-14:10**

采用爪极同步发电机和 PWM 整流器的汽车发电系统的高性能控制设计
High-Performance Control Design of Automotive Power Generation System with Claw-Pole Synchronous Generator and PWM Rectifier, pp.6-233~6-236

卢子广 广西大学
 纵葵花 广西大学

近年来，随着汽车电器和电控设备的广泛使用，汽车电负载快速增长。由于输出功率和效率的局限性，目前还被广泛使用的 14 伏爪极同步发电机系统难以满足未来汽车对高效、高输出功率发电系统的需求。

本文在现有爪极同步发电机的基础上，采用 PWM 升压整流器构成一种 42 伏汽车发电系统。变速时调节励磁电流，使发电机定子电势满足升压整流的能控条件。基于磁场定向控制原理，调节与负载匹配的定子电流，实现强抗扰、快响应的直流稳压控制。为减小用于抑制动态电压的滤波电容，提出了负载预估前馈控制策略。所述控制方法已得到实时仿真实验的验证

In recent years, many electronic control systems and electrical driven units are introduced in vehicles and result in steadily increasing electrical loads. A new high-power, high-efficiency alternator system is needed to meet these requirements. Today's 14-V claw-pole synchronous generator is not able to meet the future power requirements due to its inherent design limitations. For this purpose, a claw-pole synchronous generator with pulse-width-modulation (PWM) rectifier regulated at 42-V is proposed in this paper. The ac voltage of the generator is controlled with excitation currents for achieving controllable condition of boost rectifier during varying speed. To improve the suppression of dynamic voltage during load-dump and jump-start charging, the dc output voltage of rectifier is regulated with stator current matching to load based on field-oriented control principle. A load current prediction feed-forward control approach is proposed in order to minimize the dc-link capacitance for compaction of the system. The proposed approaches are evaluated by the real-time simulation experimental results.

SaA08-3 **14:10-14:30**

Tracking of Nonholonomic Control Systems Based on Visual Servoing Feedback, pp.6-459~6-463

Li Qingsong Univ. of Shanghai for Sci. & Tech.
 Wang Chaoli Univ. of Shanghai for Sci. & Tech.
 Niu Wenbin Univ. of Shanghai for Sci. & Tech.

This paper investigated the visual servoing tracking of nonholonomic mobile robots. Nonholonomic kinematic systems with visual feedback are uncertain and more involved in comparison with common kinematic systems. Barbalat theorem and two-step techniques were exploited to craft a robust controller that enables the mobile robot image pose and the orientation tracking despite the lack of depth information and the lack of precise visual parameters. The most interesting feature of this paper is that the problem was discussed in the image frame and the inertial frame, which made the problem easy and useful. The convergence of the error system by using the proposed method was rigorously proved. The simulation was given to show the effectiveness of the presented controllers.

SaA08-4 **14:30-14:50**

一种基于热电偶分度表的线性温度变送装置
A Linear Temperature Transmitter Based on Thermocouples Reference Tables, pp.6-307~6-310

刘希民 济南大学

介绍了一种热电偶线性温度变送装置，该装置由 AD590M、标准电阻、放大器、AD 转换器、数据采集与处理系统、串行输出端口、数码显示、DA 转换及 4 20mA.DC 输出等组成。AD590M 除做冷端温度补偿外还作为电流源，在单片计算机的控制下，经标准电阻提供标准毫伏信号先对放大器进行校准，然后系统对热电偶的热电势采样，经计算获得高精度的热电势值，再根据热电势值的大小查热电偶分度表求取对应的温度值，因此实现了真正意义上的线性化，大大减小了放大器温漂和非线性的影响，不计热电偶测量误差时，在 -100 ° C 1372 ° C 范围内该装置的测量误差为 ± 2 ° C。另外，该装置实现了热电偶全温度分度范围的温度测量。

A temperature transmitter is introduced for linear temperature measurement by using thermocouples. It consists of AD590M, standard resistor, amplifier, AD converter, data sampling and processing system, serial output port, digital display, DA converter, 4-20mA.DC output and so on. AD590M is used as current source in addition to cold junction compensation. Under the control of a single

chip processor, the amplifier is first calibrated with a standard millivoltage signal provided from a standard resistor. Then the system samples the value of thermoelectric power of thermocouples. The highly accurate value of thermoelectric power is obtained via computing. Further, the temperature is obtained by looking into the reference table with the value of thermoelectric power. Therefore, high linearity is implemented; and the impact of temperature-drift and non-linearity of amplifier is greatly reduced. The test error is 2 centigrade in -100 1372 centigrade without considering the error of thermocouples. In addition, the device implements the temperature measuring of full range of reference table.

SaA08-5 14:50-15:10

比利时巧克力系统的低阶控制器设计

Stabilization of the Belgian Chocolate System via Low-order Controllers, pp.3-88~3-92

何冠男 中国科学院
王 龙 北京大学
夏壁灿 北京大学
郁文生 中国科学院

本文研究了 V.Blondel 提出的“比利时巧克力镇定问题”。借助新近发展的不等式定理机器证明的理论与方法,系统地给出了四阶及小于四阶双稳定控制器存在条件下参数 δ 的取值上界。通过对所得可镇定条件引入适当的扰动,得到的控制器数值算例改进了已有文献中的最好结果。

This paper considers the challenging Belgian chocolate stabilization problem posed by V.Blondel. Based on the recent development in automated inequality-type theorem proving, the exact upper bounds for δ which guarantee the existence of bistable stabilizers with order no more than four have been determined. By a suitable perturbation of the obtained stabilizable conditions, a numerical example of fourth-order controller is found, which improves the maximal value of δ proposed in the literature.

SaA08-6 15:10-15:30

基于 Windows Vista 的 TTS 系统实现

Implementation of TTS System Based on Windows Vista, pp.6-400~6-403

肖 志 江南大学
于凤芹 江南大学
李 玉 江南大学

在对微软公司刚推出的新一代操作系统 Windows Vista 及其语音合成模块作了深入的研究后,结合 Windows Vista 的语音 API 和 C# 的类库,用一种分离算法把 TTS 引擎无法识别的专用名词和英文缩写等字符从朗读文本中分离出来,并重新设置其发音,解决了以往的一些算法对特殊字符无法识别问题。该算法充分利用了 Windows Vista 的语音 API 和 C# 的类库,并优化了分离算法的运算效率,编程容易实现,最后举例验证了该算法的优越性。

After thoroughly researched the new generation of operating system Windows Vista promoted by Microsoft and its synthesis module, combining the speech API of Windows Vista with the class libraries of C#, use a kind of separation algorithm to separate the special-purpose term and English abbreviation which the TTS engine can't identify from the recited text, and reset its pronunciation, it resolved the problem which former algorithms are unable to identify the special character. This algorithm has fully used the speech API of Windows Vista and class libraries of C#, it optimized the operation efficiency of the separation algorithm and make the programming realized easily. Feasibility of this algorithm has been verified by some examples finally.

SaA09 13:30-13:50 Meeting Room 9

智能机器人 (1)

Intelligent Robot (1)

Chair: 方勇纯 南开大学
Co-Chair: 马宏绪 国防科技大学

SaA09-1 13:30-13:50

欠驱动两足步行机器人 3D 动态行走控制方法研究

Dynamic Walking Control of Underactuated 3D Biped Robot, pp.5-93~5-98

绳 涛 国防科技大学
王 建 国防科技大学
蔡文澜 国防科技大学
马宏绪 国防科技大学

在平面型欠驱动两足步行机器人的基础上,提出了一种 3D 欠驱动两足步行机器人模型和动态步行控制方法。建立了机器人的复杂动力学模型,通过时不变规划方法对机器人运动进行规划,并通过有限时间收敛控制策略对机器人运动进行控制。仿真实验表明,动态步行渐进收敛于稳定的极限环,控制算法是可行的。分析了步行姿态对行进速度的影响,提出了一种欠驱动两足步行机器人步行速度控制策略并通过仿真实验对算法进行了验证。

A new underactuated 3D biped robot and its control strategy are presented. Hybrid dynamics model is developed and gait is planned using the strategy of time-invariant. By the finite-time nonlinear controller, the robot receives stable dynamic walking. Simulation results show that a stable limit cycle of dynamic walking is achieved, and the control strategy is feasible. Based on the analyses of robot configuration and walking velocity, a method to control the walking velocity is presented and validated by simulation at last.

SaA09-2 13:50-14:10

非完整移动机器人的集合镇定控制

Set Stabilization of Nonholonomic Mobile Robots, pp.2-497~2-501

杨 杰 东南大学
李世华 东南大学

传统的关于非完整系统的镇定控制器都是使得闭环系统被镇定到一个目标点。本文针对非完整移动机器人的运动学模型,提出了一种集合镇定控制的设计方法,提出的控制律使得闭环系统渐近稳定于一个目标点集。首先,对一阶旋转角子系统,设计一种状态反馈控制律,使得该一阶闭环子系统渐近稳定于目标点集;其次,对二阶平面质心坐标子系统,设计一种状态反馈控制律,使得该二阶闭环子系统渐近稳定于零。仿真结果表明了该方法的有效性。

Conventional stabilizing controllers for the nonholonomic systems stabilize the closed loop system to a target point. In this paper, considering the kinematic model of nonholonomic mobile robots, a design approach based on set stabilizing control is proposed. The proposed control laws can stabilize the closed loop system asymptotically to a set of given target points. First, for the one-order subsystem of the heading angle, a state feedback control law is designed to guarantee that the state of the closed loop subsystem is asymptotically stabilized to a set of target points. Second, for the second-order subsystem of the planar coordinates of the mass center, a state feedback control law is designed to guarantee that the states of the closed loop subsystem are both asymptotically stabilized to zero. Simulation results show the effectiveness of our method.

SaA09-3 14:10-14:30

一种基于 2D 单应矩阵的摄像机标定方法

A Camera Calibration Method Based on 2D Homography, pp.5-113~5-117

张雪波 南开大学
方勇纯 南开大学
马博军 南开大学

本文提出了一种基于 2D 单应矩阵来进行摄像机标定的方法,该方法首先把摄像机内参数分解为两部分,然后分别利用最小二乘法求解。与通常的标定方法相比较,本文提出的方法可以得到更好的初始条件,因此能够有效地提高非线性优化的计算效率和精度。针对镜头的径向畸变,本文根据具体的应用背景,提出了两种目标函数来进行非线性优化,进而得到了两组不同的畸变系数,前者适合于从已知三维信息来求解二维信息,而后者则更有利于实现从图像信号中提取

三维信息。最终通过仿真和实验结果验证了此方法的有效性。

In this paper, a new method for camera calibration is presented based on 2D homography. First, intrinsic parameters are separated into two parts which are then solved out respectively using the least squares method. Compared with other techniques, the proposed method can obtain a much better initial guess which will subsequently improve the efficiency of the nonlinear-optimization algorithm and the precision of the final result. For the convenience of different applications in practice, two objective functions are proposed for nonlinear optimization, and correspondingly, two different kinds of radical distortion coefficients are obtained. While the former is well suited to infer 2D image coordinates from 3D information, the latter is more helpful to obtain 3D information from 2D image signals. Simulation results are provided to demonstrate the superior performance of the method.

SaA09-4 14:30-14:50

一种新型排水管道检测机器人研究

On a New Detecting Robot in Sewer Pipe, pp.5-189~5-192

杨清梅

北京联合大学

孙建民

北京建筑工程学院

对排水管道进行检测可获得排水管道当前的状况信息,这是保证排水管道经济可靠地正常运行和减少各种排水管道阻塞和泄漏事故发生的关键。通过对国内外的排水管道机器人的研究现状分析,提出了一种新型排水管道检测机器人方案。该排水管道检测机器人是一种用于城市主排水管道检测的自动化检测装置,可携带 CCD 视觉系统和其它的检测排水管道的传感器。该机器人包括机器人的机械本体、视觉监控控制装置和检测控制系统等。机器人的电机驱动采用了数字 PID 算法,设计了机器人的电机驱动控制系统的控制硬件和软件。

The information of sewer underground can be received by detecting sewer. It is a key for ensuring that sewer pipe can normally run and decrease some accidents such as drainpipe barrage leakage and so on. According to the analysis of status on robot in sewer and drainpipe detecting technology, a new sewer detecting robot is put forward. It is a automatic equipment used in sewers for d detecting sewer. The robot can take CCD visual sensor and other sensors so that it can detect objections of sewer pipe such as crackles, corrupts to avoid the accidents of leak, block and so on. It consists of mechanical structure, measurement system, control system and CCD system. The hardware and software on drive system of the sewer detecting robot are designed. The digital PID algorithm is applied in motor drive system of the sewer detecting robot.

SaA09-5 14:50-15:10

Constraints Analysis in the Motion Control Process of Parallel Robots, pp.5-123~5-127

Guo Sheng

Beijing Jiaotong Univ.

FANG Yuefa

Beijing Jiaotong Univ.

Huai Chuangfeng

Beijing Jiaotong Univ.

In this paper, how to analyze the constraints in the motion control process is presented. The idea of platform singularity in the design configuration is presented. The constraints acting on the platform provided by all limbs are analyzed in view of their linear association relationship to judge the platform's moving characteristic. According to the different result of platform's moving situation caused by constraints' linear association, we classify them into two types. The one may cause platform singularity in the design configuration and destroy the rightness of the design. On the opposite side, linear associated constraints may form a new over-constrained parallel robot. Finally, we present a serial of regulations to guide designers how to rightly analyze constraints in the motion control process, based on the analysis, the right control algorithm may be designed respectively.

SaA09-6 15:10-15:30

基于 SPF 模型的闭链机构自适应控制

Adaptive Control of Closed Kinematics Chains Based on Singularly Perturbed Formulation, pp.5-128~5-132

吴爱玲

济南大学

王中华

济南大学

周志群

济南大学

含有闭链的并联机器人动力学模型通常由微分-代数方程描述。在这类机器人系统的传统控制方法中,往往需要采用诸如牛顿迭代等数值方法对非独立坐标进行求解,不利于实时控制。本文考虑机器人惯性参数的不确定性,提出一种基于奇异摄动模型的自适应跟踪控制方法。这种方法将对原系统微分-代数方程的控制转换为对人造奇异摄动模型的控制,从而使算法易于实施。运用 Lyapunov 理论证明了这种控制器能够保证渐近轨迹跟踪。仿真结果表明了该方法的有效性。

The dynamics of parallel robots containing closed kinematics chains (CKCs) are usually described by differential-algebraic equations (DAEs). For the sake of control this type robot, the conventional control schemes usually rely on solving nonlinear algebraic constraint equations to obtain the dependent coordinates using the Newton-type iterations, this is not applicable to real-time implementation. In this paper, a novel adaptive control approach to the control of CKCs considering the inertia parameters uncertainties is proposed based on singularly perturbed model. This method transfers the control of the original DAEs to the control of an artificially created singularly perturbed system and can be conveniently implemented. The scheme is shown using Lyapunov theory that asymptotic trajectory tracking can be achieved. Simulation results of an illustrate example are given to demonstrate its efficacy.

SaA10 13:30-15:30 Meeting Room 10

信息处理系统 (1)

Information Processing System (1)

Chair: 吕金虎

中国科学院

Co-Chair: Liu Lin

Beijing Jiaotong Univ.

SaA10-1 13:30-13:50

自校正分量解耦信息融合 Kalman 平滑器

Self-tuning Decoupled Component Information Fusion Kalman Smoother, pp.5-303~5-307

高媛

黑龙江大学

张鹏

黑龙江大学

贾文静

黑龙江大学

邓自立

黑龙江大学

对于带未知噪声方差的多传感器系统,用相关方法提出了噪声方差的在线估值器,进而基于 Riccati 方程和对分量按标量加权最优融合规则,提出了自校正解耦融合 Kalman 平滑器,实现了分量解耦融合估计。并提出了自校正融合器按实现收敛的新概念。用动态误差系统分析方法,证明了自校正融合 Kalman 平滑器按实现收敛于最优融合 Kalman 平滑器。一个 3 传感器跟踪系统的仿真例子说明了其有效性。

For the multisensor systems with unknown noise variances, an on-line noise variance estimator is presented by using a correlation method. According to the ergodicity of the sampled correlation function, it is proved that the estimation of noise variances is consistent. Based on the Riccati equation and optimal fusion rule weighted by scalars for components, a self-tuning decoupled fusion Kalman smoother is presented, which realizes a decoupled fused estimation for state components. By using the dynamic error system analysis (DESA) method, it is proved that the self-tuning fusion Kalman smoother converges to the steady-state optimal fusion Kalman smoother in a realization, so that it has the asymptotic optimality. A simulation example for a tracking system with 3-sensor shows its effectiveness.

SaA10-2 13:50-14:10

装卸桥调度问题及其混合智能优化算法 GASA

The Crane Scheduling Problem and the Hybrid Intelligent Optimization Algorithm GASA, pp.6-92~6-96

孙俊清
李平
韩梅

天津理工大学
天津理工大学
天津理工大学

在集装箱港口的运作中, 装卸桥调度对港口的运作效率起着至关重要的作用。本文提出了改进的港口装卸桥调度问题的数学模型, 应用混合智能算法 GASA 和遗传算法 GA 分别对模型的仿真数据实例进行了求解, 并对其求解结果进行了分析。由仿真数据实例的求解结果分析可知, 与遗传算法相比, 混合优化策略 GASA 增加了种群多样性, 加速了进化过程, 能有效避免陷入局部极小解。

In the operations of the container ports, quay crane scheduling is critical to the operational efficiency of a container terminal. In this paper we present an improved model for the quay crane scheduling problem and solve this mix integer programming model by the genetic algorithm GA and the hybrid intelligent optimization algorithm GASA respectively. Compared with the genetic algorithm, the hybrid intelligent optimization algorithm GASA increases the diversity of the individuals, accelerates the evolution process and avoids sinking into the local minimal solution.

SaA10-3 **14:10-14:30**
Vibration Control of Vehicle-bridge Dynamic Interactive System, pp.6-21~6-25

Wu Wei
Liu Lin

Beijing Jiaotong Univ.
Beijing Jiaotong Univ.

The vehicle-bridge system is simplified as a moving oscillator traversing a 1D elastic distributed parameter continuum. The control device is placed in parallel with spring and dashpot elements that comprise the suspending part of the vehicle. Three different control schemes are investigated, namely active control, semi-active control using ideal controllable damper and semi-active control using MR damper. The control objective is to suppress both the acceleration of vehicle and the deflection of bridge. The clipped optimal controller tracing the active optimal control law is selected for the semi-active cases. For the MR damper, an experimentally verified dynamic model is adopted, and the model can inversely predict the command voltage applied on the damper for control purpose. Numerical results indicate that the control efficiency is highly dependant on the initial condition of the vehicle, and the two semi-active dampers can well approach the performance of active control.

SaA10-4 **14:30-14:50**
高阶蔡氏电路及其 FPGA 实现
High Order Chua's Circuit and Its FPGA Realization, pp.6-409~6-413

禹思敏
吕金虎

广东工业大学
中国科学院

基于一个典型的三阶蔡氏电路, 通过在其电感支路中串入一个由负电阻、电容、电感和电阻组成的型子电路, 本文构建出五阶、六阶和七阶蔡氏电路。基于数字化处理技术, 通过对系统的连续时间状态方程进行离散化处理和变量比例变换, 我们进一步用 FPGA 技术硬件实现高阶蔡氏电路中的混沌吸引子。本文以七阶蔡氏电路为例, 提出了用 FPGA 技术产生混沌吸引子的一般设计原理并给出了其硬件实现的途径。上述结果为复杂高阶电路系统的设计与实现提供了一条切实可行的途径。

Based on a typical three order Chua's circuit, we constructed the five, six and seven order Chua's circuits by adding a PI-type sub-circuit in its inductance subcircuit. The PI-type subcircuit consists of negative resistors, resistors, capacitances, and inductors. Moreover, based on the digital processing technology, we further physically realize the generating chaotic attractors by discretizing the state equation of continuous time, ratio transformation of variable, and field programmable gate array (FPGA) approach. Furthermore, we propose a general design principle of FPGA technology for chaos generation. As an example, the seven order Chua's circuit is de-

tailedly analyzed and the experimental results are given. These results provide a practical route of the design and realization for the general complex high order circuit systems.

SaA10-5 **14:50-15:10**
Optimization Design on Sensing Field of Electromagnetic Tomography, pp.5-386~5-390

Xue Yixuan
Zhao Shu
Dong Feng

Tianjin Univ.
Chinese Acad. Medical Sci.
Tianjin Univ.

Electromagnetic tomography (EMT) is one kind of tomography based on electricity sensing principle. It can reconstruct spatiotemporal distributions of the electrical conductivity and magnetic permeability materials by detecting the boundary magnetic induction of the researched space. Sensor array of EMT system has the advantages of non-invasive, non-contacting and non-hazardous and has many potential applications in industrial fields. This paper presented the fundamental principle of EMT and studied the sensing field of sensor array using the Finite element (FEM) simulation. The magnetic induction distribution of the sensing field with this excitation model has been acquired. The influence of objects with different permeability, conductivity, and positions on the excitation sensing field was analyzed. The results were verified by image reconstruction experiment.

SaA10-6 **15:10-15:30**
基于向量空间模型的信息安全审计系统
Information Audit System Based on Vector Space Model, pp.5-359~5-362

喻飞
夏晓燕
吴蓉晖
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苏州大学
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信息安全审计系统智能性研究是目前信息安全领域的研究热点, 其中模式识别及数据挖掘等技术在信息安全审计上的应用得到了广泛的关注。本文在传统向量空间模型的基础上, 实现了基于 N 层向量空间模型, 并对其进行了理论分析和实验测试, 实验结果表明, 利用该模型实现的信息安全审计系统, 其查准率与查全率都有所增加, 与传统向量空间模型分类算法相比有更好的性能。

At Intelligent Methods for information audit system is hot spot in the field of network security, and application of pattern recognition and data mining in information audit system is world widely concerned and worldwide studying. This paper introduces some improvements of the Vector Space Model algorithm based on an advanced research on current algorithm. The results of our experiments prove that it promotes the precision of text categorization.

SaA11	13:30-15:30	Meeting Room 11
建模、辨识与信号处理 (3)		
Modeling, Identification and Signal Processing (3)		
Chair: Hu Yueming		South China Univ. of Tech.
Co-Chair: 宋其江		中国科学院

SaA11-1 **13:30-13:50**
一类连续不确定动态系统的鲁棒融合滤波器设计与性能分析
Design and Performance Analysis of Robust Fusion Filters for a Class of Continuous Uncertain Dynamic Systems, pp.3-301~3-305

孙航
刘荣利
文成林

杭州电子科技大学
杭州电子科技大学
杭州电子科技大学

研究不确定多传感器动态系统的鲁棒融合滤波器设计问题, 拟将传统的鲁棒滤波理论与常用数据融合技术相结合, 基于参数依赖 Lyapunov 函数, 探讨了一种鲁棒 H2 融合滤波器的设计方法。在研究滤波器鲁棒性和对其进行求解的基础上, 通过仿真实例比较多传感器动态系统的鲁棒融合滤波器的性能, 结果表明, 该融合算法对于解决当

系统模型存在参数不确定性时的滤波问题有更好的鲁棒性能。

The design problems of robust fusion filters for uncertain multi-sensor dynamic systems are dealt with by means of combining the traditional robust theory and data fusion technology. In terms of parameter-dependent Lyapunov function, a kind of design methods robust H2 fusion filters are discussed. Based on the research for the robustness of the filter and its resolvent, the performance of the robust fusion filters for the multi-sensor dynamic systems is compared by simulation example. Simulation results show that the proposed design method have a better robust performance for the filter problems when parameter uncertainties exist in the system model.

SaA11-2 13:50-14:10

基于变量聚类 和 PCA 的神经网络在碳分分解率预测中的应用研究
On Neural Network Based on Variables Clustering and PCA for Prediction of Carbonation Precipitation Ratio, pp.3-217~3-221

王晓丽 中南大学
阳春华 中南大学
桂卫华 中南大学

铝酸钠溶液的连续碳酸化分解末槽分解率直接影响着氧化铝的产量和质量,然而,分解过程具有多重大滞后、严重非线性和变量间耦合等特点,使得末槽分解率控制困难。本文详细分析了连续碳酸化分解过程中,影响末槽分解率的各种因素,建立了基于变量聚类和一种改进的主成分分析 (PCA) 的神经网络末槽分解率预测模型。模型首先对影响末槽分解率的因素进行变量聚类和主成分分析,对所有影响因素进行分层构权重组,再将分析结果用于神经网络的输入,最终得到末槽分解率。对模型的验证结果表明,该模型泛化能力较强,具有较高的准确度,实用性好。

The last trough's precipitation ratio in the process of continual carbonation precipitation of sodium aluminate solutions determines the outputs and their quality. Because of the characters of multiple time-delay, nonlinear and variables-coupling in the process, it's difficult to control the ratio. The paper analyzes the factors which influence the ratio of the last trough in the process in detail. A neural network prediction model based on variables clustering and PCA is established. The variables are clustered by variables clustering analysis at first, then every sub-cluster was reorganized by PCA. And results of PCA were used as the inputs of BP neural network. Finally, precipitation Ratio of the last trough is got. The model was validated, and the results show that the model possesses higher accuracy and practicability.

SaA11-3 14:10-14:30

车辆燃油波动模型分析及滤波方法研究
An Approach to Fluctuation Modeling and Filter Design of Vehicle Oil Tank, pp.3-232~3-236

尹海 哈尔滨工业大学
刘志远 哈尔滨工业大学

本文对燃油波动建模方法进行了讨论,给出了两自由度燃油动态特性的状态空间描述,为分析简化和便于滤波器设计,进而探讨了通过俯仰角近似获取燃油垂直方向波动的计算方法。本文在燃油波动模型中将路面分解为确定性路面干扰和随机路面干扰,可有效分析不同路面对燃油波动的影响。结合典型的波动路面,本文给出了对油位传感器测量结果的滤波要求和滤波器设计方法。仿真和实验结果表明,本文给出的方法是有效的。

The fluctuation model of vehicle oil tank is discussed and the description of the two-degree fuel dynamics characteristics in state space is presented in this paper. In order to simplify analysis and design, the approximate calculation of the oil fluctuation in the vertical direction based on pitch angle is addressed. Farther the road disturbances are divided into certain and random disturbance, resulting in efficiently analyzing the effects of different road conditions on oil fluctuation. Based on the typical road, the filter requirement and design method of oil data are given. Simulation and experiment

results show that the fluctuation model and filter design method proposed in this paper are effective.

SaA11-4 14:30-14:50

Modeling and Analysis of SMT Motion Control System, pp.3-237~3-240

Zhang Yachen South China Univ. of Tech.
Hu Yueming South China Univ. of Tech.
Yuan Peng South China Univ. of Tech.

This paper addressed the model of the four-degree-of-freedom control system of SMT. Undesirable uncertainties are introduced and considered to improve the proposed model. Experiments, simulations and analysis give more understanding in this model.

SaA11-5 14:50-15:10

基于因果聚类的多变量时间序列相关性研究及预测
Multivariate Time Series Correlation Extract and Prediction Based on Cluster, pp.3-187~3-191

韩敏 大连理工大学
李德才 大连理工大学

基于常规的聚类分析,本文提出一种改进的多变量降维方法。该方法主要在变量间相似程度的判别标准方面进行改进,根据预测变量同预测对象间的相似性,并同时考虑距离因素同相关系数对相似性程度的影响,更加合理的对变量进行分类。在此基础上,对各类中的变量加权求和,作为预测模型的输入,实现多元时间序列的预测。采用本文方法对三门峡处径流量进行预测,并同基于常规聚类方法的预测结果进行比较,仿真结果证明了本文方法的有效性。

Based on general cluster method, this paper introduces a improved multivariate reduce dimension method. This method improves on the aspect of similar extend of multivariate variables, classifies variables more reasonable. Based on result of this classification, and uses it as the input of neural network, implement prediction for multivariate time series. Applying the method in this paper predict runoff yield of Yellow river, simulation results shows that compared to the prediction based on general cluster method, the method introduced in this paper behaves more effectively.

SaA11-6 15:10-15:30

量测噪声为 ARMA 的变量带误差系统的辨识
Identification of Errors-In-Variables Systems with ARMA Measurement Noises, pp.3-292~3-295

宋其江 中科院系统所
陈翰馥 中国科学院

文章研究了单输入单输出、量测噪声为 ARMA 的变量带误差 (EIV) 系统的辨识问题。利用 iid 输入得到了对 EIV 系统参数的递推估计,并证明了估计是强一致的。在文章结尾给出一个仿真例子,仿真结果与理论一致。

The paper concerns identification problem of the single-input single-output errors-in-variables (EIV) systems with ARMA measurement noises using iid input. Recursive estimates are given for parameters of EIV systems. The strong consistency of the recursive algorithms is proved. A simulation example is provided, which justifies the theoretical results.

SaB01 15:45-17:45 Meeting Room 1

Invited Session: Recent Advances in Control of Automotive Systems
Chair: Shen Tielong Sophia Univ.
Co-Chair: Liu Kang-Zhi Chiba Univ.

SaB01-1 15:45-16:05

A Nonlinear Semiactive Rear Differential Control in Rear Wheel Drive Vehicles, pp.6-597~6-602

Riccardo Marino Univ. of Rome Tor Vergata
Scalzi Stefano Univ. of Rome Tor Vergata
Cinili Fabio Univ. of Rome Tor Vergata

Many vehicle control systems are based on the yaw rate error to

help the driver during oversteer and understeer conditions. The control systems usually operate on brake pressures distributions such as ESP and/or on active steering control (front and rear steering control). The main contribution of this paper is to show that vehicle dynamic performance can be improved by an electronically controlled semiactive rear differential which is based on yaw rate and rear wheel speed measurements. A nonlinear first order reference model for the yaw rate and for the rear wheels speed difference dynamics driven by the driver steering wheel input is employed. The controlled system shows new stable cornering manoeuvres and enlarged stability regions; moreover safety is increased in emergency conditions in which the driver does not react to a sudden external disturbance, since the regions of attraction are enlarged by feedback. The activation of the control law is based on Lyapunov techniques. Several simulations are carried out on a standard small SUV CarSim car model to confirm the analysis and to explore the robustness with respect to unmodelled dynamics such pitch, roll and nonlinear combined lateral and longitudinal tire forces according to combined slip theory.

SaB01-2 16:05-16:25

Efficient Engine Development Using Model Based Development (MBD), pp.6-603~6-607

Junichi Kako Toyota Motor Corporation
Soejima Shinichi Toyota Motor Corporation
Ohata Akira Toyota Motor Corporation

Currently, almost all automotive and supplier companies are trying to expand Model Based Development (MBD) [1] [2] [3] [4] for control system development. Conventional development processes depend heavily on actual engine and vehicle testing, which means that control logic design can not start before the hardware is completed. And when performance is not sufficient, hardware and control design iteration is required. To shorten the development period, concurrent development of hardware and software is effective. Moreover, the control logic complexity is becoming higher in accordance with the implementation of new sensors, actuators, and improved control system performance. In turn, this increased complexity results in a huge control logic parameter calibration task. Various studies that use modeling to reduce calibration measurements have been tried. To expand MBD throughout our development process, we require that models are developed in a rapid and timely manner. In this paper, we discuss the concepts of MBD and concurrent development, and introduce some example applications. We also describe some key points for efficient model development.

SaB01-3 16:25-16:45

Automatic Parking Benchmark Problem: Experimental Comparison of Nonholonomic Control Methods, pp.6-608~6-612

Horii Masaki Chiba Univ.
Liu Kang-Zhi Chiba Univ.

This paper presents several experimental results for typical non-holonomic control methods. Although numerous nonholonomic control methods have been proposed, few is known about the advantages and disadvantages of each method. So in this paper an automatic parking system is used as a benchmark to test several typical nonholonomic control approaches experimentally. The emphasis is put on the applicability and control performance.

SaB01-4 16:45-17:05

Experimental Analysis and Control-Oriented Modeling for Cyclic Variation of Cylinder Pressure in IC Engines, pp.6-613~6-617

Li Po Wuhan Univ.
Shen Tielong Sophia Univ.
Oguri Yasufumi Sophia Univ.

Cyclic variability control is the essential way for torque generation

balance, which is an important index when engine works in the steady mode. This paper proposes an idea for indirectly balancing cyclic variability by keeping cylinder pressure of fixed crank shift degree at its nominal value. Ignition time is chosen as the actuator after sensitive analysis is executed, and the dynamics from spark advance to cylinder pressure at the given crank shift degree is modeled, parameters are identified by using least variance algorithm, an simulation for this model is established and the PI control validated by this simulation is tested by experiments too.

SaB01-5 17:05-17:25

Nonlinear Feedback Speed Control of Internal Combustion Engines, pp.6-618~6-622

Zhang Jiangyan Yanshan Univ.
Shen Tielong Sophia Univ.
Junichi Kako Toyota Motor Corporation
Jiao Xiaohong Yanshan Univ.

In this paper, the engine speed control problem formulation is motivated from realistic engineering performance requirements and practical implementation considerations. For an actual internal combustion (IC) engine, based on Lyapunov theory, two simple nonlinear feedback controllers are constructed by using engine system physical characteristics to ensure system stability, and then, the extension for the basic idea using switching boost action is developed to improve system response ability, and the benefit is also discussed from analytical point of view. Experimental results are given to verify the performance of the proposed strategies.

SaB01-6 17:25-17:45

A Model Predictive Control Method for A High-speed Magnetic Actuator, pp.6-623~6-626

Mukai Masakazu Kyushu Univ.
Seikoba Suguru Kyushu Univ.
Kawabe Taketoshi Kyushu Univ.

This paper considers a novel model predictive control method for a high-speed magnetic actuator. The actuator consists of two opposing electromagnets and an armature is suspended between them. The armature reciprocates between the two magnets. The armature is suspended by the springs with a large spring rate, enabling it to move at high speed. A difficulty is that push-pull control force for the armature is not available from the electromagnets. Additionally, magnetic force is effective only when the armature is very close to the pulling magnet. To overcome those difficulties, we propose a controller using model predictive control method with a fixed compensator. Based on optimality, the model predictive controller generates a target trajectory with searching for the terminal time, and a fixed compensator is attached in order to improve robustness drastically.

SaB02 15:45-17:45 Meeting Room 2

Invited Session: Quantum Control and Quantum Information

Chair: 丛爽 中国科学技术大学
Co-Chair: 李春文 清华大学

SaB02-1 15:45-16:05

Reinforcement Strategy Using Quantum Amplitude Amplification for Robot Learning, pp.6-571~6-575

Dong Daoyi Chinese Acad. of Sci.
Chen Chunlin Nanjing Univ.
Li Hanxiong City Univ. of Hong Kong

Quantum amplitude amplification is a kind of useful technique in quantum computation and it can boost the success probability of some quantum algorithms. Reinforcing strategy in reinforcement learning is essentially to boost the selection probability of "good" action. Considering the common characteristics, this paper uses the idea of amplitude amplification to reinforcement learning as a

new reinforcement strategy, proposes a learning algorithm based on quantum amplitude amplification and demonstrates its effectiveness through simulated experiments.

SaB02-2 16:05-16:25

基于 Bloch 球的量子系统状态演化的轨迹控制

Track Control of the States Evolution of Quantum System Based on Bloch Sphere, pp.6-576~6-580

楼跃升
丛爽

中国科学技术大学
中国科学技术大学

基于单量子比特的 Bloch 球表示, 对控制场的作用进行分析, 针对两种不同的要求, 给出外加控制场参数需要满足的条件, 以实现任意单量子位初态到终态之间的演化, 并采用 Bloch 球进行了系统数值仿真实验, 得到演化路径在 Bloch 球上的表示, 得到演化路径的长短与控制场的不同条件与参数的关系。

The effect of control fields is analyzed based on Bloch sphere representation of a single qubit, the conditions which parameters obey are given under two different requirements in order to achieve the transition from an arbitrary initial state to a target state, and numerical simulation is also done to get the track of evolution on Bloch sphere. The relationship between the parameters and the track is analyzed.

SaB02-3 16:25-16:45

操控多个量子位系统的“代价”分析

Cost Analysis of Manipulating Multiple Qubit Systems, pp.6-581~6-585

张明

国防科学技术大学

对于多量子位系统而言, 系统维数随量子位个数的增长而呈指数增长的, 那么操控多量子位系统的资源代价是否也随量子位个数的增长而呈指数增长呢? 最近的研究发现: 当只允许实施单量子位物理操作和双量子位相互作用物理操作时, 也仅需要 $n(n+3)/2$ 个控制哈密顿即可保证 n -量子位系统是可控的; 而制备多个量子位的 GHZ 纠缠态的最小资源代价也只随量子位个数的增长而线性增长。我们一定程度上可以乐观地预期: 操控多量子位的代价是可以承受的。

For a multiple qubit system, the dimension of the system is exponentially large in the number of qubits, one may ask whether the cost of manipulating multiple qubit systems is exponentially large in the number of qubits or not? It has been found that only $n(n+3)/2$ control Hamilton will guarantee open-loop controllability of n -qubit systems when only single qubit operators and two-qubit-interactive operators are permitted. Further more, the minimum cost of deterministically generating multiple qubit GHZ entangled state will be at most linearly large in the number of qubits. To some extent, one may predict that the "cost" of manipulating multiple qubit systems is tolerable.

SaB02-4 16:45-17:05

Performance Comparison Between Classical and Quantum Control for a Simple Quantum System, pp.6-586~6-588

Xi Zairong

Chinese Acad. of Sci.

Brańczyk et.al pointed out that the quantum control scheme is superior to the classical control scheme for a simple quantum system using simulation. Here we strictly prove the result from mathematical view.

SaB02-5 17:05-17:25

基于状态转移矩阵的薛定谔方程的解

Solution of Schrödinger Equation Based on State Transition Matrix, pp.6-589~6-591

邢艺凡
肖钦文
储迪阳
孙喜策
吴俊

浙江大学
浙江大学
浙江大学
浙江大学
浙江大学

本文在系统地讨论了归一化、算符矩阵化的基础上, 进一步采用状态

转移矩阵的方法, 给出了定态、非定态薛定谔方程的求解公式。不同于量子信息中本征态的矩阵表示, 本文给出了叠加态的矩阵求解原理, 为如何将控制的手段运用于量子系统中提供了理论依据。

Based on the systematic discussion of normalization and the matrix representation of operator, we use state transition matrix to derive the solutions for stationary and non-stationary Schrödinger equation. Unlike the matrix representation of eigenstate in quantum information, this paper presents a matrix solution theory for superposition state, and provides a theoretical basis for applying the means of control to quantum systems.

SaB02-6 17:25-17:45

SU(1,1) 型双输入量子系统能量最优控制

Energy Optimal Control for Two-input Quantum System Evolving on the Lie Group SU(1,1), pp.6-592~6-596

吴建武
李春文
张靖

清华大学
清华大学
清华大学

- 基于极大值原理, 讨论了在李群 $SU(1,1)$ 上演化的量子系统的能量最优控制问题, 针对正常极值和非正常极值两种不同情形, 分别给出了双输入时最优控制的解析表达式。所研究的系统是一类在非紧李群上演化的典型量子系统, 可用其来描述大量实际物理问题。

In this paper, we consider the energy optimal control problem for the class of quantum systems evolving on $SU(1,1)$. Analytic solutions are provided for the two-input case with respect to both normal and abnormal extrema. The involved dynamic model is widely used to describe physical problems in quantum theory.

SaB03 15:45-17:45 Meeting Room 3

系统理论与控制理论 (3)

System Theory and Control Theory (3)

Chair: 王国胜
Co-Chair: Zhao Hongguo

装甲兵工程学院
Shandong Univ.

SaB03-1 15:45-16:05

二阶动力学系统的全维 PD 观测器设计

Design of Full-order PD Observers for Second-order Dynamic Systems, pp.2-5~2-8

王国胜
刘峰
梁冰
段广仁

装甲兵工程学院
装甲兵工程学院
哈尔滨工业大学
哈尔滨工业大学

本文考虑了二阶动力学系统的全维比例微分 (PD) 观测器设计问题。基于一类广义 Sylvester 矩阵方程的解, 提出了二阶动力学系统的全维比例微分观测器设计参数化方法。该方法给出了该类观测器的增益矩阵和左特征向量矩阵的参数化表达式, 其所含参数除了满足两个约束条件之外是完全自由的。这些参数为控制系统设计提供了全部自由度, 可通过优化等手段适当选择这些参数来满足某些性能要求, 如干扰解耦、LTR 和鲁棒性等。此外, 该观测器设计的参数化直接基于二阶动力学系统的参数矩阵, 不涉及二阶动力学系统的变换或增广, 表明了所提观测器设计方法的简单有效性。

The design of full-order proportional plus derivative (PD) observers in second-order dynamic systems is investigated in this paper. Based on the solutions to a so-called generalized Sylvester equation, a parametric method to solve this design problem is proposed. This method presents the parametric expressions for the gain matrices and the left eigenvector matrix of the full-order PD observers. These parameters included in this method offer all the design degrees of freedom, which can be further utilized to satisfy certain specified performances, such as disturbance decoupling, LTR and robustness. In addition, this method utilizes directly the original system data and involves manipulations only on n -dimensional matrices. An illustrative example shows the effect and simpleness of the proposed method.

SaB03-2 16:05-16:25

Robust Filtering and Fixed-lag Smoothing for Linear Uncertain System with Single Delayed Measurement, pp.2-23~2-27

Zhao Hongguo Shandong Univ.
Zhang Huanshui Shandong Univ.
Zhang Chenghui Shandong Univ.
Song Xinmin Shandong Univ.

This paper deals with the robust filtering and fixed-lag smoothing problem for linear uncertain system with single delayed measurement. The robust filter and robust smoother is derived based on the reorganized innovation analysis approach. The calculation of the robust estimator involves in solving two Riccati difference equations of the same dimension as that of the original system and one Lyapunov equation.

SaB03-3 16:25-16:45

不可约迭代函数系统的商空间理论

Quotient Space Theory About an Irreducible Iterated Function System, pp.4-190~4-192

张铃 安徽大学
张燕平 安徽大学
方宏彬 安徽大学
张沅 安徽大学

本文利用商空间理论和鞅论研究迭代函数系统,即分形几何图像,得出如下结果。

In this paper, we use the relations of quotient space theory and martingale theory to research the iterated function system that is fractal geometry images, and propose these conclusions: Given an irreducible iterated function system $X, w_i, p_{ij}, i, j=1, 2, \dots, n$, then exists a corresponding chain of quotient space $W_k=(X_k, u_k, F_k), k=1, 2, \dots$ and a martingale $(u_k, F_k), k=1, 2, \dots$ on the chain, therefore there are: 1) Assume P_k is a invariant subsets of W_k , P is a invariant subsets of W , then exists $\lim P_k=P$ and the convergence is according to Hausdorff distance. 2) Assume u_k is a invariant measure of F_k , u is a invariant measure of F , then exists $\lim u_k=u$. 3) P_k is a support set of u_k , P is a support set of u . Namely we present the quotient approximation theorem about fractal geometry images, and build relations among chain of quotient space, martingale, fractal geometry images and Markovian process.

SaB03-4 16:45-17:05

基于二维混合模型的最优重复控制

Optimal Repetitive Control Based on Two-Dimensional Hybrid Model, pp.2-89~2-92

兰永红 中南大学
吴敏 中南大学
余锦华 东京工科大学

本文针对一类线性系统,提出一种基于连续/离散二维混合模型的线性二次调节最优重复控制设计新方法。首先,通过独立地考虑重复控制系统连续的控制行为与离散的学习行为,建立重复控制系统的连续/离散二维混合模型,将重复控制器设计问题转化为一类连续/离散二维系统的镇定问题。然后应用线性二次调节最优控制原理,针对给定的性能指标泛函,获得了二维系统的前馈-反馈最优控制律。在此基础上,再将最优控制律转化为最优重复控制律。由于能通过调节评价函数中相关状态的权能来独立的进行控制和学习过程的调节,从而控制律参数与控制性能的关系更加明确。最后,通过数值仿真实例验证了本文所提方法的有效性。

This paper proposes a new method of doing that for a repetitive control system containing a class of linear plants based on hybrid continuous-discrete two-dimensional (2D) model. First, by analysing of the control and learning processes independently, a hybrid continuous-discrete 2D model for the repetitive control system is established and the repetitive controller design problem is then converted to a stabilization problem for the continuous-discrete 2D systems. Next, under some performance index function, a forward-feedback controller for the continuous-discrete 2D

systems is obtained by using LQR optimal control theory. Based on this, the optimal control law is transformed into the optimal repetitive control law. Unlike previous methods, the control and learning processes can be adjusted independently by the parameters in the performance index function and the relations between parameters and the performance of the repetitive controller are more intuitive than previous. Finally, the validity of the method is verified by a numerical example.

SaB03-5 17:05-17:25

Distributed Remote Control System of UAV Based on Man-in-loop Real-time Operation, pp.2-119~2-122

Zhang Fengqing Beihang Univ.
KONG QUANCUN Beijing Information Sci. & Tech. Univ.

Unmanned aerial vehicle (UAV) has been widely applied in reconnaissance, strategic bombing, discharging electromagnetic interference. Of paramount significance to completing tasks is control system; the UAV control system should have the ability of formate, reevaluating the flight plan timely, making on-line decisions. Such requirements greatly challenge present control technology. A solution is presented to improve current UAV control system into a remote control system with network distributed computing, three dimensional dynamic display and man-in-loop real-time operation. This system aims to provide better functionality of real time, visualization, and intelligence in order to meet the above demands. Besides, the application of forecasting display control technology in this system can not only mitigate delay problem, one usual problem in remote control system but also realize a high level of intuitive operability. Moreover, the application of .NET remoting lightens data dropout and makes this system meet the high data-rate communication requirement.

SaB03-6 17:25-17:45

无轴承异步电机径向悬浮力的微分几何变结构解耦控制

Decoupling Control of the Bearingless Induction Motor Based on Differential Geometry Variable-structure Method, pp.4-17~4-21

董磊 江苏大学
刘贤兴 江苏大学
孙宇新 江苏大学

针对无轴承异步电机这一多变量、非线性、强耦合的系统,本文采用微分几何方法进行动态解耦控制。首先根据虚位移法建立了无轴承异步电机径向悬浮力的数学模型和状态方程;然后介绍微分几何理论并通过恰当的坐标变换和非线性状态反馈将系统补偿成线性系统;最后采用滑模变结构控制理论来对完全线性化后的系统设计控制器,以使转子高精度稳定悬浮。仿真结果表明,系统具有良好的动态和静态性能。

A decoupling control approach based on differential geometry has been developed for the bearingless induction motor, which is multi-variable, nonlinear and high coupling system. To start with, the mathematical equations of the bearingless induction motor describing the dynamic behavior of the radial force model have been transformed. Also the state equations of the motor are set up. Secondly, the theory of differential geometry is given and the suspension spring with variable stiffness instead of conventional one is used in the model. So the nonlinear model is transferred into a linear one. Last but not least, sliding model control theory has been applied to these subsystems to obtain the desired response. The simulation results have showed that the whole control system has good dynamic and static performance.

SaB04 15:45-17:45 Meeting Room 4

鲁棒控制与 H_∞ 控制 (1)

Robust and H_∞ Control (1)

Chair: Xue Anke Hangzhou Dianzi Univ.
Co-Chair: Gao Huijun Univ. of Alberta

SaB04-1 **15:45-16:05**
On an Output Feedback Stabilization Problem for a Class of Non-linear Systems, pp.3-561~3-564

Li Zili Nankai Univ.
 Chen Zengqiang Nankai Univ.
 Yuan Zhuzhi Nankai Univ.

The problem of uniformly bounded stability of a class of special uncertain nonlinear systems whose uncertain terms contain state, unmeasured state, control input and output is considered. When the unmeasured state is input state practical stability (ISPS), we can get a general result of the uniformly bounded stability of the systems through designing observer of the systems which gain can be obtained by a differential equation. We have also designed a dynamic output-feedback controller, and this feedback involves an on-line tuned gain.

SaB04-2 **16:05-16:25**
 离散时间代数 Riccati 方程解矩阵的迹的下界
On Lower Bounds of the Solution of the Discrete Time Algebraic Riccati Equation, pp.3-565~3-567

陈东彦 哈尔滨理工大学
 毕海云 哈尔滨理工大学

研究一般离散时间代数 Riccati 方程 (DTARE) 解的估计问题。首先, 利用矩阵求逆等式给出 DTARE 的等价形式; 然后, 通过矩阵特征值和矩阵迹的性质, 推导出 DTARE 的解矩阵的迹的三个新的下界; 将这些下界与已有研究结果进行了比较, 并借助于数值算例进行了验证。

In this paper, the estimation problem of solution of the general discrete time algebraic Riccati equation (GDTARE) is discussed. First, the equivalent of the GDTARE is given by using the formula of matrix inversion; then, three new lower bounds for the trace of the solution of the GDTARE are derived by means of the properties of eigenvalues and traces of matrices; Compared to the majority of the approach proposed in the literature, the present results have less conservative under certain conditions and the illustration is made with two numerical examples.

SaB04-3 **16:25-16:45**
 数值界不确定关联大系统输出反馈分散鲁棒 H_∞ 控制
Decentralized Robust H_∞ Output Feedback Control for Value Bounded Uncertain Large-scale Interconnected Systems, pp.3-583~3-589

谢永芳 中南大学
 黄 灿 中南大学
 桂卫华 中南大学
 蒋朝辉 中南大学
 阳春华 中南大学

针对一类状态矩阵、控制输入矩阵及关联矩阵存在数值界不确定性的关联大系统, 研究其分散鲁棒 H_∞ 输出反馈控制器设计问题。利用 Lyapunov 稳定性理论与线性矩阵不等式方法, 得到了关联大系统的一个新有界实引理。基于该有界实引理将存在分散鲁棒控制器的条件归结为一个非线性矩阵不等式, 采用同伦迭代方法求解该控制器, 使闭环大系统鲁棒渐进稳定, 并满足给定的 H_∞ 性能指标。最后用数值例子说明了所提方法的有效性。

The design of decentralized robust H_∞ output feedback controller for the large-scale interconnected systems with value bounded uncertainties in the state, control input and interconnected matrices is investigated. A new bounded real lemma for the large-scale interconnected systems is obtained by Lyapunov stability theory and linear matrix inequality method. Based on the new bounded real lemma a sufficient condition for the existence of a decentralized robust H_∞ output feedback controller is derived. This condition is expressed as the feasibility problem of matrix inequalities. The controller which enables the closed-loop large-scale system robust stable and satisfies the given H_∞ performance is obtained by a

homotopy iterative method. At last a numerical example is given to illustrate the effectiveness of the offered method.

SaB04-4 **16:45-17:05**
Delay-dependent Robust H_∞ Control for Uncertain Discrete Singular Time-varying Delay Systems Based on a Finite Sum Inequality, pp.3-595~3-599

Wang Huijiao Hangzhou Dianzi Univ.
 Xue Anke Hangzhou Dianzi Univ.
 Lu Renquan Hangzhou Dianzi Univ.
 Chen Yun Hangzhou Dianzi Univ.

The problem of delay-dependent robust H_∞ control for uncertain discrete singular time-varying delay systems is addressed in this paper. The uncertainty is assumed to be norm bounded. By establishing a finite sum inequality based on quadratic terms, a new delay-dependent bounded real lemma is derived and expressed in terms of linear matrix inequality(LMI). A suitable robust H_∞ state feedback control law is presented, which guarantees that the resultant closed-loop system is regular, causal and stable with disturbance attenuation level γ for all admissible uncertainties. A numerical example is given to demonstrate the applicability of the proposed method.

SaB04-5 **17:05-17:25**
Delay-dependent Robust Stability and H_∞ Control for Jump Linear System with Interval Time-varying Delay, pp.3-609~3-614

Guan Haiwa Wenzhou Univ.
 Gao Lixin Wenzhou Univ.

This paper deals with delay-dependent robust stability and H_∞ control problems for uncertain jump linear systems with interval time-varying delay. Base on the Lyapunov-Krasovskii functional approach, a stability criterion is derived by some linear matrix inequalities(LMIs). Furthermore, corresponding H_∞ control laws are given. Some numerical examples are worked out to show the usefulness of the theoretical results.

SaB04-6 **17:25-17:45**
Robust H_∞ Filter Design for 2DFM Model, pp.3-615~3-619

Meng Xiangyu Harbin Inst. of Tech.
 Gao Huijun Univ. of Alberta
 Chen Tongwen Univ. of Alberta

This paper is concerned with the robust H_∞ filtering problem for uncertain two-dimensional (2-D) systems described by the Fornasini-Marchesini model. The polynomially parameter-dependent idea is first utilized to solve the robust H_∞ filtering problem, with sufficient conditions for existence of the desired H_∞ filters expressed in terms of linear matrix inequalities(LMIs). These conditions are developed based on homogeneous polynomially parameter-dependent matrices of arbitrary degree. As the degree grows, test of increasing precision is obtained providing less conservative filter designs. An example is given to show the effectiveness of the proposed approach.

SaB05 **15:45-17:45** Meeting Room 5
 最优控制与最优化 (4)
 Optimal Control and Optimization (4)

Chair: Su Weizhou South China Univ. of Tech.
 Co-Chair: 阳春华 中南大学

SaB05-1 **15:45-16:05**
 基于分布式混合优化策略的有限装卸力下取送车作业优化
Optimal Operation for Placing-in and Taking-out Wagons with the Limited Loading/Unloading Capacity Based on Distributed Hybrid Optimization Strategy, pp.3-512~3-516

王雅琳 中南大学
 黎良伟 中南大学
 阳春华 中南大学

桂卫华

中南大学

在工矿企业铁路货运站装卸力有限的情况下, 现有取送车作业优化方法存在不足。为此, 本文综合考虑装卸队作业计划和调车取送车作业计划, 建立以调车机车总耗时最小为优化目标的数学模型, 并提出求解该模型的分布式混合优化策略。该策略根据装卸任务分配均匀度与调车机车总耗时的线性关系, 将优化问题分解为装卸任务均匀分配问题和最优装卸任务下的取送车作业优化问题, 并分别采用启发式算法和改进遗传算法予以求解, 提高算法寻优效率。实例仿真结果验证了所提策略的有效性和合理性。

To solve the problem that the current operation optimization methods for placing-in and taking-out wagons can't deal with in the railway freight station with the limited loading/unloading capacity for the industrial and mining enterprises, an operation optimization model is constructed taking the whole consuming time of locomotive as the object, and a distributed hybrid optimization strategy is proposed to solve the model, synthetically considering the loading/unloading operation and the operation for placing-in and taking-out wagons. According to the linear relationship between the evenness degree of the operation task for each loading/unloading team and the whole consuming time of locomotive, the operation optimization is divided into two parts. The first part is to assign the loading/unloading task uniformly by using heuristic algorithm, and the second part is to determine the optimal operation for placing-in and taking-out wagons under the condition of optimal loading/unloading task by using an improved genetic algorithm, which greatly improves the searching efficiency. The simulation results verify the effectiveness and rationality of this strategy.

SaB05-2

16:05-16:25

一类离散时间多智能体系统的线性二次分散动态博弈
Linear Quadratic Decentralized Dynamic Games for a Class of Discrete-time Multi-agent Systems, pp.3-517~3-521

马翠芹
李 韬中国科学院
中国科学院

本文研究了具有耦合二次型随机性能指标的离散时间大种群随机多智能体系统的分散博弈问题。采用状态聚集方法构造了对种群状态的平均的估计, 基于 Nash 必然等价原理设计了分散控制律, 并利用概率极限理论分析了闭环系统的稳定性和最优性。主要结果包括: 1) 证明了对种群状态的平均的估计在某种范数意义下的强一致性, 即种群状态的平均与其估计值之间的误差在该范数意义下将随系统个体数 N 的增加几乎必然收敛于 0; 2) 证明了闭环系统的几乎必然一致稳定性, 即系统的稳定性与种群个体数 N 无关; 3) 证明了所设计的分散控制律是在 Nash 均衡意义下几乎必然渐近最优的。

In this paper, decentralized games of discrete-time large population stochastic multi-agent systems are considered under a coupled quadratic performance index. Based on the state aggregation method, the estimate of the population state average is constructed, with which and the Nash certainty equivalence principle, the decentralized control law is designed. By the probability limit theory, the stability and optimality of closed-loop system is analyzed. The main results are: 1) The estimate of the population state average is shown to be strongly consistent in some norm sense, which implies that the estimation error is convergent to zero almost surely as the number of agents increases to infinity. 2) The closed-loop system is almost surely uniformly stable, in other words, the stability is independent of the number of agents. 3) The decentralized control law is almost surely asymptotically optimal in the sense of Nash equilibrium.

SaB05-3

16:25-16:45

需求不确定闭环供应链鲁棒运作策略设计
Robust Operation Strategy Design for a Closed-loop Supply Chain with Uncertain Demands, pp.3-522~3-526

徐家旺

沈阳航空工业学院

姜 波

沈阳航空工业学院

建立了顾客需求不确定环境下一类同时具有再分销、再制造和再利用的闭环供应链动态运作的鲁棒优化模型。供应链由一个制造商和一个供应商构成, 废旧产品的回收及对废旧产品的再处理均由制造商完成。闭环供应链的运作的动态的且满足诸如供应链成员之间协调、各成员运作收益最大等多个目标。采用具有已知概率的离散情景描述顾客需求的不确定性, 利用基于情景分析的鲁棒线性优化方法建立供应链的运作模型。数值算例的结果验证了运作策略的鲁棒性。

Under the synthetically consideration of re-distribution, remanufacturing and reuse, the dynamic operation models for a closed-loop supply chain is established. The supply chain is composed of one manufacturer and one supplier, in which the manufacturer is in charge of recollecting and re-disposal the used products. The operations of closed-loop supply chain are dynamic and meet multi-objectives such as coordination between members, maximum profits of each member. Uncertain demands are described as a scenario set with certain probability, the supply chain operation model is constructed by using the robust linear programming method based on scenario analysis. The result of a numerical example verified the robustness of the operation strategy.

SaB05-4

16:45-17:05

Optimal Tracking Performance of a Linear System with a Quantized Control Input, pp.3-531~3-535

Liu Yin
Qi Tian
Su WeizhouSouth China Univ. of Tech.
South China Univ. of Tech.
South China Univ. of Tech.

This paper studies the optimal tracking performance of a linear system with a quantized control signal. The plant under consideration is linear time-invariant (LTI) stable and the reference signal in the tracking problem is a step signal. The tracking performance is measured by the energy of the error between the output of the plant and the reference. To achieve asymptotical tracking, a new quantization scheme is proposed. This scheme includes two parts: one is quantized steady-state control signal transmitted to the plant at initial time and the other is a logarithmic quantizer which quantizes the error between the control signal and its steady-state value. The logarithmic quantization error is assumed to be a product of the original signal and a white noise with a uniform distribution over a given range. The best attainable tracking performance is obtained, in terms of characteristics of the given plant and the quantizer. This result gives a clear answer to a fundamental question in networked control system: How large quantization error is allowed for a step tracking problem with a given tracking error energy level in an averaged sense?

SaB05-5

17:05-17:25

基于对等 SAP 的 Q 学习在机器人作业分配中的应用
The Application of Peer to Peer SAP-based Q-Learning in Task Assignment to Multiple Robots, pp.3-536~3-539

丁丽洁
唐 昊
周 雷合肥工业大学
合肥工业大学
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基于强化学习, 文章讨论了高速搬运系统中多个机器人的作业分配问题。针对状态空间随机器人个数增加呈指数增大这一难题, 提出对等状态-行动对 (State-Action Pair) 概念, 设计了一种改进的 Q 学习算法。在该算法中, 每次采取一个行动后, 更新相应的所有对等 SAP 的 Q 值, 且只需保存其中一个 SAP 的 Q 值。与标准 Q 学习相比, 该算法能够节省存储空间, 提高系统的学习效率。

This paper proposes a method of solving the task assignment of high-speed handling system to multiple robots. In order to reduce the state space and improve the efficiency of learning, an improved Q-Learning algorithm based on peer to peer SAP is designed. In the proposed algorithm, all the Q value of the peer to peer SAP are updated after take an action, and these Q value are required only

one memory unit. Compare to the standard Q-Learning algorithm, the results demonstrate the efficiency of the proposed algorithm.

SaB05-6 **17:25-17:45**
Stackelberg Equilibriums of Open-loop Differential Games, pp.3-446~3-450

Xu Yashan Fudan Univ.

The paper is concerned with Stackelberg differential games for two players. Based on different assumptions on the favor of the players, several notions of Stackelberg equilibrium solution in the open-loop form are introduced, which are different from the concept given by G. Freiling, etc([?]). Specialization of this model to the case of linear quadratic differential game with indefinite coefficients is provided. We obtain a sufficient and necessary condition to the existence of an equilibrium by the operator method. Further, two representation formulas of the equilibrium are presented respectively via a two-point boundary value problem and a Riccati equation.

SaB06 **15:45-17:45** Meeting Room 6
 模糊系统与模糊控制 (2)
 Fuzzy System and Fuzzy Control (2)

Chair: 喻飞 江苏省计算机信息处理技术重点实验室
 Co-Chair: 王俊玲 哈尔滨工程大学

SaB06-1 **15:45-16:05**
 基于模糊推理的入侵检测系统

Intrusion Detection Based on Fuzzy Reasoning, pp.4-331~4-335

喻飞 江苏省计算机信息处理技术重点实验室
 沈岳 湖南农业大学
 廖桂平 湖南农业大学
 张林峰 湖南农业大学
 徐成 湖南大学

提出了一种基于模糊神经网络的入侵检测系统, 利用神经网络的学习能力, 对不清楚规则的复杂系统的输入输出特性进行适当的非线性划分, 自动形成规则集和相加的隶属关系, 克服了在多维空间上经验性的确定隶属函数的困难. 新的体系结构采用网络处理器在网络底层实现数据的采集与分析, 并建立了一个原型系统. 试验证明, 具有较好的入侵检测能力和较低的误报率, 而且, 能够检测出未知的入侵行为.

The paper proposes a new network intrusion detection system based on fuzzy neural network by redesigning the intrusion detection system's architecture and arithmetic. In order to overcome the difficulty of specifying the membership function of rules depending on experiences of experts in multi-dimension space., neural network is introduced to distinguish non-linearly input/output characteristics of complex system and to generate rule sets and membership functions automatically. The new architecture adopts the network processor to collect and analyse the data in the low layer of network., and to establish a prototype system. This system demonstrated in this experiment appears to be better intrusion detection ability, moreover, which is able to detect unknown attack and plays down false alarms.

SaB06-2 **16:05-16:25**
 采用模糊逻辑的同位素在线矿浆浓度计
Isotope Online Ore Pulp Concentration Gauge Using Fuzzy Logic, pp.4-262~4-265

唐耀庚 南华大学
 高嵩 南华大学
 欧阳惠斌 南华大学
 李兰君 南华大学

同位素检测一直是在线测量矿浆浓度的主要方法, 测得的矿浆浓度值是对时间平均的测量结果. 为了减少统计误差, 要求浓度计在测量中采用较长的测量时间. 然而, 当输入信号变化较快时, 这会导致浓度计响应迟缓, 测量动态误差大. 本文将模糊逻辑应用于同位素矿浆浓度计, 根据输入信号变化自动调整测量时间. 仿真结果表明该方法

使浓度计的动态性能和统计精度都得到了改善.

Measurement with isotope has been a primary method for measuring ore pulp concentration all alone, the derived concentration value is the result of a time-averaged measurement. In order to decrease statistical error, longer measuring time should be adopted by isotope ore pulp concentration gauge to performs measurement. However, the gauge cannot respond quickly and dynamic measurement error will be higher due to longer measuring time when input signal changes rapidly. Hence, fuzzy logic was employed to control the gauge operation and adjust the measuring time according to variations of the input signal. Simulation results show that the proposed method improves both the dynamic behavior and statistical accuracy of the gauge.

SaB06-3 **16:25-16:45**
 基于模糊逻辑的变速恒频风电系统最大风能追踪控制
The Maximal Wind-Energy Tracing Control of Variable-Speed Constant-Frequency Wind Generation System Based on Fuzzy Logic, pp.4-294~4-298

肖运启 华北电力大学
 徐太平 华北电力大学
 吕跃刚 华北电力大学

根据风力机功率特性, 提出了一种基于模糊逻辑的最大风能追踪策略. 该策略无需测量风速, 对风力机参数和空气密度无依赖性. 发电机工作在直接转速控制模式, 模糊逻辑系统根据有功功率的变化方向和幅度设定其转速参考, 动态追踪最大风能. 在分析双馈异步发电机数学模型和磁场定向矢量变换控制的基础上, 建立了完整的变速恒频风力发电系统. 仿真结果验证了这种最大风能追踪策略的有效性.

Based on the wind-turbine characteristics, a method of tracking the maximum wind energy using fuzzy logic principles, without the wind velocity measurement is proposed, which is independent of the turbine parameters and air density. The Generator is operated in the indirect speed control mode with the speed reference being dynamically modified by fuzzy logic system in accordance with the magnitude and direction of active power changing. By analyzing the mathematical model of a doubly-fed induction generator (DIFG) and the field-oriented vector transformation control scheme, the whole variable-speed constant-frequency (VSCF) wind-power generation is formed. The simulation results validate the correctness of the proposed control strategy.

SaB06-4 **16:45-17:05**
 基于模糊控制的 IUla 特性智能充电机
A Automatic Charger with IUla Characteristic Based on Fuzzy Control, pp.4-318~4-321

高飞燕 南华大学
 李兰君 南华大学
 阳武娇 南华大学

本文利用模糊控制系统和 SCR 控制技术, 结合牵引式蓄电池充电过程中的专家经验, 实现了一种符合德国 DIN41772 标准具有 IUla 特性的牵引式蓄电池智能充电机.

Using fuzzy control system and SCR controller, combining the expert's experiences of the charging process for the traction battery, one kind of automatic charger for the traction battery is designed, the charger has IUla characteristic according with the standard DIN41772 of Germany.

SaB06-5 **17:05-17:25**
 模糊路径查询系统及其在 PX 吸附分离过程中的应用
Fuzzy Path-Query Algorithm and Its Application in PX Absorption and Separation Process, pp.5-381~5-385

任佳 浙江理工大学
 雷美珍 浙江理工大学
 张益波 浙江理工大学

随着数据挖掘技术和理论不断发展, 针对复杂工业过程的数据挖掘成为相关领域工程师和研究人员关注的热点. 然而, 由于复杂工业

过程固有的特点,使得数据挖掘在该领域的应用研究面临不少瓶颈。其中之一为如何找到一种合适的方式,既能挖掘出历史数据中的优秀操作经验,又能将这些经验用一种简单、实用,易于被现场操作人员所接受的方式表达出来。本文就针对这个问题提出了一种解决方案,称为模糊路径查询系统。本文详细介绍了模糊路径查询系统的建立过程以及它在 PX 吸附分离过程中的应用。应用结果表明:模糊路径查询系统确实是一种面向复杂工业过程的优秀的数据挖掘解决方案。

With the development of data mining technology and theory, data mining in complex industry process has become the hot topic of engineers and researchers in this field. However, because of its inherent characters, the research of data mining in this field has faced a series of bottlenecks. One is how to find a proper way that can not only discover the excellent operating information but also output the obtained knowledge in a simple and practical way. On this background, a novel data mining solution to complex industry process named fuzzy rule path-query system was proposed and discussed. The construction process of fuzzy rule path-query system was discussed, as well as its application in PX absorption and separation process. The practical application demonstrates that the novel system is really a good solution to data mining in complex industry process.

SaB06-6 17:25-17:45

不确定性非线性离散系统的非脆弱模糊保性能控制
Non-Fragile Fuzzy Guaranteed Cost Control of Uncertain Nonlinear Discrete-Time Systems, pp.4-361~4-365

王俊玲	哈尔滨工程大学
舒喆醒	哈尔滨理工大学
陈亮	哈尔滨工程大学
王忠信	哈尔滨工程大学

针对一类用 T-S 模糊模型描述的具有参数不确定性的非线性离散时间系统,研究其非脆弱保性能模糊控制问题。在控制器增益存在可加性摄动和可乘性两种摄动的情况下,分别设计非脆弱保性能模糊控制器,使得闭环系统渐近稳定并且给定的性能指标低于确定的上界。利用线性矩阵不等式处理方法,得到非脆弱保性能模糊控制器存在的充分条件。并且用数值仿真验证了所提出方法的可行性。

This paper is concerned with the problem of non-fragile guaranteed cost control for a class of uncertain nonlinear discrete-time systems described by T-S fuzzy model with parameter uncertainty. For both the cases with additive and multiplicative uncertainties, we address the problem of designing non-fragile guaranteed cost fuzzy state feedback controllers such that, for all admissible uncertainties, the resulting closed-loop fuzzy system is stable and the cost performance is no more than a certain upper bound. Sufficient conditions for the existence of desired controllers are proposed in terms of linear matrix inequalities. Simulation results demonstrate the feasibility of the proposed approach.

SaB07 15:45-17:45 Meeting Room 7
非线性系统及其控制 (4)
Nonlinear System and Control (4)

Chair: Wang Yuzhen	Shandong Univ.
Co-Chair: Zhang Jing	Kunming Univ. of Sci. & Tech.

SaB07-1 15:45-16:05

受约束哈密顿系统的稳定性及控制
Stability and Control of a Class of Constrained Hamiltonian Systems, pp.2-482~2-486

Cai Xin	Shandong Univ.
Wang Yuzhen	Shandong Univ.
Sun Weiwei	Shandong Univ.

This paper investigates the stability and control design of a class of constrained Hamiltonian systems, and presents some results for the systems. Firstly, we investigate the stability of constrained Hamiltonian systems. Based on the structural properties of the Hamiltonian systems, several useful stability criteria are derived.

Then, we discuss feedback stabilization of the constrained Hamiltonian systems. Finally, we study the H_∞ control of constrained Hamiltonian systems, and design an effective control law.

SaB07-2 16:05-16:25

多重分形和高空间理论在蛋白质结构类分析中的应用
Protein Structure Class Analysis Based on Multifractal and Quotient Space, pp.2-487~2-491

郑婷婷	安徽大学
毛军军	安徽大学
吴涛	安徽大学
宋杰	安徽大学

运用多重分形理论对蛋白质序列进行分析,多重分形能够多层次地刻画蛋白质特征序列的内部精细结构,突出异常局部的变化特征。同时,结合高空间粒度计算理论,对多重分形方法中的加权因子进行粗粒度化处理,使得二维空间 $(\text{deta}(a), \max(c,q))$ 在结构聚类问题上,起到显著效果。为进一步预测蛋白质结构类,提供了有益的帮助。

The multifractal spectrum of protein feature sequences was computed and analyzed with the multifractal. The parameters of multifractal spectra were used to describe hierarchically refined structure of protein feature sequences and pop out the singularity of local sequences. And with using quotient space granularity computing theory power gene of multifractal was chosen wilder. Constructing 2D space $(\text{deta}(a), \max(c,q))$, and it presented good efficiency in structure classing, which is favor of predicting protein structure class.

SaB07-3 16:25-16:45

受约束非线性系统的线性化
Linearization of Switched Nonlinear Systems, pp.2-419~2-423
Yuan Yanyan Chinese Acad. of Sci.
Cheng Daizhan Chinese Acad. of Sci.

The problem of static state feedback linearization of switched nonlinear system is considered. First, the single input switched systems are considered. A necessary and sufficient condition is provided, which contains an uncertain single variable function. Then the result is extended to multiple input case. Some examples are presented to illustrate the linearization process.

SaB07-4 16:45-17:05

基于组件的复杂控制软件建模层次
Hierarchy Modeling for Component-based Complex Control Software, pp.2-395~2-398

Zhang Jing	Kunming Univ. of Sci. & Tech.
Zhang Yunsheng	Kunming Univ. of Sci. & Tech.
Xiang Fenghong	Kunming Univ. of Sci. & Tech.

Complex control software is heterogeneous and difficult to design. This paper presents a component-based hierarchy modeling strategy that divides the basic computational parts into components and separates interaction among components as pattern. Under the support of hierarchy architecture, component and pattern achieve reuse. We introduce a notion of behavior generator to characterize the property that the architecture can aggregate individual component's computation into a well-defined composite computation such that heterogeneous models can be composed. A simplified component-oriented hierarchically hybrid control software is implemented to prove the feasibility and flexibility of our methodology.

SaB07-5 17:05-17:25

一类离散双线性系统的全局渐近稳定控制
Globally Asymptotically Stabilizing Control for a Class of Discrete-time Bilinear Systems, pp.2-309~2-311

齐义文	黑龙江大学
张显	黑龙江大学

研究了一类离散双线性系统的全局渐近稳定问题。针对该系统,给出了一种简单的反馈控制律。运用 Lyapunov 稳定性理论证明了在此控制律下的闭环系统是全局渐近稳定的。

The globally asymptotically stable problem of a class of discrete-

time bilinear systems is studied. For the systems, we give a simple feedback control law. Based on Lyapunov's stability theory, the globally asymptotically stability of the closed-loop systems is investigated.

SaB07-6 17:25-17:45

基于线性微分包含的约束非线性系统双模预测控制
Dual-mode Predictive Control of Constrained Nonlinear Systems via Linear Differential Inclusion, pp.2-434~2-438

赵敏 上海交通大学
李少远 上海交通大学

基于线性微分包含的概念,针对一类可以化为多面体线性微分包含的约束非线性系统,给出一种双模预测控制算法。首先利用泰勒级数对系统线性化,通过对每个偏导数分别取最大和最小的方法构造多面体描述不确定系统包裹原非线性系统,然后对这个多面体描述系统构造不变集,并通过求解有线性矩阵不等式约束的半定规划得到反馈控制器,从而获得原非线性系统的控制律。算法以线性不确定系统作为桥梁,避免了在线求解非线性预测控制中复杂的非凸非线性规划问题,能够满足系统实时优化的要求,而且原非线性系统的稳定性可以通过多面体描述系统的稳定性保证。

Presented in the paper is a nonlinear predictive control method. It is known that some nonlinear plants can be transferred into linear time-varying systems after being globally linearized. So it is feasible to solve some certain problems of nonlinear systems via dealing with the corresponding linear uncertainty systems. Based on this idea, a dual-mode predictive control method for a class of constrained nonlinear systems whose trajectories can be embedded within polytopic linear differential inclusions is proposed. After being linearized through the Taylor series, the initial nonlinear systems can be embedded into the polytopic description systems by using the maximum and minimum of each partial derivative over a bounded region of the state space. Then polytopic invariance is constructed on the polytopic description system to propose a predictive control algorithm, which is unlike earlier nonlinear predictive control methods that have to tackle online a complex nonlinear non-convex optimization problem, requires the solution of a semi-definite programming with linear matrix inequalities. And this can satisfy the demand of online optimization. Meanwhile, the stability of initial nonlinear system is based on the polytopic description system.

SaB08 15:45-17:45 Meeting Room 8
工业系统 (1)
Industrial System (1)

Chair: 孟庆金 济南大学
Co-Chair: Liu Lin Beijing Jiaotong Univ.

SaB08-1 15:45-16:05

转子速度估计使用零过零信号
Rotor Speed Estimation Using Zero-Crossing Times Signal of Stator Current, pp.6-298~6-302

Ghanbarian Mahdi Islamic Azad Univ.
Mohammadi Ali Islamic Azad Univ.
Kavehnia Farzad Islamic Azad Univ.
Keivani Hamid Islamic Azad Univ.
Askari Mohammad Islamic Azad Univ.
Mohammadi Sirous Islamic Azad Univ.

The purpose of this study is to illustrate a new method for sensorless vector control of induction motors. This approach uses Zero-Crossing Times (ZCT) signal of stator current to estimate rotor speed. ZCT signal contains useful information which can be used for estimation of rotor speed and resistance. We have used this information for online estimation of rotor speed. To avoid time consuming Fast Fourier Transformation (FFT) analysis of ZCT signal, we have used switchable high order Butterworth Filters in order to extract rotor frequency. Simulation result has expressed good performance of this simple and inexpensive sensorless vector control

of induction motors.

SaB08-2

16:05-16:25

基于体绘制技术的虚拟光刻系统建模与实现
Modeling and Implementation of Virtual Optical Lithography System Based on Volume Rendering, pp.4-783~4-786

张启程 南开大学
孙广毅 南开大学
赵新 南开大学
王俊伟 南开大学
金纯 南开大学
卢桂章 南开大学

本文提出了基于体绘制技术的虚拟光刻系统。该系统支持 BMP 格式掩膜图形输入,拥有完整的衍射和驻波模型。与其它光刻模拟器相比,本系统最大的特点是实现了仿真结果的三维可视化,并支持旋转、剖切等交互式操作,使用户能够更好地观察光刻胶内部结构。

Virtual lithography system based on volume rendering is put forward. This system supports the input of masking pattern in BMP format and includes integrated diffraction and standing wave model. In comparison with other lithography simulators, this system supports the full 3D visualization of simulated result and interactive operations such as rotation and slice, which enables the user to fully visualize the internal structure of photoresist.

SaB08-3

16:25-16:45

基于多目标智能优化的铅锌烧结生产全流程协调控制
Coordinating Control Based on Multi-objective Intelligent Optimization for the Overall Lead-zinc Sintering Process, pp.6-249~6-253

段平 中南大学
吴敏 中南大学
徐辰华 中南大学

针对铅锌烧结过程具有关联复杂、多目标多约束的特点,首先集成主成分分析、神经网络、灰色关联分析等多种方法,建立了烧矿产量指标和质量指标与工艺参数、操作参数之间的关系模型,得到了烧结生产全流程协调优化控制的目标函数,然后采用多目标协调进化算法获得最优的操作参数,并设计模糊专家协调控制器进行协调和推理,给出操作优化指导。基于多目标智能优化的铅锌烧结生产全流程协调控制技术具有高效性和实用性,实现了高产、优质的综合生产目标,取得了较好的工业控制效果。

Based on some features in the lead-zinc sintering process, such as complex relations, multiple objectives, multiple constraints, firstly, the relational models of quantity-quality indexes parameters, process parameters and operation parameters are proposed, which synthesize a lot of techniques, including principal components analysis, neural network, grey relation analysis and so on. And objective functions of the coordination-optimization control in the overall sintering process are deduced. Secondly, the optimization parameters are calculated using multi-objective coordinated evolutionary algorithm. Finally, the fuzzy expert coordinating controller is designed to coordinate the overall sintering process, and the optimization guidance is introduced. The coordinating control techniques based on multi-objective intelligent optimization of the overall sintering process are efficient and practical in achieving the comprehensive production indices of high quantity and quality, and improving the effect of sinters in industrial practice.

SaB08-4

16:45-17:05

无线传感和控制结构振动
Wireless Sensing and Control of Structural Vibration From Earthquake, pp.6-194~6-198

Liu Lin Beijing Jiaotong Univ.
Dyke Shirley J. Washington Univ. in St. Louis
Veto Rebecca Washington Univ. in St. Louis

This paper presents the feasibility of wireless sensing technology in seismic response control of structures. A shaking table test of a 3-story steel structure using MICA2 motes with accelerometers is conducted at Washington University Structural Control and Earth-

quake Engineering Lab. Magnetorheological (MR) dampers are adopted as actuators. Based on wireless acceleration feedback of the structures and wired force feedback of MR dampers, a bang-bang clipped optimal control algorithm is developed to command the MR damper. The experimental results indicate that the proposed control scheme can effectively mitigate the response of the structure.

SaB08-5 17:05-17:25

热电厂 CFB 锅炉燃烧智能控制策略研究

On Intelligent Control of Combustion for CFB Boiler in Thermal Power Plant, pp.6-311~6-313

孟庆金
权悦
景绍洪

济南大学
济南大学
济南大学

针对循环流化床燃烧控制系统的特点,以主蒸汽压力为被控对象,设计了一个基于平衡工作点的神经网络与 PID 的复合控制器。运用神经网络方法在线建立锅炉当前工况平衡工作点,再此基础上通过传统的 PID 控制实现对主蒸汽压力的控制。仿真结果表明,该控制器对蒸汽压力具有良好的控制性能。

This paper analyzes the dynamic characteristic of the controlled object of the stream pressure of CFB boiler in thermal power plant, and presents a new design method of intelligent compound controller based on the balance point. The neural network algorithm is used to adjust the current working point, and then the PID control strategy is used for the stream pressure control. The simulation shows that the intelligent compound controller has better control characteristics than the traditional controller.

SaB08-6 17:25-17:45

An LQR/Pole Placement Controller Design for STATCOM, pp.6-189~6-193

Nekoui Mohammad Ali
Valipourearkhloo Amin

Islamic Azad Univ.
Islamic Azad Univ.

The static synchronous compensator (STATCOM) is gaining extensive popularity in power system applications. In general, power factor and stability of the utility system can be improved by STATCOM. Specifically, STATCOM can stabilize a given node voltage and compensate for the power factors of the equipment serviced by that node. So STATCOM is a multiple input, multiple output nonlinear system. In this paper, we want to design a controller for STATCOM by using LQR and pole assignment methods. Simulation results show that the proposed STATCOM controller can effectively increase transient stability of the power system even in the presence of a large operation point

SaB09 15:45-17:45 Meeting Room 9

智能机器人 (2)

Intelligent Robot (2)

Chair: 苏剑波
Co-Chair: 阮久宏

上海交通大学
山东交通学院

SaB09-1 15:45-16:05

凿岩机器人液压系统 ADRC 控制器设计与仿真

Study on ADRC Controller Design and Simulation of Rock Drill Robot Joint Hydraulic Drive System, pp.5-133~5-136

阮久宏
荣学文
吴三友

山东交通学院
山东大学
山东交通学院

给出凿岩机器人关节驱动液压系统数学模型,对其进行降阶近似,使用自抗扰控制 (ADRC) 方法设计二阶 ADRC 控制器,并在不确定性环境下进行仿真研究。结果表明,ADRC 控制器对于系统参数摄动和大负载干扰力具有理想的鲁棒能力,控制过程快速、平滑,稳态精度高。

Firstly, mathematic model of rock drill robot joint hydraulic drive system was analyzed, and the reduced-order approximative model

was acquired. Then a two-order ADRC (Active Disturbance Rejection Controller) controller of the hydraulic system was designed, and the simulations were down within uncertainty environments. The simulation results show that the ADRC controller has ideal robustness to the system parameters' disturbances and the large load disturbance, and rapid and smooth control process and high steady precise performances can be implemented.

SaB09-2 16:05-16:25

无标定手眼协调跟踪系统性能分析与改进

Performance Investigation and Improvement for the Uncalibrated Hand-Eye Coordination System, pp.5-141~5-144

苏剑波

上海交通大学

本文研究利用神经网络实现雅可比矩阵模型的机器人手眼协调无标定动态系统的跟踪性能。由于网络训练条件与实际工作条件存在差别,需要在控制器设计上补偿系统未建模动态。因此,在考虑机器人动力学特性和视觉信息处理特点的基础上,建立系统离散域模型,研究系统的跟踪误差和系统稳定性,并提出改进方法。仿真和实验验证所提出方法的有效性。

The paper studies performance of the uncalibrated hand-eye coordination system, whose image Jacobian matrix is estimated by Neural Network way. Since the training conditions of NN are far from that of the practical working conditions, there are some unmodelled dynamics to be compensated in system controller designing. The discrete model of the system is set up, in accordance with the system dynamics and visual information processing, so that the system's performance and stability are well investigated, which leads to improved control method. Simulation results validate the effectiveness of the proposed method.

SaB09-3 16:25-16:45

基于地标信息融合的家庭环境机器人组合导航

Robot Integrated Navigation Based on Landmark Information Fusion in Home Environment, pp.5-145~5-148

王红霞
田国会
李晓磊
卜范骞

山东大学
山东大学
山东大学
山东大学

基于机器人与智能空间的信息交互,提出了一种组合式导航系统。首先通过视觉传感器检测地标,利用智能空间提供的各地标的相关环境信息计算它们的可信度,经 D-S 证据理论方法融合后用于选择较优地标指示的路径;同时利用机器人的距离传感器实现避障功能,最后通过决策评价控制机器人的运动。实验证明,该方法即能实现基于视觉的优化路径,又可以利用基于传感器的实时反应能力。

An integrated navigation system is proposed based on the sharing information between the robot and intelligence space. Firstly the landmarks are detected by the vision, the landmarks information which is offered by the intelligence space is fused using the D-S evidence theory, and then the path is planned. The robot's distance sensors are used for real time obstacle-avoidance. In the end the decisions are fused to control robot to move. The experiment shows that this method can get better path and response rapidly.

SaB09-4 16:45-17:05

Gait Design and Balance Control for the Biped Robot Based on Reaction Null-space Method, pp.5-169~5-173

Huai Chuangfeng
FANG Yuefa
Guo Sheng

Beijing Jiaotong Univ.
Beijing Jiaotong Univ.
Beijing Jiaotong Univ.

Presents an experimental approach to the problem of designing and optimizing walking gaits on a biped robot. The desired movements are designed off-line using a model of the robot and tracked on the real system by means of a simple control law. Because biped robot has more than twenty freedoms, it is difficult to coordinate the relationship between dynamic walking and the freedoms of biped robot. Giving some constraints on the gait in designing

body kinematical trajectory, then using the step length, the average velocity, stature, arm waves, kinematical trajectory of the body and step height of freedom leg to simply model biped robot. Above parameters can makeup almost countless gait form. Introduce a step strategy concept of biped walking robot that is stabilized by using reaction null-space method. Several results validate the accuracy of our model and exhibit the robustness and the efficiency of our controller system.

SaB09-5 17:05-17:25
A Novel Path Planning Method Based on Certainty Grids Map for Mobile Robot, pp.5-185~5-188

Li Jigong Lanzhou Univ. of Tech.
 Feng Yiwei Lanzhou Univ. of Tech.
 Zhu Chaoqun Lanzhou Univ. of Tech.

This paper proposed a novel path planning method which is called the Line-Generating Obstacle Detecting and Avoidance Method (LGODAM) for mobile robot supported by a certainty grids map which can be upbuilt by SLAM. The LGODAM can be applied to obstacles with any shape of its outline. By this means, the local optimum problem is well resolved, also the mission of global path planning is decomposed into a series of phasic sub mission in real-time way during the running of mobile robot. In our research, Uni-Vector field tracking controller is applied to robot. The effectiveness and elegance of the LGODAM is demonstrated by simulation studies. A number of test cases are presented, each shows a stable, smooth, reasonable and no oscillating path to the destination of mobile robot.

SaB09-6 17:25-17:45
The Control of Search and Rescue Robots with the General Suppression Control Framework, pp.5-229~5-233

LAU Henry The Univ. of Hong Kong

The paper described the use of the general suppression control framework (GSCF) for the control and coordination of a team of search and rescue robots undertaking exploration operation. This study adopts the biological analogy of the human immune system to derive the GSCF having the behavior of immunological cells. The framework directs the coordination of these robots in tackling search and rescue operations in an unstructured environment. Simulation study is performed to demonstrate the effectiveness of the control framework.

SaB10 15:45-17:45 Meeting Room 10
 信息处理系统 (2)
 Information Processing Systems (2)

Chair: 董峰 天津大学
 Co-Chair: 洪伟 吉林大学

SaB10-1 15:45-16:05
城市交通信号的在线强化学习控制
On-line Reinforcement Learning Control for Urban Traffic Signals, pp.6-34~6-37

刘智勇 五邑大学
 马凤伟 五邑大学

城市交通信号控制系统具有非线性、模糊性、自组织性和不确定性等特征,传统的建模和控制方法难以取得理想的效果,人工智能方法提供了解决问题的新途径。针对交通信号控制系统的特点,提出了基于 Dyna-Q 强化学习的在线控制算法,利用交通信号控制 Agent 在试错过程中获得的经验知识进行模型估计,然后从估计的模型中规划动作,从而可以加速 Q-学习迭代过程。采用 TSIS 交通分析软件对由 8 个路口组成的两条交通干线进行仿真,与定时控制、遗传算法和 Q-学习控制方法进行比较,结果表明: Dyna-Q 强化学习算法具有明显的优越性。

It is quit difficult to archive perfect effects by applying the traditional modeling and control methods to the urban traffic signal control

system because of non-linearity, fuzzyness, self-organization and uncertainty in the system. The artificial intelligence technologies may offer a new way to resolve this problem. In allusion to characteristics of the traffic signal control system, this paper proposes an on-line control algorithm based on Dyna-Q reinforcement learning, and utilizes the experiential knowledge gained by the traffic signal control agent in the trial-error process to estimate the model, and then plans the actions in the estimated model, accordingly it can accelerate the iterative process of the Q-learning. This paper adapts TSIS(a microscopic traffic analysis software) to implement the simulation on two traffic trunk roads which consist of 10 intersections. Comparing with fixed-time control, genetic algorithm and Q-learning control algorithm, simulation results indicate that Dyna-Q reinforcement learning algorithm has an obvious superiority.

SaB10-2 16:05-16:25
自适应的动态地图匹配方法
A Dynamic Map-matching Method for Adaptability, pp.6-66~6-70

洪伟 吉林大学通信学院
 田彦涛 吉林大学通信学院
 徐斌 吉林大学通信学院

本文通过对车辆导航过程中对地图匹配功能的需求变化分析,提出了一种自适应的动态地图匹配方法。该方法能够识别初始选择道路、跟踪选择道路和跟踪道路路段三种不同状态,并动态调整地图匹配策略。同时,开发了适合不同状态需求特点的匹配算法。大量的仿真实验结果表明该方法在保证匹配结果准确性的前提下,有效地提高了系统的实时性。

A dynamic map-matching method for adaptability is presented by analyzing the change in requirement of map-matching performance in the process of vehicular navigation. The method is provided with the capability of identifying three different states (selecting a road initially, selecting a follow-up road and positioning in the known road) and determining corresponding algorithms of map-matching dynamically. In order to satisfy the needs of map-matching in different states, some algorithms are developed respectively. Simulated experiments show that the method implements more timely map-matching successfully.

SaB10-3 16:25-16:45
基于压电扫描管动态特性分析的 AFM 成像方法研究
AFM Imaging Method Based on the Analysis of Piezo-Scanner Dynamic Characteristic, pp.5-404~5-408

董晓坤 南开大学
 方勇纯 南开大学
 周娴玮 南开大学
 张玉东 南开大学

原子力显微镜 (AFM) 是纳米技术和纳米操作领域中强有力的工具。本文针对扫描成像的原子力显微镜,提出了一种基于压电扫描管动态特性的 AFM 成像方法,有效地提高了 AFM 在 Z 方向上的成像精度。具体而言,论文首先介绍了原子力显微镜当前的成像方法,然后针对 AFM 在高速扫描下成像误差大的缺点,提出了一种基于压电扫描管动态特性的改进成像方法,并从理论上对这种成像方法的性能进行了分析,论文最后利用实验数据验证了本文提出的成像方法的性能。

Atomic force microscopy is a powerful tool in the field of nanotechnology and nanomanipulation. By utilizing dynamics of the AFM Piezo-scanner, this paper proposes an innovative imaging method to improve the imaging precision of AFM along the Z direction. Specifically, this article first introduces the common imaging method utilized among commercial AFMs, then an improved imaging method based on the piezo-scanner's dynamics is presented to remedy the fault of imprecise imaging along Z direction during high-speed scan, and some theoretical analysis is implemented to verify the validity of the method. Finally some experimental results acquired from a real-time AFM control platform are included

to demonstrate the superior performance of the proposed imaging method.

SaB10-4 16:45-17:05

多截面电阻层析成像系统并行数据采集的设计

Multi-Plane Electrical Resistance Tomography System Based on Parallel Data Acquisition Strategy, pp.5-391~5-395

谭超
董峰
王斌斌

天津大学
天津大学
天津大学

电阻层析成像技术 (Electrical Resistance Tomography, 简称 ERT) 通过测量敏感场内电导率变化, 得到不透明容器内的对象特性, 并通过成像算法再现测量对象的截面图象, 具有非侵入、无辐射、可视化等特点. 多截面 ERT 系统在工业过程测量与监测中有广泛的应用前景, 然而它的动态实时性能往往局限了其在工业现场的应用范围. 为此, 本文提出了基于数字 I/O 卡与高速并行 A/D 转换卡的并行多截面 ERT 系统的设计方案. 该系统通过减少测量信号的切换次数, 可实现系统工作速度的大幅提高.

Electrical Resistance Tomography (ERT) obtains the characteristic of the measured object in opaque containers by measuring the change of the conductivity in the sensing field that established by injecting exciting current into measured cross-section, and reconstructs the section image through certain reconstruction algorithm. The characteristic of this technique is non-intrusive, non-radiant, visualization and etc. Multi-plane ERT system has great prospective in industrial measurement and monitoring, however, the application is restricted by its real-time performance. In this paper, the scheme of new multi-plane ERT system based on parallel data-acquisition system has been proposed. This new system uses digital I/O card and high speed A/D transition card to decrease the switch time of measured signal and to improve system performance

SaB10-5 17:05-17:25

A New Multi-scale Estimation Scheme for Dynamic System, pp.5-396~5-399

Zhou Funan
Tang Tianhao
Wen Chenglin

Henan Univ.
Shanghai Maritime Univ.
Hangdian Univ.

Hybrid wavelet-Kalman filter method is an efficient multi-scale estimation method for dynamic system. Researches on multi-scale data fusion have become a hot topic in data fusion field. However, limited by the constraint that signal to implement wavelet transform must have the length of , multi-scale estimation problem with non-sampled observation data still hasn't been efficiently solved, which is an obstacle of multi-scale data fusion. Based on present multi-scale method, we develop a new multi-scale estimation scheme aiming to design the stacked observation model for non-sampled observation by analyzing the possible observation structure of non-sampled sensor.

SaB10-6 17:25-17:45

On Vibration Control Methods of Vehicle, pp.6-71~6-74

Sun Jianmin Beijing Inst. of Civil Engineering & Architecture
Yang Qingmei Beijing Union Univ.

According to the evaluation method of riding comfort and handling safety of vehicle, the acceleration of the sprung mass, dynamic tyre load between wheels and road and dynamic deflection between the sprung mass and the unsprung mass are determined as the evaluation targets of suspension performance. Generalized adaptive control and LMS adaptive control are studied in two-DOF vehicle suspension model. The results show that the LMS adaptive control method has the better control for vehicle vibration. The simulation results show that LMS adaptive control algorithm is not only simple but also remarkably effective. It improves further that the active control suspension system can improve both the riding comfort and handling safety in various operation conditions, and it is foundation

to make further approach to vehicle active suspension.

SaB11 15:45-17:45 Meeting Room 11

建模、辨识与信号处理 (4)

Modeling, Identification and Signal Processing (4)

Chair: Fang Haitao
Co-Chair: 陈泰任

Chinese Acad. of Sci.
中南大学

SaB11-1 15:45-16:05

多传感器信息融合 Wiener 反卷积预报器

Multisensor Information Fusion Wiener Deconvolution Predictor,

pp.3-120~3-123

毛琳
邓自立

黑龙江大学
黑龙江大学

应用现代时间序列分析方法, 基于 ARMA 新息模型和增广的状态空间模型, 提出了按标量加权多传感器最优信息融合 Wiener 反卷积预报器, 给出了局部预报器误差方差和互协方差的计算公式, 它们可用于计算最优加权系数. 同单传感器情形相比, 可提高融合预报器的精度. 一个仿真例子说明其有效性.

By the modern time series analysis methods, based on ARMA innovation model and augmented state space model, a multisensor optimal information fusion Wiener deconvolution predictor weighted by scalars is proposed. The formulas of computing the local predictor error variances and cross-covariances are given, which are applied to compute optimal weighting coefficients. Compared to the single sensor case, the accuracy of the fused predictor is improved. A simulation example shows its effectiveness.

SaB11-2 16:05-16:25

激光陀螺捷联惯导系统的系统级标定方法研究

Systematic Calibration Method for the Laser Gyro Strapdown Inertial Navigation System, pp.6-478~6-483

杨晓霞
黄一

中国科学院
中国科学院

本文从惯性导航基本方程出发, 推导了激光陀螺捷联式惯性导航系统的系统级标定的一种误差标定模型. 文章分析了该模型下惯性仪表误差参数的可观测性, 并给出了能够辨识出惯性仪表 24 项误差参数的标定方法.

In this paper, based on the inertial navigation equation, a novel model for the laser gyro strapdown inertial navigation system is provided. The observability of the error parameters is analyzed. Then a calibration algorithm, which can identify twenty four error parameters of the inertial navigation unit is presented.

SaB11-3 16:25-16:45

制导炸弹误差模型的仿真与分析

Error Model Simulation and Analysis for Guided Bomb, pp.3-256~3-259

穆育强
钱龙军
盛安冬

南京理工大学
南京理工大学
南京理工大学

考虑到工程实际中存在的多种误差干扰, 在进行半实物仿真前需用数字仿真分析其对系统性能的影响. 本文首先建立了制导炸弹的弹体动力学、弹体运动学模型、弹目相对运动学模型、制导控制模型和舵机模型, 然后详细讨论了各种不同误差干扰模型, 最后利用 Matlab 进行了制导炸弹的六自由度仿真, 并深入分析了多种误差干扰对系统性能的影响. 仿真结果表明: 在多种误差干扰条件下, 系统具有较好的鲁棒性, 从而为半实物仿真打下坚实的基础.

Considering various errors and disturbance in engineering, numerical simulation should be taken in first to analyze its influence for guidance control system before hardware-in-the-loop simulation. Bomb dynamics & kinematics, bomb-target relative kinematics, guidance and control, rudder were modeled firstly in this paper. Then models of various errors and disturbance were studied in detail. The six-degree-freedom simulation for guided bomb was taken using Matlab. The influence of errors on the guidance control

system performance was analyzed thoroughly. Simulation results demonstrate that the guidance control system has strong robust ability, laying a solid foundation for hardware-in-the-loop simulation.

SaB11-4 16:45-17:05

A Method of Super-resolution Image Restoration Based on Separation, pp.3-275~3-277

Zhang Jian Hunan Univ. of Sci. & Tech.
Fan Xiaoping Central South Univ.
Huang CaiLun Central South Univ.

According to the optical image, the layered model for image degradation is established on the basis of imaging mechanism. Some key factors (diffraction effect and down-sample etc.) resulting in the low resolution are pointed out. A method of super-resolution image restoration based on separation is proposed and the algorithm of ally-template is introduced. This separation method reduces the complexity of calculation. The experiment proves the effectiveness of the proposed algorithm.

SaB11-5 17:05-17:25

一种新的集成模型在焦炉火道温度软测量中的应用
A New Integrated Model and Its Application to Soft-sensing of the Flue Temperature in Coke Oven, pp.3-282~3-286

陈泰任 中南大学
曹卫华 中南大学
吴敏 中南大学
雷琪 中南大学

本文在分析焦炉火道温度特性的基础上,提出了一种将基于时间差分法(TD)的Elman神经网络(TD-ENN)和基于线性回归(LR)的Elman神经网络(LR-ENN)专家集成的高精度焦炉火道温度软测量模型。首先,利用蓄顶温度和立火道温度的关系,分别建立了一元、二元和十二元LR模型,并采用Elman神经网络将三个模型的输出进行融合,通过比较证明该集成方法的有效性;利用基于时间差分法(TD)的Elman神经网络对LR-ENN模型的误差进行学习和多步预测;最后,采用专家经验将这两者进行集成,从而获得火道温度软测量值。实际运行结果验证了该集成模型的有效性。

Based on the features of coke oven flue temperature, a new integrated model combining temporal difference method (TD), linear regress(LR) and elman neural network (ENN) is proposed. Firstly, LR models with one variable, two variables and twelve variables are built base on the relationship between the flue temperature and top of regenerators' temperature, and rationally integrated by elman neural network (LR-ENN). Comparing to the unique LR models, the integrated model shows the good performance. Then modified elman neural network model based on the temporal difference method is used(TD-ENN). Through this model, the error of the LR-ENN is predicted multi-step ahead. At last, the flue temperature is get through the expert coordinator which is used to coordinate the outputs of LR-ENN and TD-ENN. The actual results confirm the integrated model's validity.

SaB11-6 17:25-17:45

Recursive Subspace Identification for Closed-loop Systems, pp.3-287~3-291

Jiang YuePing Chinese Acad. of Sci.
Fang Hai-Tao Chinese Acad. of Sci.

The problem of recursive subspace identification of state-space models in closed-loop is considered in this paper. A new recursive algorithm based on SA-PCA (Stochastic Approximation-Principal Component Analysis) is proposed to estimate a basis of the extended observability matrix in the noise-free case. The algorithm is evaluated by a simulation study

Chair: 李少远
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PSaA-1

基于小波变换和形态学的复杂背景文本定位
Text Location on Complex Background Using DWT and Morphology Operation, pp.4-467~4-471

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复杂背景下的文本定位有着广泛的应用前景,可以用于图像检索、视频检索等。但文本所处的背景的复杂性使得文本定位非常困难。本文提出一种基于小波变换和数学形态学的复杂背景下的文本定位算法。该算法首先对输入图像进行小波变换,在对小波变换后的垂直方向上的高频分量图进行二值化及规则限制。实验结果表明该算法快速有效。

Text location has wide applications, such as image retrieval, video retrieval, etc. However, it is not a trivial task because of the complexity of the background. In this paper, we propose a method for text location in complex background that is based on wavelet decomposition and mathematical morphology. Firstly, the input image is decomposed using wavelet. Then sub-image which corresponds to high frequency in vertical direction is binarised. Finally, prior knowledge is used to locate the text region. Experimental results show that the proposed method is fast and effective.

PSaA-2

直流电机调速系统的无模型学习自适应控制
The Model-free Learning Adaptive Control for DC Motor Rotate Speed Systems, pp.3-738~3-742

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将基于紧格式线性化的单入单出非线性离散时间系统的无模型学习自适应控制方法应用到直流电机速度系统中。控制器的设计是直接基于伪偏导数的估计,而伪偏导数信息则是通过新型参数估计算法利用直流电机系统输入输出的数据在线导出。硬件系统采用了数据采集卡控制直流电动机的实施方案。由通用PC连接数据采集卡,控制数据采集卡产生PWM波,驱动IGBT电路控制直流电动机调速。仿真和实际应用实验演示了该方法对这种难以建模和控制的电机系统的有效性和鲁棒性。

The model-free learning adaptive control (MFLAC) approach of a class of SISO nonlinear discrete-time systems based on linearization of tight format is applied to DC motor rotate speed systems. The design of controller is model-free, based directly on pseudo-partial-derivatives (PPD) derived on-line from the input and output information of the motor motion system using novel parameter estimation algorithms. Hardware system is implemented by Data Acquisition (DAQ) to control DC motor. Conjoined general PC to DAQ and controlled DAQ to produce Pulse-Width Modulation(PWM) wave which drive the IGBT circuit to control DC motor. The effectiveness and the robustness are demonstrated for the DC motor nonlinear systems which are known to be difficult to model and control by simulation and real-time application experiment examples.

PSaA-3

Image Segmentation Based on the Mean-Shift in the HSV Space, pp.4-476~4-479

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he mean shift based on the HSV space is proposed for the image could be exactly segmented in the color image. Because the correlation of HSV was very little, H,S and V separately are segmented based on the different step size. Because the correlation of the

RGB space is strong, the drawback being the image which could not be separately segmented by R,G and B was overcome. It is proved by experiment that the algorithm could get better result.

PSaA-4

A Line Detection Algorithm Based on Error Propagation, pp.4-493~4-496

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The line detection by traditional Hough Transform has two insufficiencies, one is computationally expensive and memory consuming, the other is the insufficiency of accuracy. The scheme adopts the principle of error propagation, analyses the error of line detection by Hough Transform in detail, and obtains the factors influencing the error. The error not only depends on the noise of the image, but also depends on the distance of the line to origin. A window is used to search the best-distinguished pixels and limit the scope transform. Basing on the best-distinguished pixels and error propagation, the algorithm can improve the accuracy of the line detection by experiment. The computational efficiency of the scheme is not very well because of analyzing the error and finding the best-distinguished pixels, but for the application of high accuracy, it works well.

PSaA-5

基于输入点集求解 k-Means 聚类算法

An Approximate Algorithm for K-Means Problem Based on Input Points, pp.4-500~4-504

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k-means 聚类是聚类划分中应用最广泛的一种方案,但是现在许多关于此问题的研究并没有给出近似比为常数的算法。本文给出了一个随机算法,该算法通过以不同概率选取初始 k 个点,保证了以一定概率分别属于不同最优聚类簇的 k 个点。以这 k 个点作为初始中心点对输入点集进行交换分别执行局部搜索算法,证明了可得到期望近似比至多为 2 的解。实验结果表明该算法能够取得较优的近似解结果。

The K-means clustering is one of the most popular schemes for discovering clusters in data. Its aim is to minimize the mean squared distance from each data to its nearest center. A lot of variants of Lloyd's heuristic have been studied. Unfortunately, many research results haven't given any approximate ratio. In this paper, an algorithm is presented which can obtain the optimal clustering with the ration of at most 2. The main idea of this algorithm is that K points are selected by means of a very simple, randomized seeding technique and then the local search is implemented to improve the accuracy. Some examples are selected to verify our algorithm and got better results both the speed and accuracy than the former methods. The main algorithmic contribution is that the input points are used as the candidate sets to obtain the optimal clustering with a constant ratio by means of local search technique and one method of selecting initial points.

PSaA-6

Generalized Fuzzy Enhancement Based Recognizing Method for Planar Objects, pp.4-505~4-509

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A new recognizing method for planar objects is proposed. Firstly, a generalized iterative fuzzy enhancement algorithm is proposed which consists of a three-stage procedure, i.e., image filtering, fuzzy enhancement and gray-level transformation. Secondly, a new objective image quality assessment criterion is suggested according to the statistical features of the gray-level histogram of images to control the iterative procedure of the proposed image enhancement algorithm. Thirdly, an improved labeling method for image

segmentation is given. Computer simulation results for a degraded gray image show that this proposed recognizing method is efficient.

PSaA-7

A Novel Kernel PCA Support Vector Machine Algorithm with Feature Transition Function, pp.4-510~4-512

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Based on the kernel function, this paper proposes an integrated classification method, combining the support vector machine (SVM) with kernel principle component analysis (KPCA), and its algorithm realization steps are also presented. Simulation experiment results show that the current approach has excellent classification performance, which is suitable for the pattern recognition and eliminate the influence of noise.

PSaA-8

双向 Boosting 模糊聚类集成

A Fuzzy Clustering Ensemble Based on Dual Boosting, pp.4-549~4-553

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聚类集成是解决聚类若干难题的有效手段。受分类集成 Boosting 和 k 中值聚类方法的启发,本文提出了一种双向 boosting 的聚类集成方法。在 boosting 迭代过程中,根据样本聚类的性能,产生新的样本子集,然后调用基本的模糊聚类方法对新的样本子集进行聚类,利用联合相似性矩阵集成聚类结果。最终的聚类结果是在近似矩阵的基础上调用基于距离的聚类方法产生。双向 boosting 的重点是产生的训练样本子集,不仅包含了难于聚类的样本,也包含了易于聚类的样本。在仿真数据和真实数据上的实验表明该方法聚类的准确率和稳定性较好。

Clustering ensemble is fit for any shape and distribution dataset. Boosting methodology provides superior results for classification problems. In the paper, A dual boosting is proposed for ensemble of fuzzy clustering. At boosting iteration, a new training set is created based on the original datasets' weights which is associated with the previous clustering. According the dual boosting method, the new training set not only includes the dataset which is hard to clustering, but also includes the data which is easy to cluster. The final clustering solution is produced by re-clustering based on the co-association matrix. Experiments on both artificial and real word data sets indicate that the dual boosting clustering ensemble provides solutions of improved quality.

PSaA-9

An Improved General Particle Swarm Optimization Algorithm for Fast Infrared Image Segmentation, pp.4-558~4-562

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The method of infrared image segmentation based on 2-D maximum fuzzy partition entropy is a typical integer programming problem with huge searching space and many local optima. In order to realize fast infrared image segmentation, an improved general particle swarm optimization algorithm is proposed. The algorithm is based on general particle swarm optimization, and it makes use of adaptive balance searching strategy. When the evolution stops, simulated annealing algorithm is introduced to select the current global optimum to be chaotic optimized for the sake of enhancing local searching ability and overcoming premature convergence. Experiment shows that the algorithm can get segmentation parameters quickly and accurately to realize fast infrared image segmentation.

PSaA-10

The Path Planning of Virtual Endoscopy Based on Image Segmentation, pp.4-567~4-570

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Path planning is a prerequisite task to automatically navigate with virtual camera and plays a crucial role in virtual endoscopy (VE) application. The path planning algorithm based on segmentation combines the center-line path with the image segmentation by using the result of image segmentation to reduce the complexity of path planning. The algorithm makes use of the connectivity-preserving features of sequence images and segments a series of images by applying the adaptive region growing algorithm. It stores the seed of growing region into the chain data structure as the key point of the navigation plan. Considering there are maybe some cavities after 2D segmentation, we propose a 3D region growing algorithm. The key point of navigation path is selected during segmentation, and the navigation path is obtained after smoothing those points. Experiment results show that our algorithm is effective and robust.

PSaA-11

基于 RJMCMC 的多维尺度分析维数选择
Choice of Dimension Using Reversible Jump Markov Chain Monte Carlo in the Multidimensional Scaling, pp.4-597~4-601

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多维尺度分析是模式识别与数据挖掘领域一个有力的降维工具。在贝叶斯多维尺度分析的基础上,我们将多维尺度的本质低维维数决定问题视作模型选择问题。在贝叶斯框架下提出一种可逆转跳马尔可夫链蒙特卡罗 (RJMCMC) 的算法,能在形成多维尺度分析的低维主坐标的同时决定本质维数。在仿真数据和真实数据上的试验结果验证了本算法的有效性。

Multidimensional scaling is a powerful tool for dimensionality reduction in the field of pattern recognition and data mining. Based on the bayesian multidimensional scaling (MDS), we consider the problem of determining the number of intrinsic low dimensions of MDS as a model selection problem. A Reversible Jump Markov chain Monte Carlo (RJMCMC) algorithm is proposed for performing low-dimensional coordinate and choice of dimension simultaneously within the bayesian framework. Experiments results on simulated data and real data are presented to demonstrate the effectiveness of our RJMCMC method.

PSaA-12

VSC Based on CMAC Neural Network for a Class of MIMO Nonlinear System, pp.4-6~4-9

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Based on the nominal model of the system, Cerebellum Model Articulation Controller (CMAC) is used for the variable structure control of a class of state feedback linearizable multiple-input multiple-output (MIMO) continuous-time nonlinear systems. By using adaptive law to estimate the error of estimation, the uncertainty of the system is reduced. The variable structure gain is tuned by the fuzzy logic. We design a controller that exploits the advantages of CMAC neural network, variable structure control (VSC) and fuzzy control theory, which improved the performance of the system. For this scheme, stable update laws are determined by using the Lyapunov theory, and the boundedness of all signals in the closed loop system is guaranteed. No prior offline-training phase is necessary. The simulation results verify the efficiency of the proposed approach.

PSaA-13

3D Variable Structure Guidance Law Based on Adaptive Model-

following Control with Impact Angular Constraints, pp.4-61~4-66

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This paper proposes a new three-dimensional guidance law for the impact angle control, using the variable structure control theory. In order to study the problem of the precision guidance, the three dimensional (3D) terminal motion of aircrafts is divided into the motion in the vertical plane and the bank plane. Then the decoupling control of the guidance law is designed independently. After the linear optimal guidance laws are designed with terminal multi-constraint conditions of miss-distance, impact trajectory inclination angle and impact trajectory rotation angle, we let the linear optimal model act as the referenced model and take the linear optimal input as the reality system's referenced input. According the model matching condition, the guidance parameters are updated by variable structure laws to ensure high precision in the impact angle conditions. Some simulations of the characteristic trajectory are performed. The simulation's results show the variable structure guidance law based on adaptive model-following control is not only satisfied with the need of precision guidance and impact angular constraints, but also have excellent trajectory in terminal guidance.

PSaA-14

执行器失效不确定时滞系统的指数稳定鲁棒 H_∞ 可靠控制
Robust H_∞ Reliable Control with Exponential Stabilization for Uncertain Delay Systems Against Actuator Failure, pp.4-634~4-638

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针对一类含有时变时滞的不确定参数线性系统,研究了在执行器发生故障情况下系统指数稳定鲁棒 H_∞ 可靠控制器设计问题. 经过适当的状态变换,将原系统的鲁棒可靠指数镇定问题转化为另一个等价系统的鲁棒可靠镇定问题. 根据 Lyapunov 稳定性理论,给出了系统存在指数稳定鲁棒可靠控制器应满足的一个矩阵不等式;给出了系统同时具有 H_∞ 性能指标应满足的另一个矩阵不等式. 论文将这两个矩阵不等式转化为两个线性矩阵不等式 (LMIs). 利用论文方法设计的指数稳定鲁棒 H_∞ 可靠控制器能够使得时滞系统对于任意允许的不确定性以及一个预先指定执行器子集中任意执行器失效都保持鲁棒可靠指数稳定,并且使系统具有指定 H_∞ 范数的干扰抑制能力.

The problem of robust H_∞ reliable control with exponential stabilization is investigated for time-varying delayed uncertain systems against actuator failures. By means of model transformation, the robust reliable exponential stabilization problem is reduced to an equivalent robust reliable stabilization problem. Based on Lyapunov stability theory, a sufficient condition of the existing of robust reliable controller with exponential stability is given. At the same time, another sufficient condition of the existing of robust reliable controller possessing H_∞ performance index is presented. Those conditions are transformed to two linear matrix inequalities (LMIs). The resulting control systems retain robust reliable exponential stability and disturbance attenuation with H_∞ norm bounds despite any outages within a prespecified subset of actuators.

PSaA-15

深海采矿移动机器人控制的关键技术
On Key Control Problems of Deep Seabed Moving Mining Robot, pp.4-660~4-663

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深海作业技术的研究具有重要的战略意义,采矿移动机器人的控制质量直接影响到深海计划的实施。由于深海未知环境和机器人本身的复杂性,采矿机器人的精确控制是一项艰巨的课题研究。本文指出了深海采矿机器人控制方面的一些关键技术问题并作出了分析,明

确了进一步研究的方向。

The research on deep seabed mining technology has important stratagem significance. Deep seabed moving mining robot influences the implementation of national ocean plan greatly. Accurate control of the robot is a hard task because of complex unknown environment in deep seabed and robot's own characteristics. Some key problems related to robot control on deep seabed and next research emphases are discussed.

PSaA-16

The Applications of Model PID or IMC-PID Advanced Process Control to Refinery and Petrochemical Plants, pp.4-699~4-703

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An advanced process control algorithm, namely, Model PID or IMC-PID based on Internal Model Control (IMC), is developed. They can be implemented on DCS. The original PID parameters need to be modified into IMC-PID parameters, which are calculated by the process models. It significantly increases the control speed and the accuracy, and also has good tracking ability for the set-point control, combining with improved robustness for disturbance and model's time-varying character. It had successfully applied to refinery and petro-chemical plants, and has potential wide applications on other plants also.

PSaA-17

工业硬实时控制嵌入式软件设计中的时间触发构架 (TTA) 机制 Time-Triggered Architecture (TTA) in Industry Hard R-T Embedded Control Software Design, pp.4-736~4-739

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传统的事件触发构架 ETA 难以满足安全性要求极高的工业硬实时控制, 本文研究了一种基于时间触发构架 TTA 的硬实时控制嵌入式软件设计模式; 重点研究了其中的基于 TTA 的任务调用原理和基于 TTA 的模式切换方法, 并且给出了具体的形式化描述和执行过程的时序图。

Conventional event-triggered architecture (ETA) can not meet the industry hard R-T control requirements in security field. This paper studies a hard R-T control embedded control software design mode based on TTA; discusses the task scheduling principle and mode switching method which are based on TTA; and give a series of concrete formalized description and the sequence chart of execution.

PSaA-18

Concurrent Design of Flexible Manipulator System, pp.4-744~4-749

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This paper discusses concurrent design methodology, considering the similarities to Multidisciplinary Design Optimization (MDO), Concurrent Engineering (CE), Structure and Control Integrated Design (SCID) and Mechatronic Design Method (MDM) in broad sense and narrow sense. Concurrent design of a single-link flexible manipulator system is performed as a case study. Simulation results demonstrate the effectiveness of the integrated design and optimization method over a mechatronic system.

PSaA-19

Robust Self-tuning IMC for Opto-electronic Tracking Time-delay System, pp.4-758~4-762

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Ji Wei

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Aiming at the measurement time-delay of image tracker and plant model uncertainty, a robust self-tuning internal model control (STIMC) strategy is designed for the opto-electronic (O-E) tracking system. Equations for designing the IMC controller based on gain and phase margin specifications are given in detail. The quadratic cost function is introduced to find an optimal solution for the controller parameter. The robust stability condition under plant/model mismatch is analyzed and some designing criterions for selecting controller parameter are obtained. The experimental results in the O-E tracking turntable are presented to verify the effectiveness of the proposed method in overcoming tracking error causing by measurement time-delay.

PSaA-20

无轴承同步磁阻电动机反馈解耦控制 Feedback Decoupling Control of Bearingless Synchronous Reluctance Motor, pp.4-763~4-767

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推导了无轴承同步磁阻电动机完整的数学模型, 其负载条件下径向悬浮力和电磁转矩之间以及径向悬浮力自身在两垂直方向上的分量存有相互耦合。针对其复杂的多变量、非线性、强耦合特性, 本文提出基于无轴承同步磁阻电动机实际参数的反馈解耦控制策略, 弥补了采用前馈补偿解耦控制完全依赖给定参数与实际参数精确匹配这一缺陷, 采用反馈解耦算法可成功解除了上述变量间的耦合关系, 构成的控制系统易于实现。仿真结果表明该解耦方法能实现无轴承同步磁阻电动机稳定悬浮运行, 可获得上述变量间优良的解耦效果, 同时电动机具有良好的动、静态控制性能。

The whole mathematics model of bearingless synchronous reluctance motor (BSRM) is derived. Under the load, the main problem is coupling between radial forces and electromagnetic torque, and between the two radial forces in two axes. The bearingless synchronous reluctance motor is a multivariable nonlinear strongly coupled system. In this paper, feedback decoupling control method based on the motor's actual parameters has been proposed, this method overcomes feed-forward compensation drawback that needs exact matching between given parameters and actual parameters, the coupling between those variables is canceled by using feedback decoupling, and the control system can be realized easily. The simulation results have validated that stable suspension operation and excellent decoupling control effect can be achieved, and good dynamic and static control performance of the motor can be also obtained.

PSaA-21

商品混凝土企业集成系统研究 On Integrated System for Commercial Concrete Enterprise, pp.4-769~4-773

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在深入分析当前国内商品砼生产、控制和管理模式的前提下, 针对典型流程工业商品混凝土行业中普遍存在的生产与管理严重脱节、有效资源得不到充分利用、生产配料精度不高等问题, 率先将企业资源计划系统 (ERP) / 生产执行系统 (MES) / 过程控制系统 (PCS) 三层架构概念理论应用到商品砼企业中, 设计并实现了商品砼综合自动化系统, 最后分别从智能化、集成化、网络化三个方面对商品砼行业做了深入的研究。

Aiming to solve the prevalent problems such as the manufacture breaks away seriously from the management, resources not fully effective used, low production batching accuracy in the typi-

cal process industry—commercial concrete enterprise, This paper presents a systematic approach to develop the CIMS based on the three-layer Enterprise Resource Planning(ERP)/Manufacturing Executive System(MES)/Process Control System(PCS) architecture for the Concrete-Mixing station enterprise. Based on the deeply analysis of the production ,control and the administration pattern of the current Commercial Concrete, We designed and realized the CIMS in commercial concrete industry, Followed by the detailed statements of the system intelligent ,system Internet-based and the System Integrated .

PSaA-22

流程工业 PCS 与 MIS 数据集成技术研究与应用

PCS and MIS Data Integration in Process Industry, pp.4-787~4-790

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本文针对水泥生产的工艺特点,提出了水泥工业过程控制系统(PCS)和管理信息系统(MIS)集成的信息模型,并以某水泥厂为例,详细讨论了其 PCS(上位机采用 FIX 组态)与 MIS(数据库采用 SQL Server)进行信息集成的方法和实现技术。最后给出了一个成功的实现案例。

Based on the craft characteristics of cement production, this paper comes up with an information integration model of Process Control System(PCS) and Management Information System(MIS) for cement industry. Taking some cement plant as an example, it discusses in detailed method of information integration between its PCS (epigynous machine adopts FIX configuration) and MIS (database adopts SQL Server) and realization technology. Finally it gives a successful realization case.

PSaA-23

基于 Petri 网的企业信息化系统统一建模研究

A Petri Net Based Unified Modeling Method for Enterprise-Informationization System, pp.4-791~4-795

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通过分析 Petri 网在企业信息化系统中各个方面的应用,结合 AMR 企业信息化系统体系结构,讨论基于 Petri 网的系统不同层次建模方法。研究表明,以 Petri 网作为统一模型为系统建模,可以解决目前系统不同部分模型各异所带来的系统集成等方面的难题。

The application of Petri net in modeling Enterprise-Informationization System was investigated. The problems to model different system layers by Petri net in AMR Enterprise-Informationization System were discussed, corresponding methods were presented. Using different kinds of models in the same system is the main reason which brings problems such as the difficulties occurred in system integration. The research shows that Petri net can work as a unified model of Enterprise-Informationization System, this helps to overcome above problems.

PSaA-24

CIM 应用的扩散模型分析

Diffusion Model Analysis on the CIM Application, pp.4-796~4-800

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CIMS 是 CIM 哲理的应用,也是 CIM 哲理创新扩散的结果。为了对 CIM 哲理的扩散过程进行模拟,在 Bass 创新扩散模型的基础上,建立 CIM 应用扩散行为的非线性系统模型,并对模型的稳定性进行定量分析,给出定性分析结果。随后,对非线性模型进行模拟仿真,仿真结果与定性分析一致。这一模型有助于企业分析 CIM 应用的实施情况与发展趋势,进行正确的决策,从而提高自身竞争力。

Computer Integrated Manufacturing System (CIMS) is the application of CIM philosophy, as well as the innovational diffusion of the

CIM philosophy. To simulate the diffusion process of the CIM philosophy, a nonlinear model is established based on Bass Model. Then the stability of the model is analyzed, and qualitative results are given. And then, the nonlinear model is simulated, and the results are consistent with the qualitative results. The diffusion model is helpful for enterprises to analyze the implementation and trend of the CIM application, make correct decision, and improve the competitive power.

PSaA-25

基于扩展卡尔曼滤波器的无速度传感器异步电动机直接转矩控制
Speed-sensorless Direct Torque Control for Asynchronous Machine Based on Extended Kalman Filter, pp.5-10~5-13

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针对直接转矩控制系统特点,以定子侧变量为状态量建立扩展卡尔曼滤波器的状态方程,为满足实时控制的需要,建立了实时预测和滤波迭代算法,通过定子电流与电压值就可辨识出速度和定子磁链。实现无速度传感器的异步电动机直接转矩控制,仿真结果表明,扩展卡尔曼滤波器对速度的辨识准确性较高,具有很好的鲁棒性。

In allusion to the characteristic of direct torque control system, the state equation for extended Kalman filter was established by stator variables. The real-time forecasting and filtering iterative algorithm were founded in order to real-time control. Speed and stator flux can be discerned through the stator current and voltage, and the speed-sensorless direct torque control for asynchronous motor was realized. Simulation results show that the speed have a high accuracy and a good robustness.

PSaA-26

高性能直线/圆弧插补的设计与对比

Comparison and Design of High Performance Straight-Line and Circular Arc Interpolations, pp.5-14~5-18

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通过以一个平面四分之一椭圆弧为例,针对期望精度的要求分别采用直线插补和圆弧插补逼近目标曲线来研究不同插补方法所具有的性能。直线插补采用基于曲率圆模型的等误差法和等参数增量法;圆弧插补采用基于 min-max 逼近的最优圆弧插补和以多边形为中介的双圆弧插补。通过不同插补方法的求解过程,从插补点数的多少及轨迹的连续性两方面来分析参数对误差的影响,以及不同插补方法对运动控制精度的影响。

Several interpolation methods performance are studied and compared. A quarter of a planar ellipse arc is used to be the desired objective curve. Straight-line and circular arc interpolations are used to approximate such desired curve to a specified tolerance. In straight-line interpolation, constant error approach and constant parameter increment based on the model of curvature circle are used. In circular arc interpolation, optimal circular arc interpolation based on the principal of min-max approximation, and the bi-arc interpolation with a polygon approximation are used. The effect of error is analyzed by mean of the number of interpolation points and the continuity of trajectory. The effect on motion control accuracy is also analyzed by different solving methods.

PSaA-27

无轴承异步电机转子磁场定向控制研究

Rotor Magnetic Field Oriented Control for Bearingless Induction Motors, pp.5-19~5-22

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实现无轴承异步电机电磁转矩和径向悬浮力之间的解耦控制是其稳

定悬浮工作的关键. 本文介绍了无轴承异步电机基本工作原理, 给出了径向悬浮力和电机旋转部分的数学模型, 并采用转子磁场定向控制方法设计了无轴承异步电机矢量控制系统, 利用 Matlab 对该控制系统进行了仿真. 仿真试验表明该控制系统不仅可以实现转子稳定悬浮, 而且实现了径向悬浮力和旋转力矩之间的解耦控制, 电机具有良好的动静态性能.

The decoupling control of torque and radial suspension forces is the key technology of the stable operation for a bearingless induction motor. In the paper, the principle of bearingless induction motor is expounded. The mathematics models of radial suspension force and the rotation part on a bearingless induction motor are given. A control system based on rotor magnetic field oriented control is designed. The control system is simulated with Matlab software. The simulation results have shown that the rotor can be suspended steadily, torque and radial suspension subsystems can be controlled independently, the control method is valid and the control system has good static and dynamic performance.

PSaA-28

开关磁阻电机的模糊自适应 PID 控制

Fuzzy Logic Based Adaptive PID Control of Switched Reluctance Motor Drive, pp.5-41~5-45

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开关磁阻电机的高度非线性特性使得采用经典的 PID 控制难以取得较好的控制效果. 为此, 本文将模糊逻辑与 PID 控制相结合构成模糊自适应 PID 控制策略, 根据系统响应过程中的误差及误差变化, 按由专家知识和操作者的经验总结的模糊整定规则对 PID 控制器的参数进行在线自适应调整. 模糊自适应 PID 控制策略兼具模糊逻辑控制和 PID 控制的优点, 具有控制灵活、适应性强、可采用专家知识、鲁棒性强、不需被控系统的数学模型及控制精度高等优点. 实验结果证明, 采用这一控制策略对非线性严重的开关磁阻电机取得了较好的控制效果, 系统动态响应快, 超调小, 稳态精度高, 系统具有较强的抗扰动能力, 鲁棒性强.

The severe nonlinearity of switched reluctance motor (SRM) make it hard to get a good control performance with the conventional PID controller. Therefore, in this paper, fuzzy logic based adaptive PID control strategy is developed. According to the error and change-in-error in the transient period, parameters of the adaptive PID controller are tuned on online according to fuzzy logic tuning rules which are summarized from the expert's control knowledge and operator's experience. Fuzzy logic based adaptive PID controller has the merit of both fuzzy controller and PID controller. It has the advantage of flexibility, adaptive, expert knowledge based, robustness, model free and high control precision. Experimental results demonstrate that a good control performance is achieved. The system responds quickly with little overshoot. There is no error at steady state. The system shows a strong ability to reject disturbance and a strong characteristic of robustness.

PSaA-29

An Application of Fuzzy Logic Controller for Switched Reluctance Motor Drive, pp.5-50~5-53

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This paper develops a fuzzy logic controller (FLC) for the speed control of switched reluctance motor (SRM) drive. The advantage of this method is that the proposed FLC has the characteristics of robustness, nonlinearity and facility to take advantage of human control knowledge. In this paper, the inputs and output of the FLC are described. Also, the principles of the fuzzy logic control are given. The universe of discourse of error, error in change and output are given. The control rule base in the form of linguistic rule is given. The control rule surface is given. The experimental tests are carried out for the proposed FLC. The experimental results demon-

strate that the proposed FLC presents a better performance than the conventional PID controller.

PSaA-30

基于 ARM 的机器人运动控制系统

A Robot Motion Control System Based on ARM, pp.5-54~5-57

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机器人的关键技术之一是运动系统的控制, 为了提高机器人的性能, 本文用集成了嵌入式处理器 ARM 以及 FPGA 的芯片器件 EPXA10 设计了机器人运动控制系统. 提出了一种基于 FPGA 与嵌入式处理器 ARM 的机器人运动控制方法. 硬件部分给出了系统设计图并简述了控制过程, 软件部分给出了中断服务流程以及电机的 PID 控制流程图. 研究证明, 采用嵌入式芯片 EPXA10 的机器人运动控制系统较传统控制系统在可靠性、小型化、功耗、性价比等方面都具有明显的优势. 运动系统也可以扩展出远程的网络控制功能.

The key technology of robot is motion control system. In order to improve the performance of robot, a robot motion control system was designed based on EPXA10 which has integrated FPGA and the imbedded processor ARM. A method for robot motion control system based on FPGA and the embedded processor ARM is presented in this paper. The hardware segment depicted the whole plan for the system and the controlling process, while the software segment planed the ISR flow and the PID-control flow of micro-motors. Study proved that, comparing with conventional control, this control system will have obvious superiority at aspects of reliability, miniaturization, power consumption, and performance/ price ratio. The remote control function of the motion system can be extended based on ARM.

PSaA-31

大气隙直线感应电机矢量控制系统建模与仿真

Modeling and Simulation of Field Oriented Controlled Large Air-gap Linear Induction Motor, pp.5-87~5-91

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大气隙直线感应电机 (气隙长度大于 10mm) 目前已经在地铁、轻轨中得到了很好的应用, 其在低速磁浮领域也将会有很好的应用前景. 它与小气隙直线感应电机有很大不同, 因此需要对该类型电机的特性以及驱动有较深入的研究. 本文在直线感应电机 DUNCUN 等效电路的基础上, 借助有限元分析, 获得等效电路参数, 进而建立了大气隙直线感应电机的等效电路模型. 在此基础上建立了大气隙 LIM 考虑动态纵向端效应的矢量控制系统仿真模型, 通过仿真分析, 对矢量控制系统中比较关键的问题进行了探讨. 结论将为此类型电机控制系统设计提供参考.

The large air gap linear induction motor (air gap length is greater than 10mm) is well used in metro, light rail now, and also will have a nice future in Low-speed Maglev Vehicle. There are many difference between large air-gap linear induction motor and the small air-gap ones. It is necessary to do some research for the characteristics and driven technique of large air-gap linear induction motor. The paper introduced the DUNCUN equivalent circuit model for linear induction motor. By implementing FEM analysis of one large air-gap linear induction motor, the parameters for the DUNCUN equivalent circuit model were extracted. Then taking dynamic longitudinal end effect of this LIM into consideration, the secondary flux oriented control simulation model of this LIM is developed. Via simulation analysis, some of the key points about field oriented control was discussed. As a result, they can supply some good tips to driven system design of this kind of motor.

PSaA-32

Cooperative Control for Target Search, Classification and Attack for AUAVs(Attack Uninhabited Air Vehicles), pp.5-99~5-102

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The purpose of this research is to investigate the effectiveness of a team of AUAVs in various scenarios using cooperative behavior algorithms. The search-theoretic approach based on "rate of return" maps is developed the cooperative search strategy that guides the movement of a group of AUAVs so as to get as close to optimal non-implementable search plan as possible. Templates are developed and views are combined to maximize the probability of correct target classification over various aspect angles. A false classification matrix is used to represent the probability of incorrectly classifying false targets as target. The approach is illustrated by use of a simulation test bed for a team of 8 searching AUAVs and 50 Monte Carlo simulation runs for each scenario to evaluate the cooperative control strategy relative to the non-cooperative cases.

PSaA-33

A Study of Autonomous Parking for a 4-Wheel Driven Mobile Robot, pp.5-179~5-184

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This paper deals with the autonomous parallel parking problem of a car-like 4-wheel driven mobile robot. The parking problem corresponds to the point-stabilization problem of nonholonomic system. In this paper, we propose an efficient algorithm for the problem with stability analysis. Also we show parking problem simulation which proves the effectiveness and stability of the algorithm. In the simulation, MFC is utilized with various parking conditions. Using this algorithm, a car-like mobile robot could be controlled to move to a desired posture within a prescribed boundary. The developed system which integrated the control algorithm for parking tested with car-like mobile robot through simulations and experiments.

PSaA-34

*移动机器人航迹跟踪控制律设计与仿真平台开发
Control Law Design of Mobile Robot Trajectory Tracking and Development of Simulation Platform*, pp.5-198~5-202

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本文讨论差速转向移动机器人自动行驶控制。通过对移动机器人进行动力学分析,确定了机器人运动状态的约束条件;针对移动机器人在行驶状态中存在的不确定因素,提出了一种新颖的模糊控制方法。构建了基于 ADAMS 与 MATLAB 的移动机器人联合仿真平台,以 iRobot ATRV2 型移动机器人为例,利用随机数字序列和功率谱密度函数建立了行驶道路模型,跑车仿真试验证明了本文提出的模糊控制方法的有效性。

Autonomous steering control of wheeled skid-steer mobile robot is focused on. According to dynamic analysis on the robot motion, kinematic constraints of the robot motion is put forward. As uncertain control factors exist during the robot running state, a novel fuzzy control algorithm is proposed. Based on ATRV2 mobile robot and its running environment information, using random number sequence, power spectra density function and virtual prototype technology, ADAMS and MATLAB co-simulation platform is built up, and the robot simulation running experiment is performed in the environment. At the same time, the simulation results show that the fuzzy control algorithm is robust and effective for the mobile robot control.

PSaA-35

*非完整性约束下移动机器人带虚拟障碍物的路径规划
Virtual Obstacle Based Approach to Path Planning of Mobile Robot with Nonholonomic Constraints*, pp.5-207~5-211

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通过设置虚拟障碍物的方式描述路径规划中的非完整性约束问题,在移动机器人等系统因受到非完整性约束而无法运动的方向设置虚拟的障碍物,约束系统的运动方向和姿态,使得路径规划结果具有完全的运动学可跟踪性能,有效的解决了移动机器人导航中的泊车位姿和平行停车等问题。

The nonholonomic constraint in path planning is described by setting virtual obstacles. Virtual obstacles are supposed to limit the motion direction and posture in the directions that the robots or vehicles cannot move under nonholonomic constraints. The results of path planning based on virtual obstacle are kinematics traceable. And the parking posture and parallel parking in path planning of mobile robot are solved.

PSaA-36

Water Level Control of Boiler Drum Using One IEC61131-3-Based DCS, pp.5-252~5-255

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The drum water level is a very important parameter of the boilers in power plants. One method, using FBD language in IEC61131-3 to implement the water level control system on the platform of the 893-DCS, is probed. On the basis of the description of the IEC61131-3-based DCS and the analysis of the dynamic process of the boiler drum water level, the two-level-tracking technology of the no-disturbance switch and the dead band approach in the control system are presented and discussed in detail. The good applications have proved that this water level control system is one reliable and open system.

PSaA-37

*GDSCS 任务调度的 SPN 模型研究
SPN Modeling for GDSCS Task Scheduling*, pp.5-256~5-260

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合理容错的调度机制是有效利用网格资源;保证应用任务执行生命的关键因素。针对基于网格环境下的分布式控制系统(GDSCS),提出了二级任务调度系统框架:系统调度器将所有上传任务按功能或属性分类排序,再分派局域调度器选择资源分配任务,由其在任务进程中动态调度节点资源及容错处理。针对分布式控制系统完全独立与不完全独立两种类型的子任务,对局域调度器建立了具有容错机制的 SPN 模型,给出了完全独立子任务的选择策略;分配策略,提出非完全独立子任务的动态调度思路。

Reasonable and fault-tolerance scheduling mechanism is the key factor of effective use the grid resource and guarantee the implement of applicable task. For Grid-based Distributed Control System (GDSCS), this paper introduces the two-level task scheduling system frame: System scheduler sorts all upload tasks by functions or attributes, then assigns local area scheduler to dispatch tasks to resource nodes, and handles fault-tolerance dynamically during the process of task. Considering two types subtask of complete independence and non complete independence of GDSCS, establishes a fault-tolerance mechanism model by Stochastic Petri Nets (SPN) for local areas scheduler, describes the complete independent sub-task dispatching and allocating policies, and proposes a dynamic

scheduling train of thought of non complete independent subtask.

PSaA-38

Output Feedback of Model-based Networked Control Systems with Multi-rate Input Sampling, pp.5-269~5-272

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In this paper, control problem of model-based networked control systems (MB-NCSs) with multi-rate input sampling is considered. Two classes of transmission policies termed as perfect transmission and delay transmission are investigated. Output feedback control of the system under the two transmission policies are studied respectively. Necessary and sufficient conditions for system to be globally exponentially stable are derived.

PSaA-39

基于令牌总线的网络控制系统中信息的优化调度
Optimal Scheduling Algorithm for Messages in Networked Control Systems Based on Token-Bus, pp.5-288~5-291

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针对网络控制系统中的信息调度, 本文分析了网络控制系统中信息的特性, 给出了信息模型, 并分析了信息之间的相互关系。基于此采用了非抢占 EDF 算法调度进行信息调度, 并给出了该算法基于令牌总线的实现方法。分析了信息的可调度性, 给出了信息可调度性的判断条件。根据各子信息之间存在的相互关系, 对子信息时限进行了优化, 以提高网络的极限利用率。仿真结果表明本文给出的方法是有效的。

For scheduling messages in networked control system (NCS), the characters of messages in NCS are analyzed firstly in this paper. The message models are given and the relationship of messages is studied. Non pre-emptive EDF (earliest deadline first) is selected for scheduling messages and the method for realizing the scheduling algorithm is presented based on token control. The schedulability of messages is investigated and schedulable condition is given. According to the relationships of submessages, the submessage deadlines are optimized to increase the maximal utilization of network and the algorithm for computing optimal deadlines is prevented. The simulation results show that the algorithms prevented in this paper are effective.

PSaA-40

Create Multi-dimension Linked Lists on Recursive Algorithm and the Application, pp.5-336~5-339

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Multi-dimension linked lists is a new data structure, which has powerful function and well visiting performance. It can be applied in scientific computing analysis, image processing, database index and so on. With the development of computer science, multi-dimension linked lists may be applied in other rectangular coordinate system's spatial expression and multi-dimension linked lists recursive algorithm will give us very large significance. By the research of multi-dimension linked lists in this paper, it would be given out of the mathematical model and recursive algorithm of multi-dimension linked lists.

PSaA-41

结合图像信息的污染企业选址研究
On Location Selection for Contaminative Factory Based on Image Processing, pp.5-340~5-343

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传统的选址空间决策支持系统的数学模型难以考虑图像信息等选址影响因素, 因而模型存在一定缺陷。利用图像处理技术和粒子群优化算法, 本文提出了一种结合图像信息的污染企业选址算法, 可以充分利用 GIS 的空间和非空间信息, 且考虑的因素更为全面, 是对选址决策支持系统数学模型的改进。

In establishing the location selection mathematical model in spatial decision support system, the conventional methods have deficiencies in dealing with images. To improve the mathematical model, in this paper, based on the image processing and particle swarm optimizers, a new method is introduced to the research of spatial decision support system for location selection of contaminative factory. As a remarkable improvement on the conventional methods, the mathematical model can be easily established by fully utilizing positional information and attribute information in GIS.

PSaA-42

车载 SINS/GPS 紧组合导航算法研究与实现
SINS/GPS Tightly Integrated Navigation Algorithm for Land Vehicle Applications, pp.5-400~5-403

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针对车载 SINS/GPS 组合导航应用, 研究了基于运动约束的自适应卡尔曼滤波算法。该算法采用伪距、伪距率的紧组合导航方案, 在卫星少于 4 颗时, 仍能进行组合导航计算; 充分利用车辆的运动约束, 建立了载体速度约束和位置约束的观测方程; 应用带遗忘因子的自适应卡尔曼滤波算法, 提高了系统的鲁棒性。动态车载实验表明, 基于运动约束的自适应卡尔曼滤波算法有效地提高了系统性能, 相对于传统的卡尔曼滤波算法, 定位精度提高了 4.86 倍, 速度精度提高了 1.23 倍。

This paper discusses the design of SINS/GPS adaptive Kalman filtering algorithm based on motion constraints for land vehicle applications. The algorithm adopts the architecture of tight integration which can continue to work even with no more than four GPS satellites. The vehicle motion constraints enhance the observation of the integrated navigation when satellite is outage. Adaptive Kalman filter with forgetting factor improves robustness of the integrated system. Some experiments are carried out and the results show that the proposed algorithm advances the performance of SINS/GPS integrated system. It gains better position accuracy 4.86 times and better velocity accuracy 1.23 times than traditional Kalman filtering algorithm.

PSaA-43

Data-Fusion Techniques in Hard Shoulder Monitoring System, pp.5-413~5-416

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This paper describes the development of a Hard Shoulder Monitoring System (HASMOS), capable of combining the data from the two independent sensor systems with the aim of improving overall system performance. The data-fusion algorithms that form the core of the system are described in detail, together with the development work being undertaken to bring the system from its initial proof-of-concept form to a deployable pilot system. Following comprises the trial of the system, using simulated data generated by a software model and real data obtained from off-road and on-road trials, and subsequent refinement of the system analysis of the trials.

PSaA-44

劣化系统的故障诊断和检测策略的综合研究
On Fault Diagnosis and Inspection Policy for Deteriorating System, pp.5-477~5-481

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研究系统的故障诊断和检测策略问题. 假定系统有两种工作状态(正常、异常)和一种故障状态. 每隔一段随机时间检测一次系统. 检测目的是通过诊断参数的观测值, 确定系统的状态并采取适当的维修措施. 由于系统的劣化和巨额的更换费用, 在对系统进行更换之前, 先进行修复非新的维修. 利用概率分析和向量 Markov 过程方法推导出系统的各种可靠性指标, 并求出诊断参数的最优临界值和最优检测周期. 该最优值使稳态收益率最大. 数值算例说明这种方法是可行的.

The fault diagnosis and inspection policy were discussed for a system which has two operating states (normal, abnormal) and a failure state. The system is inspected periodically. The purpose of inspection is to identify the state of system and adopt appropriate repair strategy by measuring the value of diagnosis parameter. Because the system is deteriorated gradually and a replacement is expensive, several imperfect repairs are allowed until a replacement is needed. The objective of this paper is to determine the optimal critical value of diagnosis parameter and the optimal inspection cycle such that the expected profit per unit in steady states is maximized. Reliability indexes of the system are also derived. Probability analysis and vector Markov process are used in this paper. Researches on the numerical example show the feasibility of the policy.

PSaA-45

基于核函数和概率神经网络的 TE 过程监控研究

Nonlinear Process Monitors Method Based on Kernel Function and PNN, pp.5-511~5-515

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核主元分析方法是利用核函数计算高维特征空间的主元成分, 从而把输入空间中的非线性问题转化为特征空间中的线性问题. 虽然核主元分析方法在故障检测方面明显优越于线性 PCA, 但故障辨识问题仍一个难题. 本文提出了一种基于核函数梯度算法和概率神经网络的新型非线性故障诊断方法. 首先利用核函数梯度算法进行故障特征提取, 然后采用概率神经网络进行故障模式识别, 完成故障辨识过程. 最后以 Tennessee Eastman (TE) 化工过程的 15 种故障模式为例, 通过仿真实验证明 KPCA-PNN 方法可保持较高的故障诊断率, 体现了该网络具有令人满意的故障诊断能力.

Kernel PCA can efficiently compute principal components in high-dimensional feature spaces by means of nonlinear kernel functions. Therefore, the nonlinear problems are translated into the linear ones in the space high-dimension feature space. Although it has been proved that KPCA is superior to linear PCA for fault detection, the problem of fault identification theoretically has yet been a puzzle. A new fault detection and identification method based on the gradient arithmetic of kernel function and probabilistic neural network (PNN) for nonlinear system is developed. The gradient arithmetic of kernel function is used to extract the main features of faults firstly. Then, probabilistic neural network is used to identify the fault variables. To demonstrate the performance, the proposed method is applied to Tennessee Eastman processes. The simulation results under 15 fault modes of TE process show that the proposed method effectively identifies the source of various types of faults.

PSaA-46

Vibration Fault Detection and Diagnosis Method of Power System Generator Based on Wavelet Fractal Network, pp.5-520~5-524

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A novel fault diagnosis method for turbo-generator set based on fractal exponent theory and wavelet network is presented. When faults occur, they usually produce nonstationary vibration signals. The wavelet transform is used to localizes the characteristics of vibration signal in the time frequency domains and in a view of the inter relationship of wavelet transform between fractal theory, the whole and local fractal exponents obtained from wavelet transform coefficients as features are presented for extracting fault signals, which are inputted into radial basis function for fault pattern recognition. The improved Levenberg-Marquardt(LM)optimization technique is used to complete the network structure parameters. By means of choosing enough samples to train the fault diagnosis network and the information representing the faults is input into the trained wavelet network, and according to the output result the type of fault can be determined. The practical diagnosis for stator temperature fluctuation and rotor vibration demonstrates that the wavelet fractal network can provide an effective way to diagnosis faults for turbo-generator set in power system.

PSaA-47

The Research and Application on Wavelet Energy Eigenvalues of a Faulty Generator Set, pp.5-530~5-534

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I studied the fault feature of the generator set and the characteristics of wavelet packet theory for signal de-noising, and give a method of "energy-fault". The vibration signal of the generator set in different states is analyzed by using the signal re-construction technique of the wavelet packet theory. The time domain method is given for the generator set fault diagnosis. The analysis shows, the "energy-fault" diagnosis which is based on wavelet theory is dependable and applied in the vibration fault diagnose of the generator set, and is a good assistant of fault diagnostic. The experiment results show that the wavelet packet theory can be used to directly identify the state of the generator set, and provide a credible new idea for complex machinery fault diagnosis.

PSaA-48

Traffic Flow Forecasting Based on Fuzzy-Neural, pp.4-391~4-394

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Fuzzy systems can be excellently used to represent human knowledge. Traffic technology is a science where this property of fuzzy logic can be used very well because it is hard to make mathematical models due to human influences and complex connections between input parameters. This paper applies a novel Fuzzy Cerebella-Model-Articulation-Controller (FCMAC) into univariate time-series forecasting and investigates its performance in comparison to established techniques such as the Box-Jenkin's ARIMA model. Experimental results from Pudong New Strict in Shanghai traffic flow data reveal that the FCMAC model yielded lower errors for certain data sets. The conditions under which the FCMAC model emerged superior are discussed. Furthermore, we show how neural networks can be used to improve the performance of the system.

PSaA-49

On Remote Real-time Communication Between MATLAB and PLC Based on OPC Technology, pp.5-545~5-548

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Aiming at the communication between MATLAB and PLC, the paper presents a method of implementing remote real-time communication based on OPC (OLE for Process Control) on the Ethernet. It analyzed the principle of remote real-time communication

between MATLAB and PLC and designed a remote real-time communication test system consisting of MATLAB, Ethernet and S7-300 PLC. The author realized the S7-300 PLC hardware configuration, OPC server configuration, configuration variable and real-time data exchange between MATLAB and S7-300 PLC by using MATLAB OPC toolbox, and gave out the details of procedure and program. The test results indicate that the function of exchanging remote real-time data can be attained between MATLAB and S7-300 PLC through OPC server, and prove that it is an effective and feasible method to realize the real-time remote communication between MATLAB and PLC. The proposed method can be used to realize data process and advanced control in industrial to improve the quality of control.

**Poster Session PSaB
July 28, 16:30-18:00**

Chair: 胥布工 华南理工大学
Co-Chair: 楚天广 北京大学
Co-Chair: 周彤 清华大学

PSaB-1

网络化控制系统的转换控制

Switched Control of Networked Control Systems, pp.5-549~5-552

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对于网络诱发延迟大于一个采样周期的网络化随机控制系统,在分时算法控制模式下当系统的延迟很大数倍于采样周期时,其LQG最优控制器的求取变得非常复杂,工程上难以实现,为解决这个问题,本文提出了一种基于 α -置信度的转换控制法,针对时延的不同情况对系统进行分段控制,分别采用不同的控制器,达到改善系统性能的目的,仿真结果验证了文中理论的有效性。

Under a time-division algorithm control mode, when the network-induced delay in networked control systems with multi-step delay is too long, the derivation of LQG optimal control law is very difficult in engineering. In order to solve this problem, a switched control method based on Credibility is proposed. A piece-wise control method based on various time delays is used to improve the performance of the networked control systems. Simulation result verifies the validity of the proposed theory.

PSaB-2

网络控制系统采样速率和时延抖动稳定性分析

Stability Analysis of Network-Based Control Systems Subject to Jitter of Sampling Rates and Time Delays, pp.5-567~5-570

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网络控制系统中,通讯网络会引起控制环路时延,网络带宽分配(调度)技术引起采样速率改变,不规则采样和时延抖动会影响闭环系统稳定性能。本文将在有界区间范围内抖动引起的时变不确定性描述为系统的离散时间闭环区间状态矩阵,通过对单个时不变矩阵范数的判断,导出区间系统鲁棒稳定的充分条件,仿真算例表明该判断简单易实现。

In the network-based control systems, the insertion of the communication network introduces time varying delays in the control loop, the application of dynamic bandwidth allocation/scheduling techniques may introduce varying sampling rates for each control loop, varying sampling rates and time delays may degrade the stability of control loops. This paper represents these bounded time uncertainty as a discrete-time closed-loop interval matrix, and derives a robust sufficient stability condition based on evaluating the norm of a time invariant matrix. Simulations show that our result is simple and efficacious.

PSaB-3

存在数据包的NCS状态预估控制设计与稳定性分析

Stability Analysis and State Predictor Design of the NCS with Data Packet Dropout, pp.5-584~5-586

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本文针对存在数据包丢失现象的网络控制系统,根据更新控制器采用的信息不同,比较了两种不同的处理方法,进行了稳定性分析,提出了基于状态预估的控制器设计方法。并在数据包丢失率一定时,建立了网络控制系统的动态系统模型,并分析了网络控制系统的指数稳定性,通过仿真实例验证了结论的正确性。

In view of the NCS with data packet dropout, according to which information controller update, this paper compare two different solution, and give each a stability condition in the form of LMI. proposes a method to design controller which based on state prediction. With data-packet dropouts rate constant, set up a dynamical system model for NCS and analyze the exponentially stability of NCS. Also simulation examples are given to illustrate the validity of the results.

PSaB-4

Energy Efficient Routing Protocol Based on Residual Energy and Energy Consumption Rate for Heterogeneous Wireless Sensor Networks, pp.5-587~5-590

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This paper investigates a heterogeneous sensor network with two different types of nodes possessing same initial energy but sending different length data packet to base station. It is found that conventional routing protocols can not finely adapt the network model we proposed, therefore, an energy efficient routing protocol based on residual energy and energy consumption rate (REECR) is proposed. Simulation results show that the algorithm proposed balances the energy consumption better compared with conventional routing protocols and achieves an obvious improvement on the network lifetime.

PSaB-5

网络拥塞控制算法的动态分析

Analysis on Dynamics of Congestion Control Algorithm, pp.5-595~5-598

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研究了一类具有通信时延的基于速率的点对点TCP-Like拥塞控制算法。通过分析拥塞控制算法的特征方程,得到了保证系统稳定的通信时延的临界值。应用时滞系统的中心流形定理和规范性理论,进一步分析了拥塞控制算法在通信时延临界值附近的动态行为,最后通过数字仿真验证了结论的正确性。本文的研究结论揭示了通信时延对Internet网络服务质量的影响。

A class of end-to-end rate-based TCP-Like congestion control algorithms with communication delays is studied. A critical value of the delay to ensure the stability of Internet is presented by analyzing the characteristic equation of the congestion control algorithm. By applying the center manifold theorem and the normal form theory, the dynamics of the algorithm is discussed around the critical delay value. Finally, a numerical simulation is used to verify the theoretical results. These conclusions show the effect of communication delay on the quality of service (QoS) of Internet.

PSaB-6

一种基于P2P技术的Gnutella网络的资源定位搜索算法的研究

Improved Resource Discovery Algorithm on Gnutella Based on P2P Networks, pp.5-599~5-602

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在分析和总结当前有关 Gnutella 网络资源搜索算法的基础上, 提出了一种新的基于路由搜索算法。该算法能最大限度地减少 Gnutella 网络中因采用泛洪搜索算法所造成的大量冗余搜索信息, 从而最有效地抑制了网络中冗余搜索信息流量的增加, 并且该算法还较好地解决了搜索查询过程中系统信息的完整性, 提高了 Gnutella 系统的可用性和可扩展性。

In this paper, An improved resources search algorithm in Gnutella network is proposed by analyzing and summarizing current related Gnutella network resources search algorithm. Experiments showed that proposed algorithm can more effectively reduce network traffic than flooded search policy in Gnutella system. and improve Gnutella P2P network's integrity, availability and scalability.

PSaB-7

动态规划在传感器网络路由协议中的应用

The Application of Dynamic Programming Algorithm in Route Protocol of Wireless Sensor Network (WSN), pp.5-615~5-618

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本文针对无线传感器网络中低功耗问题进行实验研究。在比较贪婪算法、Floyd 算法和动态规划算法优缺点基础上, 采用动态规划算法改进传感器网络路由协议, 寻求从源节点到目的节点的最优路径, 达到降低传感器网络能耗的目的。最后将改进的路由协议在 NS2 实验平台上仿真, 结果表明, 动态规划路由协议相对于传统洪泛路由协议在路由开销、网络延迟等方面有很大改善。

The main body of this paper is studied specifically for the problem of low-power consumption in wireless sensor network (WSN), and then carries out an experiment. On comparing greedy algorithm and Floyd algorithm with dynamic programming algorithm, finally we adopt the dynamic programming algorithm to improve the route protocol of WSN, and explore an optimal route from Resource node to SINK node, on the purpose of reducing energy consumption of WSN. At last we use NS2 to testify the improved route algorithm, the result shows that it has a huge development in route overhead and end to end transmission delay.

PSaB-8

网络控制系统的动态调度与鲁棒控制协同设计

Dynamic Scheduling and Robust Control Co-Design for Networked Control Systems, pp.5-639~5-643

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针对 CAN 网下的网络控制系统 (Networked Control Systems, NCSs), 提出了一种基于网络运行状态的动态调度策略, 通过在线调整控制系统的采样周期以适应网络中信息流的变化。采用动态调度策略的 NCS 为一变采样周期系统, 将存在时延和数据包丢失的变采样周期 NCS 建模为一类具有参数不确定性的离散切换系统, 利用 Lyapunov 方法研究了系统的鲁棒稳定性和控制器的设计方法。仿真结果表明所提出的综合设计方法对改善网络的运行能力和保证系统稳定性是有效的。

A dynamic scheduling strategy based on network running situation is proposed to allocate network bandwidth by adjusting the sample periods of control systems sharing CAN resource in the networked control systems. Then the NCS is a vary-sample period system which is modeled as a class of discrete switched systems when network-induced delay and data-packet dropout exist. Based on the model, the approach of robust controller design is studied. Finally, a group of simulations validate the effectiveness of the control and scheduling co-design method.

PSaB-9

自适应 Internet 主动队列管理算法

Internet Adaptive Active Queue Management Algorithm, pp.5-648~5-651

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基于 Internet 拥塞控制机制, 建立了一个在线自适应的 PI 控制器作为 Internet 的 AQM 算法来调节网络连接节点的拥塞概率。利用误差积分优化方法在线调整算法的参数, 使得新的 AQM 算法能在线自适应网络系统的变化, 从而有效地控制网络系统的队列长度。仿真对自适应算法和已有的 AQM 策略进行了比较, 结果表明自适应 AQM 算法对网络的负载扰动具有很强的鲁棒性。

Based on the system of Internet congestion control, an adaptive network controller is established as active queue management (AQM) algorithm to adjust the congestion marked possibility at the links, whose parameters is auto-tuned by applying the minimization of an integral criterion for adapting the change of the network. By comparing with those existent AQM schemes in the simulations, the adaptive AQM algorithm has the better robustness for the loading perturbation.

PSaB-10

NEMO 网络中基于 NSIS 的资源预留

NSIS-based Resource Reservation for NEMO, pp.5-671~5-675

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网络移动 (NEMO: Network Mobility) 主要研究子网作为一个整体在全球互联网范围内移动过程中存在的网络可达性、效率和安全等方面的问题。NEMO 网络可能导致连接在固定网络中的不同接入路由器之间频繁的切换。当没有足够的资源用于切换请求时, 可能发生 QoS 降级或者被迫服务中断。本文主要研究一个在 NEMO 网络中提供资源预留的新协议 NEMOR, 在 NEMO 和家乡代理 (HA) 之间建立一条预留资源的虚隧道, 在一个 NEMO 上下文中支持 QoS, 以保证整个 NEMO 网络数据流的 QoS。为了达到此目标, 使用一个称为 NSIS 的通用信令协议, 可以结合 IntServ 和 DiffServ 两种协议的优点进行资源预留, 加快资源动态分配过程, 减少信令开销, 进而提高实时性, 为 NEMO 提供合适的 QoS。

Network mobility (NEMO) is concerned with managing the mobility of an entire network to change its point of attachment to the Internet and thus its reachability, efficiency and security. NEMO networks may lead to frequent handoffs between various access routers that are connected to the fixed network. Quality of service degradation or forced service termination may occur when there are insufficient resources required for handoff requests. This paper discusses a new resource reservation protocol called NEMOR, which create a virtual RSVP resource reservation tunnel between NEMO and the Home Agent (HA) aiming at supporting QoS guarantee in a NEMO context. For doing so, we use a generic signaling protocol called NSIS that may exploit advantages of both protocols: IntServ and DiffServ to provide a suitable QoS to NEMO.

PSaB-11

基于小生境遗传算法的配电网电容器优化配置

Optimal Configuration of Capacitors in Distribution Network Based on Niche Genetic Algorithm, pp.5-727~5-730

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将生物学的小生境概念引入到基本遗传算法 (GA) 中, 并对编码方法和遗传操作等方面作了改进, 形成了可用于配电网电容器优化配置的小生境遗传算法。应用此算法时, 可用共享度改变个体的适应值, 同时加速淘汰适应值低的个体, 提高每一代个体的平均适应值水平,

以减少迭代的次数。给出的算例验证了算法的有效性。

Based on GA, this paper introduces Niche that is a concept of biology, improves the coding method and genetic operators, and then forms the Niche Genetic algorithm that can be used in the optimal configuration of capacitors in distribution network. This algorithm changes individual adaptive value with sharing degree, accelerates to eliminate individual which have low adaptive value, increases the average adaptive value of every generation, and achieves the goal of reducing iterative times. Test results on the example indicate the feasibility of the proposed algorithm.

PSaB-12

On Line Parameter Identification of an Induction Motor Using Improved Particle Swarm Optimization, pp.5-745~5-749

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The paper introduces a improved particle swarm optimization (IPSO) algorithm with dynamic inertia weight and applies this method to parameter identification of induction machine including the effects of saturation. The machine dynamics can be presented as a set of time-varying differential equations with machine saturable inductances modeled by nonlinear functions of exciting current. Based on the data acquired from the 1.1kw induction motor, a comparison between the real parameters response with that determined by the proposed algorithm have been presented, and the result of identification using the GA (genetic algorithm) and standard particle swarm optimization algorithm have also been provided. The results show that the performance of the IPSO is better than other techniques. It is concluded that IPSO is a effective algorithm for parameters identification.

PSaB-13

A Kind of Image Segmentation Method Based on the Combination of GA and Two-Dimensional Entropy, pp.5-766~5-770

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The optimal threshold determination is a challenging problem in the image segmentation technology. To solve this problem, a kind of threshold choosing method for the image segmentation based on the combination of the GA (genetic algorithm) and two-dimensional entropies is presented in this paper. Then the key technology, algorithm procedure and the control parameters are analyzed in detail; The verification results show that the method is effective and practicable.

PSaB-14

基于预测速度的改进微粒群算法

Predictive-Velocity Modified Particle Swarm Optimization, pp.5-780~5-784

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标准微粒群算法的速度进化方程仅仅利用了前一代速度的大小,却忽视了该速度的方向,从而导致了速度所含信息的利用率较低,影响了算法的计算效率。通过修改速度进化方程,使得新一代的速度不仅利用原速度的大小,而且基于原速度的方向,提出了一个预测速度,并利用该预测速度对算法下一代的位置向量进行了校正。经过分析,发现该算法能有效的提高算法的计算效率。实例仿真证明了该算法的有效性。

Velocity update equation of standard particle swarm optimization uses only the size information of previous velocity vector whereas ignoring the corresponding direction information. By adding predictive velocity, a new predictive-velocity modified particle swarm op-

timization (PVPSSO) which using the size and direction information of velocity vectors to estimate and correct particle's next generation positions is proposed. Theoretical analysis proves the new algorithm owns an enhanced global search capability. The optimization computing of some examples is made to show that the PVPSSO has better global search capacity and rapid convergence speed.

PSaB-15

自适应 PID 控制微粒群算法

Self-adaptive PID-Controlled Particle Swarm Optimization, pp.5-799~5-803

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PID 控制微粒群算法是一种新型的微粒群算法,该算法通过引入控制器,将算法的动态行为从一个二阶系统改为三阶系统,从而有效地提高了算法的收敛性能。然而,由于 PID 控制器的引入,使得该算法具有六个参数。因此,如何有效的选择这些参数将对算法性能起着非常重要的作用,本文从稳定性理论出发,推导出参数之间的关系方程式,进而提出了一种参数的自适应选择策略。实例仿真证明了该策略的有效性。

As a new version of particle swarm optimization (PSO), PID-controlled PSO introduces the concept of controller into the algorithm structure. However, with the introduction of PID controller, three additional parameters are incorporated into the algorithm. Thus, how to provide a proper selection of these parameters is an important problem to affect the algorithm efficiency. In this paper, the relationships among these parameters are conducted by the stability theory. Further, a self-adaptive parameter selection strategy is proposed. Simulation results show the proposed strategy is effective.

PSaB-16

HTS Levitation and Transportation with Linear Motor Control, pp.6-10~6-14

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High temperature superconductor (HTS) bulk can produce strong levitation force and has attracted strong interest of application in maglev transportation systems, to which a linear motion drive has advantages to be incorporated. This paper presents the design and performance analysis of a linear synchronous motor drive for a levitated object by HTS bulks. The analysis results show that the developed linear motor scheme can effectively drive and control the HTS levitated transporter.

PSaB-17

线控系统着色混合 Petri 网建模及其模糊控制

Modeling and Fuzzy Control of Artery System Using Colored Hybrid Petri Nets, pp.6-26~6-29

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城市道路线控系统是一个离散和连续相结合的混合系统,具有动态、并发及同步特征, Petri 网能很好地描述这些动态行为。因此,本文进行了线控系统的 Petri 网建模及其控制研究:基于模块化建模思想建立了混合 Petri 网相位模块;相位模块着色后组建了线控系统模型,模型直观、简单易读;将模糊理论嵌入 Petri 网模型中,运用模糊规则定义了一些变迁,使线控系统 Petri 网模型适于配时设计。

Urban artery system, which is characterized by dynamic, concurrence and synchronization, is a hybrid dynamic system involving discrete and continuous behaviors. The dynamic actions of the ur-

ban artery system can be modeled through Petri nets. Therefore, modeling and control of the urban artery system based on Petri nets are discussed in this paper. First, a phase module is modeled using hybrid Petri nets according to modularization methods. Then, a distinct and readable model of the urban artery system is presented after coloring the phase module. Moreover, to scheme signal parameter, fuzzy theory is embedded into Petri nets by using fuzzy rules to define some transitions of Petri nets.

PSaB-18

车辆横摆角速度的广义预测控制研究

A Research on Generalized Predictive Control for Vehicle Yaw Rate, pp.6-30~6-33

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本文将广义预测控制算法引入车辆横向稳定性控制中,通过将车辆非线性模型线性化,建立了横摆角速度的预测模型和参考模型,根据车辆速度和转向盘转角信息来预测车辆未来时刻横摆角速度的输出,并与参考模型横摆角速度比较,根据横摆角速度预测输出与参考模型输出的差值来确定施加的抵抗横摆运动的横摆力矩的大小。基于 GPC 的参数模型预测控制用于车辆转向横向性控制系统,在模型已知的情况下,能较精确预测横摆角速度的未来输出,并且在车辆失稳前施加控制,因此适合车辆横向稳定性控制系统。仿真结果表明, GPC 算法能很好地跟踪给定的横摆角速度参考模型,与 PID 控制方法相比,在车辆转向行驶工况,车辆横摆角速度变化曲线无明显的振荡,并且横摆角速度的超调量也有较大降低。

A yaw stability controller based on generalized predictive control is presented in this paper. The predictive and the desired model of yaw rate are established based on a linearized vehicle model, the future output of yaw rate of the vehicle according to the information of vehicle speed and the steering wheel angle is predicted. Compared with a desired value, a controlling yaw moment is calculated based on the difference between the desired and the actual yaw rate. The predictive control of parameter model applied to the yaw stability control system based on GPC, in the known model situation, can predict the future output of yaw rate of the vehicle precisely and take control action before the yaw instability of vehicle occurs, so this method suits the yaw stability control system of vehicle. The simulation result indicates the yaw rate based on GPC algorithm can track the desired yaw rate well. Compares with the PID control algorithm, the curve of yaw rate has no obvious surge, and the overshoot reduces greatly.

PSaB-19

基于一维元胞自动机的双跟驰模型

Two-car Following Model Based on One-dimension Cellular Automaton, pp.6-62~6-65

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根据实际交通中车辆的跟驰状况和车头时距的分布,提出一种基于一维元胞自动机的双跟驰模型。该模型在建模中考虑了本车之前的第一、二辆车的速度和车头间距,因此所包含的交通信息比较充分,交通流亚稳态特性具有较强的鲁棒性,交通流临界密度高,能够并行更新规则,适用于大规模交通仿真。理论分析和仿真研究揭示了亚稳定状态的产生与前后车的关联程度、随机慢化概率的大小均有一定关系。

A one-dimension cellular automaton traffic flow model, named two-car following model is proposed. Taking into account of the two frontal vehicles' velocity and time-headway when modeling, the model has more traffic information. It can reveal traffic flow's metastable characteristics with better robustness and higher crit-

ical density. And the update rule is completely parallel, so it can adapt to large-scale traffic simulations. Theoretical analysis and experimental results reveal that the metastable character is relevant with the relation degree between cars and the random slow probability.

PSaB-20

电力市场中电量交易博弈行为分析

An Analysis of Game of Electricity Trade in Electricity Power Market, pp.6-133~6-137

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电力工业已在发电领域引入了竞争,发电与输电由过去的垂直一体化调度转变为商业形式的买卖交换。电网公司在与电力企业的博弈中既要让发电企业降低成本增加消费者剩余,又要激励电力投资保证供给义务,则合同电量的时间长短与合同电价的制定是同样重要的。其时间的长短首先应确保集资电力企业能回收其投资成本,又要管制在位企业抢先扩张生产能力,以长期合同阻止新进入者,形成市场力;然后对电网公司和电力企业在区域市场撮合交易过程中的博弈行为进行了建模和分析;采用迭代法对安顺新建和扩建电厂以及天生桥新建电站的投资回收给出了合同时间的求解过程,采用遗传算法对交易中竞争电量的博弈模型进行了计算和验证。

Competition has been introduced into electricity power area by electricity industry, style of generating and transmitting electricity converts from vertical unity distribution to commercial exchange. In the game with power generating corporation, power grid corporation should not only make its rivals to reduce generating cost to increase consumer surplus but also encourage them to raise electricity investment so that supply duty is insured, thus, setting up appropriate time of contract electricity is as important as establishment of electricity price. During which time, electricity power corporation should be able to recover its investment, also, the time should not be so long that present corporation can form market power by expanding manufacturing ability with the long-time tract; we set up a model of game of the regional market business transactions between power grid corporation and electricity power corporation and make an analysis; method of iteration is used to calculate appropriate contract time for investment recovering of Anshun and Tian-shengqiao power stations. The Anshun station is building a new station and expanding its old one, while the later is building a new station. We have uses algorithms to calculate and examine the model of game.

PSaB-21

基于优化 GM(1,1) 模型的人口预测方法研究

A Novel Population Prediction Method Based on Optimization GM(1,1) Model, pp.6-162~6-165

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本文在阐述灰色理论和优化算法研究的基础上,给出一种基于最优化的新型 GM(1,1) 模型及其辨识过程,该方法利用累加再生成操作和优化理论来调整灰参数,提高样本序列的光滑度来减少其随机性,从而提高 GM 模型的拟合精度和预测精度。最后通过该方法对我国未来人口的发展进行建模和验证,结果表明该方法辨识精度高,优于一般灰预测方法,具有良好的应用价值。

In this paper, based on the research of grey theory and optimization theory, a new method of GM(1,1) is proposed, and the mathematical model is established. By using this method to choose the optimal grey parameter and smooth the original data sequence, the random properties of some non-stationary time series can be reduced and the GM model's fitting precision and prediction precision is advanced. Experiments with modeling the population show that the method gives prediction values and practicable values better than those by common grey forecasting method.

PSaB-22

Optimization and Application of EPA Device Description Based on XML, pp.6-175~6-179

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In order to enhance field devices interoperability in Ethernet Plant for Automation (EPA) network control system, the key of the research is focused on the characteristics of eXtensible Device Description Language (XDDL) and device description document based on XML. On this foundation, this paper puts forward a synthetic optimizing solution for device description document application from three aspects which include optimization methods of Extensible Markup Language (XML) parsing, buffer-memory display and secondary-parse storage structure. The test results prove that the processing rate of optimized EPA device description document triples over, which achieves an obvious effect.

PSaB-23

An Ultrasonic In-line Inspection System on Crude Oil Pipelines, pp.6-199~6-203

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The ultrasonic in-line inspection is one of the important ways to inspect the wall-loss defects on-line for crude oil pipeline. As an integrative device, ultrasonic in-line inspection system contains complex mechanism, electronic instruments and a computer to achieve ultrasonic inspection, orientation, guarantee technology, signal processing, data management and project executor. An ultrasonic in-line inspection system with 20 ultrasonic channels is developed to meet this need. The multi-channels ultrasonic inspection system consists of main and sub-structure. The system locates the corrosion by course wheel orientation, welding line modification, outer orientation modification and revolving angle orientation. Experiments under the water show that it can inspect and display the shape, size and location of the corrosion of the pipeline and the data acquisition, management, storage and image display can satisfy the inspection of long-distance pipelines in practice.

PSaB-24

一种新型高性能恒频 PWM 谐振开关变流器

On High Performance PWM AC/DC Switching Converters, pp.6-209~6-212

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该文分析及研究了谐振开关变流器的工作原理和控制方法,建立了谐振开关变流器各个工作模式的转换条件,并对原有电路拓扑结构提出相关改进措施,研究了新的电路拓扑;同时,为了进一步减小变流器磁性器件的体积、重量和损耗,研究了集成磁技术,即把开关变流器中所有主要磁性器件从结构上集中在一起,用一个磁性器件来实现,经过优化设计,磁芯当中的磁通变化量减小,从而降低磁芯损耗,减小磁芯体积;文中给出了电路分析、计算机仿真以及变流器电路实验。

This paper analyzes and discusses topology of two-stage PFC converters, and the objective of the research in this paper is to study the development of new converter topology that AC/DC two-stage PFC schemes to produce new class of AC-DC converter with High Performance and higher efficiency and increased reliability. This is achieved by analysis, design and circuit experiments, as well as combining the advantages of existing single-stage and two-stage AC/DC converters.

PSaB-25

灰色预测控制在篦冷机系统中的应用

The Grey Predictive Control on Grate Cooler System, pp.6-218~6-221

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简单介绍了预测控制的发展及特点,然后分析了篦冷机作为水泥生产冷却设备的主要性能及工作原理。根据篦冷机的工作特性,选用灰色系统理论建立控制模型,并且采用了预测控制算法对篦冷机进行控制,实际运行效果证明:预测控制算法在窑头出料波动较大时优于PID控制算法。

The characteristic of predictive control based on grey model and the primary principle of the grate cooler is introduced. The cooler model is built using the grey system while the control is realized through optimization and feedback adjustment. The result of practice proves that the grey predictive algorithm is more effective than PID algorithm when fluctuating error of clinker from the kiln head is bigger.

PSaB-26

精练全过程电极自动定位控制系统

Automatic Control System of the Electrode's Position During the Whole Process of LF Steel-Making, pp.6-245~6-248

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针对直流电弧-电渣加热钢包炉,设计一种基于实时控制的炼钢全过程电极自动定位控制系统。在炼钢过程中准确测量电极与钢水之间的电压,确定两阳极与钢水间的准确距离。在阳极下降至钢水液面时,记下初始位置,阴极下降开始引弧时,阳极和阴极位置适当上移,达到最佳控制距离,最终完成炼钢全过程,同时实现钢水提纯的工作。本系统能够有效降低炼钢过程中的钢水增碳,实现钢液温度及成分的优化控制,保证品种钢的质量。

An automatic control system of the electrode's position during whole process of steel-making based on real-time control is presented in this paper, which is adapted for LF steel-making stove. The voltage between electrode and molten steel is measured accurately, which is used to calculate the accurate distance of the electrode and molten steel, during whole process of steel-making. The original position is memorized when the anodes descend to the molten steel, and the electrodes move upwards suitably when the cathode begin to make electric arc that achieves the best control distance. The whole process of steel-making would complete and the molten steel would purify. The problem of carburet of molten steel would guarantee the quality of steel production by using the control system.

PSaB-27

Application of Wavelet Network for Automatic Power Quality Disturbance Recognition in Distribution Power System, pp.6-254~6-258

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Power quality (PQ) has attracted considerable attention from both utilities and users due to the use of many types of sensitive electronic equipment. This paper proposed a novel approach for the PQ disturbances classification based on the wavelet network. Wavelet transform is utilized to extract feature vectors for various PQ disturbances based on the multi-resolution analysis (MRA). These feature vectors then are applied to wavelet network for training and testing. The signal containing noise is de-noised by wavelet transform to obtain a signal with higher signal-to-noise ratio (SNR). The

synthesized method of recursive orthogonal least squares algorithm (ROLSA) and improved Givens transform is used to fulfill the network structure. The fundamental component of the signal is estimated to extract the mixed information using wavelet network, and then the disturbance is acquired by subtracting the fundamental component. The simulation results demonstrate that the proposed method is effective. Compared with conventional methods, the simulation results show accurate discrimination, fast learning, good robustness, and faster processing time for detecting PQ disturbing.

PSaB-28

基于小波网络的电厂汽轮发电机组故障诊断

Fault Diagnosis Method Based on Wavelet Neural Network for Power System Turbo-Generator, pp.6-259~6-263

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针对传统的单一故障诊断方法在汽轮发电机组振动类多重并发故障诊断中的局限性,研究了基于小波变换与神经网络相结合方法的应用。采用二进离散小波变换获取有效的故障征兆向量,输入到神经网络进行故障模式分类,充分发挥了两种方法各自的优点。通过选择足够的样本对神经网络进行训练,将代表故障的信息输入训练好的神经网络,由输出结果就可判定故障类型。实际应用表明该方法可以有效诊断汽轮发电机组振动类多重并发故障,诊断结果全面、准确。

An effective method for composite fault diagnosis based on integration of wavelet transform and neural networks is presented. The fault diagnosis model of turbogenerator set is established and a new method of detecting fault symptom signal based on discrete binary wavelet transform is discussed. Wavelet transform is used to extract effect character vector which is sent to neural networks to complete pattern recognition. With sufficient samples training, the type of fault mode can be obtained when signal representing fault is inputted to the trained neural networks. The diagnosis result improves to be accurate and comprehensive. The method can be generalized to other devices fault diagnosis.

PSaB-29

基于在线谱估计的超声管道内检测系统

The Ultrasonic In-line Inspection System of Pipelines Based on Spectrum Estimation On-line, pp.6-267~6-271

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超声检测是管道腐蚀缺陷在线检测的重要方法之一,短时间序列、高分辨、抗干扰能力强的在线功率谱估计算法是管道内检测的关键技术。基于在线功率谱估计,研制了具有20个探头的数字式多通道超声管道内检测系统。检测系统采用主从结构,检测板卡通过PCI总线与嵌入式计算机通信,高速切换开关扩展检测通道数,超声回波信号在线处理采用Burg最大熵谱估计法。经标准实验管段检测证明,该检测系统能够检测管道内外腐蚀缺陷,适用于管道腐蚀在线检测,应用前景较好。

The ultrasonic detection is one of the important ways to inspect the wall-loss defects on-line for oil pipeline. The on-line power spectral estimation what characterized short time serial, higher resolution and anti-noise was a key technology to in-line inspect the pipeline. Based on power spectral estimation on-line, the digital multi-channels ultrasonic inspection system with 20 probes was developed. The system consists of main and sub-structure. Inspection board communicated with embedded computer with PCI bus and the numbers of channel was expended by means of high-speed switch. The ultrasonic echo signal was processed with Burg maximum entropy spectrum estimation on-line. The test shows that the inspection system could inspect the inner and outer defects and

is suitable for on-line detection of pipeline corrosion. It will be used widely in practice.

PSaB-30

一种新型的蓄电池组状态在线检测及故障预报算法

A New Algorithm of Online Monitoring and Fault Prediction for the Battery Set State, pp.6-351~6-355

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本文在传统蓄电池浮充电压检测方法的基础上,提出了一种新型的基于蓄电池内阻的蓄电池组状态在线检测方法,并利用灰色系统理论建立了VRLA蓄电池内阻阵的GM(1,1)预测模型以实现蓄电池状态的故障预报。同时针对影响内阻变化的因素太多且不确定的情况,提出了实时在线的方法建立起动态新息的GM(1,1)预测模型。经实验仿真验证,该方法可明显地提高预测精度,且能对蓄电池内阻变化趋势做出正确预测。

Based on the traditional floating voltage examination method of the VRLA battery, this paper proposed a new online examination method of the VRLA battery interface resistance, and established GM(1,1) forecast model of the battery interface resistance to examine the batteries' condition and predict the fault. Because many uncertain factors impact the internal resistance, this paper give a real time method and establish a dynamic innovation forecast model of GM(1,1). The forecast precision is improved greatly through experiment, and the feature of internal resistance of battery can be forecast exactly.

PSaB-31

中立型模糊随机时滞系统的能量-峰值滤波: LMI方法

Energy-to-peak Filtering for Fuzzy Stochastic Neutral Systems with Time-delays: LMI Approach, pp.4-253~4-256

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基于T-S模糊模型,讨论了一类中立型非线性时滞系统的能量-峰值滤波问题。给出了保证滤波误差动态系统随机稳定,且满足给定 L_2 - L_∞ 噪声抑制水平的充分条件。该条件和滤波器的优化设计方案最终可用一组线性矩阵不等式(LMI)表示。仿真结果表明了所提方法的有效性和可行性。

Based on Takagi-Sugeno (T-S) fuzzy models, the energy-to-peak filtering problem is studied for a class of nonlinear stochastic neutral systems with delays. Sufficient conditions on the stochastic stability with prescribed L_2 - L_∞ noise attenuation level are proposed. The conditions and the optimal design of the controller are formulated as a set of direct linear matrix inequalities (LMIs). The effectiveness of the proposed method is illustrated by a simulation example.

PSaB-32

基于T-S模型不确定非线性系统的鲁棒非脆弱 H_∞ 控制

Non-Fragile H_∞ Robust Control of Uncertain Nonlinear Systems Based on T-S Model, pp.4-257~4-261

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针对一类Takagi-Sugeno(T-S)模糊模型,构建了具有状态和输入不确定连续时间非线性系统,研究了其 H_∞ 稳定和控制器设计问题。基于Lyapunov(李雅普诺夫)函数稳定性分析理论,采用PDC(并行分布补偿)基本思想和LMI(线性矩阵不等式)方法,设计出了其非脆弱 H_∞ 模糊控制器,使闭环系统对允许的不确定参数具有 H_∞ 稳定。实例仿真结果验证了该控制器设计方法的有效性和可行性。

The generalized H_∞ stabilization and the controller design problems are studied for a class of continuous nonlinear systems described in T-S fuzzy model, which has uncertainties in state and input. The non-fragile H_∞ fuzzy controller is designed based on piecewise Lyapunov function theory, PDC and Linear Matrix Inequality method, which ensure the asymptotically stability and the

H-inf performance of the resulting closed-loop systems for all admissible uncertainties. The simulation is presented to show the feasibility and effectiveness of the proposed method.

PSaB-33

一种改进的基于 MRAS 的速度辨识方法

An Improved Speed Identification Method Based on MRAS, pp.4-270~4-274

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速度辨识是无速度传感器感应电机调速系统中一个重要环节。在基于 MRAS (模型参考自适应系统) 的速度辨识方法中, 由于参考模型采用纯积分型转子磁链电压方程, 直流偏置和积分初值累积以及定子电阻变化都导致磁链观测误差较大, 进而影响速度辨识精度。本文提出一种改进的 MRAS 方法, 首先引入高通滤波器消除纯积分的影响, 并采用模糊控制器在线调整其截止频率改善其动态性能; 其次利用模糊控制器在线辨识并调整定子电阻, 克服了定子电阻变化影响速度辨识精度的问题。仿真结果表明该方法具有较好的动静态性能以及较高的辨识精度

Speed identification is crucial in speed sensorless induction motor drives. Because the voltage model involves pure integrator, which will cause initial value and drift problems. These problems and resistance varies effect the precision of speed identification. This paper presents an improved method, which uses high-pass filter to avoid these problems and adapt the cut-off frequency on-line to improve dynamic performance by using fuzzy controller; and then eliminate the influence of stator resistance varies by using fuzzy controller to estimate and adapt stator resistance on-line. Simulation results indicate that the method has the characteristic of good dynamic and static performance and high precision speed identification.

PSaB-34

A Self-optimal Fuzzy Logic Controller Based on Association Rules Mining to Ball Mill Pulverizing System, pp.4-283~4-288

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Ball mill pulverizing system is one of the major assistant systems in a thermal power plant and it is a multi-variable and strong coupling system with nonlinearity, large delay and time-varying. To control it work stably and efficiently, a self-optimal fuzzy logic controller based on association rule mining is proposed in the paper. In the controller, the self-optimizing algorithm can adjust the controller set value to keep the ball mill pulverizing system working at the optimum point all alone, and the fuzzy logic rules are derived by the association rules mining algorithm, which uses the antecedent ergodicity and the single consequent link methods. Moreover, the consequent strength measure is presented in the paper to estimate the mined rules. Simulations results verify that the controller can control the ball mill pulverizing system effectively and has higher control quality.

PSaB-35

Robust Adaptive Fuzzy Output Tracking Control of Uncertain Robot System Using Backstepping Design, pp.4-303~4-308

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To solve the tracking control of uncertain MIMO robot system, a method of robust adaptive fuzzy control based on backstepping

is presented. This paper introduces fuzzy system to approximate complicated nonlinear functions. Compared with conventional backstepping control schemes, we do not require the unknown parameters to be linear parametrizable and do not require the differential of virtual control. The controller can provide robustness to all uncertainties. No nominal model of the robot or knowledge of the robot dynamics is required. The controller can be regarded as a universal reusable one because it can be applied to other n-link rigid robots without any modification. This method has been reported effective in simulations on two-link robot system.

PSaB-36

Fuzzy Reliability Analysis of Disk Array Systems, pp.4-314~4-317

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Reliability models for various disk array architectures are developed. Markov model is very useful calculating with state space by using transition probability and initial value. In practice, sometimes we can not have the exact values of parameters, but with some uncertainty about these values. The combination fuzzy logic and Markov model method is introduced and analyzed besides the traditionally used reliability measures such as disk array system reliability. This reliability method is a technique for analyzing fault tolerant designs under considerable uncertainty, such as is seen in compilations of component failure rates, the presented model provides the estimation of the lower and upper boundary of RAID 5 with a single run of the model.

PSaB-37

基于遗传算法的锅炉过热汽温聚类自适应模糊控制器的设计

Design of Clustering Adaptive Fuzzy Controller of Drum Boiler Superheat Temperature Based on Genetic Algorithm, pp.4-341~4-344

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将聚类算法和模糊控制相结合, 针对具有非线性、大时滞的电力系统锅炉过热汽温系统, 提出一种聚类自适应模糊控制器设计方法。该方法采用改进的遗传算法对模糊控制器的隶属参数进行优化, 有效地解决了非线性、大时滞对锅炉过热汽温系统影响的问题。仿真结果表明了该方案具有良好的控制性能, 因此具有很强的工程实用价值。

Based on the combination of clustering algorithm and fuzzy control, a kind of clustering adaptive fuzzy controller is designed and applied to the nonlinear big-lagged superheat temperature system of drum boiler. The subsection parameters of the fuzzy controller are optimized by improved genetic algorithm. The problem of nonlinear and time-delay for superheat temperature system is solved effectively. Simulation results show that the proposed project has satisfying control performance and further prospects for its engineering applications.

PSaB-38

Control of Proton Exchange Membrane Fuel Cell Based on Fuzzy Logic, pp.4-345~4-349

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This paper presents a control strategy suitable for hydrogen/air proton-exchange membrane fuel cells (PEMFCs), based on the process modeling using fuzzy logic. The control approach is tested using a PEMFC stack consisting of 32 cells with parallel channels. An optimal fuzzy-PI controller is designed to mainly control the hydrogen and air/oxygen mass flows, and auxiliary variables such as the temperature, pressure, humidity of the membrane, and

proportion of stoichiometry. The fuzzy logic controller possesses many advantages over the PID controllers, such as a higher performance/cost ratio. It is shown experimentally that the optimal fuzzy-PI controller can improve the voltage and current performance of the system when the load changes.

PSaB-39

基于模糊理论的智能服装交易系统研究

Humanized Clothing Recommendation System Based on Fuzzy Set Theory, pp.4-380~4-385

解迎刚
王志良
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本文设计了一个基于 MAS 的智能服装交易系统,并运用模糊集合理论,对顾客的模糊需求信息进行处理,将需求和在乎程度量化成特征向量,并将服装服务信息也量化成特征向量,运用符合度计算,分析交易可能性。通过模糊理论的综合评价,实现了服装选购的智能推荐和交易,体现了系统的智能化和人性化

On the basis of fuzzy sets theory, this thesis discusses a personalized intelligent clothing recommendation system using MAS. Using fuzzy theories could solve the matching problems of suppliers and buyers in clothing recommendation. The fuzzy problems are numerically simulated by the constraints of logical variables such as believability and subject functions to [0,1]. Then the solutions could be gotten. Finally, it will achieve ordering of recommended clothing and carry out intelligent business. This fuzzy evaluation model and Agent utility analysis designed in this system intensifies the intelligence of the whole system.

PSaB-40

Fuzziness in Covering Generalized Rough Sets, pp.4-386~4-390

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Guangdong Ocean Univ.

Rough sets theory has been considered as a useful method to model the uncertainty and has been applied successfully in many fields. And every rough set is associated with some amount of fuzziness. On the other hand, rough sets theory has been generalized with coverings instead of classical partition. So it is necessary to consider the amount of fuzziness in generalized rough sets induced by a covering. In this paper, a measure of fuzziness in generalized rough sets induced by a covering is proposed. Moreover, some characterizations and properties of this measure are shown by examples, which is every useful in future research works of generalized rough sets induced by a covering.

PSaB-41

Using Fuzzy Neural Network in Real Estate Prices Prediction, pp.4-399~4-402

Zhang Xiaoli

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To forecast real estate prices more accurate, we combined fuzzy reasoning technique with neural network to construct a fuzzy neural network (FNN), which has ability in fuzzy reasoning and learning. In our research, we first use our relative real estate sample data to train the fuzzy neural network. Thereafter, we can use the exact test data to forecast real estate price. Compared with the traditional network, FNN obtained a much better result. Thus, we give a more accurate and effective method to forecast real estate prices.

PSaB-42

基于 MATLAB 供热温度模糊自整定 PID 控制系统仿真

On Fuzzy Self-tuning PID MATLAB Simulation for Central Heating, pp.4-425~4-429

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集中供热系统二次侧供水温度控制属于大惯性、大延迟系统。随着供

热系统热负荷变化,导致用户端供水温度波动明显。为使其温度恒定在 55 oC ~ 75oC,采用模糊自整定 PID 和常规 PID 串级控制相结合,使构成的模糊 PID 控制器不仅具有常规 PID 控制器的特性,而且具有智能控制器的自适应能力,增强系统对不确定因素的适应性。通过模糊自整定 PID 串级主控制器控制规则的建立和控制器的仿真,验证了模糊自整定 PID 串级控制方法的可行性。

The secondary side water supply temperature control belongs to great inertia and long delay system for central heating. The user-end water temperature changes greatly with the variation of heating load. In order to make the temperature between 55ºC -75ºC, combined fuzzy self-tuning PID control with conventional PID cascade control, That PID controller did not only have characteristics of conventional PID control, but also possess the characteristic of intelligent control and the self-adaptive ability, and the adaptability of uncertainties for system was enhanced. the feasibility of fuzzy PID self-tuning cascade controller is validated by establishing the control rules and simulation .

PSaB-43

Feature Extraction Method in Fault Diagnosis Based on Wavelet Fuzzy Network for Power System Rotating Machinery, pp.4-437~4-441

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A new combined fault diagnosis approach for turbo-generator set based on wavelet fuzzy network is proposed. The wavelet transform is used to extract fault characteristics and neural network is used to diagnose the faults. To improve the performance of applying traditional fault diagnosis method to the vibrant faults, a novel method based on the statistic rule is brought forward to determine the threshold of each order of wavelet space and the decomposition level adaptively, increasing the signal-noise-ratio (SNR). The fault modes are classified by fuzzy diagnosis equation based on correlation matrix which shows good ability of self-adaption and self-learning. The improved least squares algorithm (LSA) is used to fulfill the network structure and the robustness of fault diagnosis equation is discussed. By means of choosing enough samples to train the fault diagnosis equation and the information representing the faults is input into the trained diagnosis equation, and according to the output result the type of fault can be determined. Actual applications show that the proposed method can effectively diagnose multi-concurrent fault for stator temperature fluctuation and rotor vibration and the diagnosis result is correct, increasing the accuracy of the fault diagnosis for rotating machinery.

PSaB-44

基于满意度的 T-S 模糊建模方法及应用

T-S Fuzzy Modeling and Application Based on Satisfactory Optimization, pp.4-446~4-450

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针对复杂的非线性系统,提出一种基于满意度的 T-S 模糊建模方法。利用采样数据集,通过模糊聚类的方法初始化模型参数,并用后向传播算法进行离线学习,辨识出被控对象 T-S 模糊模型的前件参数;引入系统品质满意度的概念,通过在线调整递推最小二乘法的遗忘因子,对实时采集的新信息进行在线学习,辨识出模型规则的后件参数,提高了模型精度和辨识的速度。将提出的算法应用于机车制动控制系统,试验结果表明了该方法的有效性。

A T-S model fuzzy modeling method based on satisfying degree function is presented for a class of complex systems with severe nonlinearity. Using the sampling data, the model parameters are initialized by fuzzy clustering and its premise parameters are recti-

fied by learning off-line using back-propagation algorithm. Introducing the conception of character satisfying degree function to rectify online the forgetting factor of recursive least square method, the consequent parameters of the fuzzy rules are self-learning online by recursive least square method. Consequently, the precision and the identify speed of the T-S model are improved. Applying to locomotive brake control unit, the result shows the effectiveness of the proposed method.

PSaB-45

永磁同步电机直接转矩控制系统的开关频率优化及其模糊控制
Switching Frequency Optimize and Fuzzy Logic Based Direct Torque Control of Permanent Magnetic Synchronous Motor, pp.4-374~4-379

盛义发
喻寿益
洪镇南
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南华大学
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分析了逆变器的开关频率、滞环宽度、电机转速三者的关系,提出了开关频率优化的方法;为进一步提高系统的稳定性和响应速度,将模糊控制技术用于永磁同步电动机控制中,提出了一种新的模糊控制方案,并引入零矢量控制,对模糊控制规则进行简化。仿真实验结果表明,通过开关频率优化和模糊控制,不仅能充分利用功率器件的开关频率,而且模糊直接转矩控制的磁链轨迹更接近于圆形;转速能在很短的时间内上升到稳定值;转矩能快速、平稳地变化。

The relation among motor speed,torque hysteresis band width and switching frequency was analyzed,and switching frequency optimize means was proposed. In order to improve the system stability and raise the response speed,fuzzy logic based direct torque control for a permanent magnet synchronous motor(PMSM) was put forward.In this scheme,zero voltage space vector sare introduced to simplify fuzzy control rulers.Simulation results show that the flux locus of the fuzzy direct torque control is more approximatively a circle by switching frequency optimize and fuzzy control,and the rotational speed can reach up to as table value quickly and the torque for the proposed scheme can change smoothly.

PSaB-46

Indefinite Stochastic Linear Quadratic Control in Infinite Time Horizon, pp.3-502~3-506

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Wu Zhen
Zhang Weihai

Shandong Univ.
Shandong Univ.
Shandong Univ. of Sci. & Tech.

In this paper, we will be concerned with an optimal stochastic linear-quadratic (LQ in short) control problem in an infinite time horizon, where the cost matrices are allowed to be indefinite. For which, a generalized algebraic Riccati equation (GARE in short) which involves a matrix pseudoinverse is introduced. Under some stabilizing conditions, we establish the relation between the solvability of the GARE and the existence of the optimal controls of the LQ control problem. Based on this relation, the optimal controls can be constructed by the solution of the GARE if it exists. Finally, we give a sufficient condition for the solvability of the GARE based on the semidefinite programming.

PSaB-47

A Novel Bionic Neural Network Control Method for Vivid Animation of Virtual Animal's Locomotion, pp.4-156~4-161

Zhang Daibing

National Univ. of Defense Tech.

The conventional anti-kinematics method for animation of virtual animal's locomotion involves lots of observations and exterior posture simulations, and it has many disadvantages such as distortions, low fluency and agility. This paper proposes a novel method which inspired from the principles of animal's locomotion central neural system. The bionic neural network control system consists of a bionic neural network and the dynamic models of all joints.

The bionic neural network is a chain network of nonlinear neural oscillators with time-delay excitory or inhibitory connections, and it produce the locomotion gait signals to control all jointal actuators to move. The animation results on the fictive animal "China dragon" proved the validity, fluency and agility of the novel method. And the novel method has favorable applications in the production of films or teleplays.

July 29, 2007

SuA01 08:30-10:30 Meeting Room 1
Invited Session: Advanced Control Theory and Applications (I)

Chair: Feng Gang City Univ. of Hong Kong
Co-Chair: Huang Jie Chinese Univ. of Hong Kong

SuA01-1 08:30-08:50
Finite-Time Input-to-State Stability and Related Lyapunov Analysis, pp.6-652~6-656
Hong Yiguang Chinese Acad. of Sci.
Jiang Zhong-Ping Polytechnic Univ. of New York
Feng Gang City Univ. of Hong Kong

Due to the need in studying finite-time control problems, this paper extends the well-known concept, input-to-state stability (ISS). A new concept, called finite-time input-to-state stability (finite-time ISS), is proposed and is applied to the finite-time stability analysis of some nonlinear systems and the design of finite-time stabilizing feedback laws. In addressing finite-time stability and control, nonsmoothness occurs in system nonlinearities and controller functions, and poses a serious technical difficulty. It is found that finite-time ISS plays an important role in nonsmooth control, in the same way as the conventional ISS in the asymptotic stability analysis and stabilization.

SuA01-2 08:50-09:10
Global Robust Output Regulation for Non-minimum Phase Nonlinear Systems in Lower Triangular Form, pp.6-657~6-661
Zhong Renxin The Chinese Univ. of Hong Kong
Huang Jie Chinese Univ. of Hong Kong

Minimum phase has been a standing assumption on the solvability of the global robust output regulation problem of lower triangular nonlinear systems. In this paper, we will show that, by utilizing the state of the zero dynamics in the feedback control law design, it is possible to weaken this assumption to some degree.

SuA01-3 09:10-09:30
Design and Implementation of a Fully Autonomous Flight Control System for a UAV Helicopter, pp.6-662~6-667
Peng Kemao National Univ. of Singapore
Dong Miaobo National Univ. of Singapore
Chen Ben M. National Univ. of Singapore
Cai Guowei National Univ. of Singapore
Lum Kai Yew National Univ. of Singapore
Lee Tong H. National Univ. of Singapore

An autonomous flight control law applicable to full-envelope was designed in this manuscript for a small-scale unmanned aerial vehicle (UAV) helicopter to fly autonomously. The UAV helicopter was constructed based on a radio-controlled hobby helicopter by assembling an avionic system. The autonomous flight control law applicable to full-envelope was designed using a decentralized design methodology incorporating a newly developed nonlinear control techniques as well as dynamic inversion. The designed autonomous flight control law was implemented and verified in flight tests with the UAV helicopter. The flight test results demonstrate that the designed autonomous flight control law successfully drives the small-scale UAV helicopter to fly autonomously. The scheme of the autonomous flight control is applicable to flight control design of other UAVs.

SuA01-4 09:30-09:50
An Improved Approach to Robust H2 and H-infinity Filter Design for Uncertain Linear Systems with Time-varying Parameters, pp.6-668~6-672
XU JUN National Univ. of Singapore
Xie Lihua Nanyang Technological Univ.

In this paper, we discuss the robust H2 and H-infinity filter problems

for a class of continuous-time and discrete-time linear systems with convex bounded uncertain time-varying parameters. By employing parameter-dependent Lyapunov functions, some improved sufficient conditions based on a scaling LMI formulation for the robust filtering problems are presented. A numerical example is given to demonstrate the effectiveness of the proposed design methods.

SuA01-5 09:50-10:10
Synchronization of Vicsek Model with Large Population, pp.6-673~6-677
Liu Zhi-Xin Chinese Acad. of Sci.
Guo Lei Chinese Acad. of Sci.

The Vicsek model can be used to describe a basic class of multi-agent systems with local interactions: each agent has the tendency to behave as other agents do in its neighborhood. Through computer simulations, Vicsek et al. (1995) showed that such simple local interactions may lead to certain kind of cooperative phenomenon (synchronization) of the overall system, if the size of the system population is large. Since this model is of fundamental importance in understanding multi-agent systems, it has attracted much attention from researchers in recent years. In this paper, we will present a comprehensive theoretical analysis of the Vicsek model in a random framework with large population. To be precise, we will show that if both the interaction radius r and the agents' moving velocity v decrease as the population size n increases, but satisfy a certain constraint on the decreasing rates, then the overall system will synchronize for large n . The proofs are based on the recent work of Tang and Guo [1][2] and involves the use of spectral graph theory and double array martingale estimation theory.

SuA01-6 10:10-10:30
A Parametric Lyapunov Equation Approach to the Design of Low Gain Feedback, pp.6-678~6-682
Zhou Bin Harbin Inst. of Tech.
Duan Guang-Ren Harbin Inst. of Tech.
Lin Zongli Univ. of Virginia

Low gain feedback has found several applications in constrained control systems, robust control and nonlinear control. Low gain feedback refers to a family of stabilizing state feedback gains that are parameterized in a scalar and go to zero as the scalar decreases to zero. Such feedback gains can be constructed either by an eigenstructure assignment algorithm or through the solution of a parametric algebraic Riccati equation (ARE). The eigenstructure assignment approach leads to feedback gains in the form of a matrix polynomial in the parameter, while the ARE approach requires the solution of an ARE for each value of the parameter. This paper proposes an alternative approach to low gain feedback design based on the solution of a parametric Lyapunov equation. Such an approach possesses the advantages of both the eigenstructure assignment approach and the ARE based approach. It also avoids the possible numerical stiffness in solving a parametric ARE and the structural decomposition of the open loop system that is required by the eigenstructure assignment approach.

SuA02 08:30-10:30 Meeting Room 2
Invited Session: 认知模式识别
Invited Session: Cognitive Pattern Recognition

Chair: Pi YouGuo South China Univ. of Tech.
Co-Chair: 田联房 华南理工大学

SuA02-1 08:30-08:50
一种突触后抑制递归神经网络结构及其在模式识别中的应用
A Post-Synaptic Inhibition Recurrent Neural Network Structure and Its Application to Pattern Classification, pp.6-683~6-688

苏彩红 佛山科学技术学院
曾永发 佛山科学技术学院
张志飞 佛山大学

吴菁

华南理工大学

突触后抑制是由抑制性中间神经元的活动引起的一种抑制,当兴奋性神经元激活抑制性中间神经元时,突触后膜产生抑制性突触后电位从而抑制突触后神经元的活动,突触后抑制包括侧支性抑制、反馈性抑制和前馈性抑制三种抑制形式。从认知神经科学的角度来对这三种抑制形式进行深入分析,提出了一种基于突触后抑制的树突侧支性抑制递归神经元模型,并基于这种神经元模型构造了一种突触后抑制递归神经网络结构,在文中给出了相应的学习算法,通过对几个模式分类问题的基准问题的测试,将提出的方法与其它的神经网络进行比较,实验结果验证了提出的网络结构和学习算法的有效性和可行性。

The post-synaptic inhibition is an inhibition which is stimulated by the activity of inhibitory interneurons. When the inhibitory interneurons are stimulated by the excitatory neurons, the IPSP arised from postsynaptic membrane will inhibit the activity of post-synaptic neurons. Post-synaptic inhibition includes lateral inhibition, feedback inhibition and feedforward inhibition. In this paper, these three inhibition modalities are in deep analyzed from the angle of cognitive neuron science. A dendritic lateral inhibition Recurrent Neuron is proposed based on post-synaptic inhibition and then the Post-Synaptic Inhibition Recurrent Neural Network is constructed. Its learning algorithm is given also. By testing several benchmark classification problems, it is proved that this network structure and its learning algorithm are effective and feasible.

SuA02-2**08:50-09:10**

Simple Grid Based on Cognitive Mechanism and Application Research on Description for Structure of Chinese Character, pp.6-689~6-693

Liang TianCai
Qiu Zhiwen
Pi YouGuoSouth China Univ. of Tech.
South China Univ. of Tech.
South China Univ. of Tech.

Structure of Chinese character is so complex that it is difficult to be describe by computer, which block process of informationization of Chinese character strongly. An simple grid which is easy to be implemented by computer is proposed by the paper, and the application of description to structure of Chinese character is also discussed. The basic configuration and its extensioned configuration are introduced detailedly. The experiment on Secondary Chinese character Basic Set within GB2312 is performed, and method of experimentation is given by the paper. Result of experimentation prove that method of description to structure of Chinese character based on simple grid is feasible.

SuA02-3**09:10-09:30**

The Frame of Cognitive Pattern Recognition, pp.6-694~6-696

Pi YouGuo
Shu HuaiLin
Liang TianCaiSouth China Univ. of Tech.
Guangzhou Univ.
South China Univ. of Tech.

Cognitive pattern recognition has two basic research problem, one is to understand principle of human pattern recognition, and the other is to develop computer recognition system which has certain learning ability and adaptive ability based on principle of human pattern recognition. Some achievement of pattern recognition in cognitive science was present, the frame of tradition machine pattern recognition was described. How to apply achievement of cognitive science to traditional machine pattern recognition by combining with characteristic of machine pattern recognition was discussed. Recognition of printed digit character was performed according to frame of cognitive pattern recognition, and the frame is supported by the result of experiment.

SuA02-4**09:30-09:50**

Bi-criteria Acceleration Minimization of Redundant Robot Manipulator Using LVI-based Primal-Dual Neural Network, pp.6-701~6-706

Zhang Yunong

Yin Jiangping

Tian LianFang

Sun Yat-sen Univ.

Sun Yat-sen Univ.

South China Univ. of Tech.

The infinity norm of joint acceleration minimization (also known as the acceleration-level minimum-effort solution) explicitly minimizes the largest component of joint accelerations in magnitude. It is useful in situations where focuses are on low individual magnitude, even distribution of workload, and analysis of motion diversity. However, the minimum-effort solution may encounter discontinuities because of the non-uniqueness of the solution. To remedy such a discontinuity problem, this paper involves two important matters. 1) A new acceleration-based bi-criteria scheme is proposed for preventing the INAM solution discontinuities and joint torques instability problem. It combines the minimum infinity-norm and minimum two-norm solutions via a weighting factor and formulates this scheme as a quadratic programming (QP) problem. 2) The LVI-based primal-dual neural network is presented to solve online such a weighting scheme, because of its simple piecewise-linear dynamics and higher computational efficiency. Simulation results based on PMUA560 robot manipulator illustrate advantages of such a neural weighting scheme proposed in this paper.

SuA02-5**09:50-10:10**

混沌免疫网络的多峰函数优化算法

Multi-modal Function Optimization Based on Artificial Immune Network and Chaos, pp.6-707~6-710

邓九英
毛宗源广东教育学院
华南理工大学

根据人工免疫网络的多峰函数优化方法,利用混沌映射的随机性和各态遍历性,以及混沌吸引子方程中变量渐进稳定到平衡点的特性,提出一种新的混合多峰函数优化算法,能够加速优化解的搜索,提高优化解的精确度,大大改进了免疫网络多峰函数优化算法(opt-aiNet)对输入参数的敏感性.对实例进行优化测试,优化结果显示了混合算法的通用性、高效性与精确性.

After the immune network algorithms of multi-modal function optimization have developed, their performance can be improved by stochastic chaos map. In chaos attractor equations the variables are steadily approached stable points. A novel algorithm of immune network combined chaos is presented. The solutions searched and optimized can be accelerated using this method. According to opt-aiNet improved, parameters sensitivity can be bated. At last, some functions are tested. Through multi-peak illustrated and results optimized, the approach is verified with high generalized, efficiency and precision.

SuA02-6**10:10-10:30**

基于小波变换和纹理测度的多模医学图像融合

Multi-modal Medical Image Fusion Based on Wavelet Transform and Texture Measure, pp.6-697~6-700

康原原
李彬
田联房
毛宗源华南理工大学
华南理工大学
华南理工大学
华南理工大学

多模医学图像融合在医疗诊断上具有重要的应用价值。本文采用双正交小波变换的多分辨率分析方法,对CT和PET图像进行融合,提出了将局部标准差和能量相结合作为纹理测度的融合算法。实验表明,该算法能较多地获得多源图像的解剖结构和功能代谢信息,很好地保留了源图像的边缘和纹理特征,是医学图像融合中比较可取的方法。

Multi-modal medical image fusion has important value in medical diagnosis. In this paper, the multi-resolution analysis of Biorthogonal Wavelet Transform is introduced for CT and PET image fusion, then a new fusion algorithm with the combination of local standard deviation and energy as texture measurement is presented. Experiments show that both anatomical and metabolism information can

be obtained effectively, and both the edge and texture features can be reserved successfully.

SuA03 08:30-10:30 Meeting Room 3
系统理论与控制理论 (4)
System Theory and Control Theory (4)

Chair: Li Shaoyuan Shanghai Jiao Tong Univ.
Co-Chair: Wu Ai-Guo Harbin Inst. of Tech.

SuA03-1 08:30-08:50
Controllability of Switched Linear Systems, pp.2-128~2-131

Qiao Yupeng Chinese Acad. of Sci.
Cheng Daizhan Chinese Acad. of Sci.

This paper considers the controllability of switched linear systems. The largest controllable subspace, C , of a switched linear system is well known. This paper shows that when the system is not completely controllable, C divides the state space into 2 or 3 path-wise connected invariant sub-manifolds. Then we consider whether each path-wise connected component is a controllable sub-manifold. Certain sufficient conditions are obtained for each sub-manifold to be a controllable sub-manifold. A few examples are given to demonstrate the result.

SuA03-2 08:50-09:10
Stability and Stabilization of Discrete-time Linear Systems Over Networks with Control Input Quantization, pp.2-137~2-140

Guo Yafeng Shanghai Jiao Tong Univ.
Li Shaoyuan Shanghai Jiao Tong Univ.

The stability and stabilization of discrete-time linear systems connected over a digital network is considered. The feedback controller design method is proposed simultaneous consideration the effect of the quantization levels, the packet dropout and the network-induced delays. Using the sector bound expression of the quantization density and the Lyapunov-krasovskii functional method, the feedback controller is constructed via solving a set of LMIs. Numerical examples illustrate the effectiveness of the proposed approach.

SuA03-3 09:10-09:30
Time-Delay Dependent Robust Passive Control for a Class of Non-linear Time-Delay Systems, pp.2-151~2-155

Yang Li Liaoning Univ.
Zhang Qingling Northeastern Univ.

The time-delay dependent robust passive control problem for a class of time-delay systems with nonlinear perturbations is discussed. Firstly we establish the time-delay robust passive criterion for the systems by the matrix inequalities, and point out the bound of the time-delay. Then we get the time-delay dependent robust passive state feedback controller. At last we testify the feasibility of the theorems by the numerical examples.

SuA03-4 09:30-09:50
A Proof of the Discrete-Time KYP Lemma Using Semidefinite Programming Duality, pp.2-156~2-160

Cheng Yiping Beijing Jiaotong Univ.

Balakrishnan and Vandenberghe have given an elegant proof of the KYP lemma based on their theorems of alternatives in semidefinite programming. Based also on these theorems, this paper gives a proof of a generalized version of the discrete-time KYP lemma. In addition, we point out that in the nonstrict case of Balakrishnan and Vandenberghe's (continuous-time) KYP formulation the hypothesis that M_{22} be positive semidefinite can be dropped.

SuA03-5 09:50-10:10
PMID Observer Design of Descriptor Linear Systems, pp.2-161~2-165

Wu Ai-Guo Harbin Inst. of Tech.

Duan Guangren

Harbin Inst. of Tech.

A new type of observers for descriptor linear systems, proportional multiple-integral derivative (PMID) observers, is proposed. Based on a general parametric solution to a type of generalized Sylvester matrix equations, a parametric approach for designing such observers is proposed. The proposed approach establishes the complete parameterizations for all the observer gain matrices, gives the parametric expression for the corresponding left eigenvector matrix of the observer system matrix, realizes the elimination of impulsive behaviors, and guarantees the regularity of the observer system. The design method can offer all the degrees of design freedom which can be utilized to achieve various desired system specifications and performances.

SuA03-6 10:10-10:30
Continuous Finite Time Control for Stewart Platform with Terminal Sliding Mode, pp.4-27~4-30

Zhao Dongya Shanghai Jiao Tong Univ.
Li Shaoyuan Shanghai Jiao Tong Univ.
Gao Feng Shanghai Jiao Tong Univ.

This paper presents a continuous finite time stability control method for Stewart Platform with terminal sliding mode. With considering the dynamics of legs of Stewart Platform as uncertainty, the sliding mode can be reached in a finite time then the position tracking error can converge to a residue set around zero in a finite time. Simulation demonstrates the effectiveness of this approach.

SuA04 08:30-10:30 Meeting Room 4
鲁棒控制与 H_∞ 控制 (2)
Robust and H_∞ Control (2)

Chair: 钟宜生 清华大学
Co-Chair: Xu Xiaojie Wuhan Univ.

SuA04-1 08:30-08:50
Nonlinear H_∞ Control of Switched Homogeneous Nonlinear Systems, pp.2-537~2-541

Zhang Lijun Harbin Engineering Univ.
Xue Suqin Yan'an Univ.

In this paper, the problem of L_2 stability and H_∞ control of switched homogenous systems is addressed. Based on the homogenous properties of the systems, the considered systems are limited to a unit sphere for investigation. First of all, the problem of L_2 stability of the switched homogeneous systems is discussed via a designed switching law under the absence of control items, it is shown that, similar to linear case, the stability of normal systems implies to L_2 stability under a given switching law. Then H_1 control problem of switched homogeneous systems is investigated. Similar to Algebraic Riccati Inequality for H_∞ control of switched linear systems, a condition for global control laws to solve H_∞ control problem is obtained for the switched homogeneous nonlinear systems, which are preferable and easier verified compared to the existing results for switched nonlinear systems.

SuA04-2 08:50-09:10
不确定时滞系统的时滞相关非脆弱 H_∞ 控制
Non-fragile Delay-dependent H_∞ Control for Uncertain Systems, pp.3-625~3-629

肖伸平 中南大学
吴敏 中南大学
张先明 中南大学

针对不确定时滞系统非脆弱控制器设计问题, 利用 Lyapunov-Krasovskii 稳定性理论和积分不等式方法获得了不确定时滞系统在非脆弱控制器作用下不仅内部渐近稳定, 而且具有给定的 H_∞ 扰动抑制水平 γ 的时滞相关条件, 给出了非脆弱控制器的设计方法, 这一方法不要调节参数, 利用 Matlab 的 LMI 工具箱求解方便, 数值仿真

说明本文方法的有效性。

This paper is concerned with the problem of delay-dependent non-fragile Robust H-infinite control for uncertain systems. Based on an integral inequality method, a new delay-dependent condition, which can ensure that the closed-loop system is internally stable with a given H-infinite disturbance attenuation level via a non-fragile controller, is obtained by using the Lyapunov-Krasovskii stability theory. Then, the design of non-fragile H-infinite controller is proposed. No any parameter needs to be tuned. It can be easily solved in terms of linear matrix inequalities (LMI) in Matlab Toolbox. Finally, a numerical simulation is given to show the validity of this approach.

SuA04-3 09:10-09:30

Non-Fragile Mixed LQR/ H_∞ Control Problem for Linear Discrete-time Systems with Controller Uncertainty, pp.3-635~3-639

Xu Xiaojie

Wuhan Univ.

This paper considers the discrete-time state feedback non-fragile mixed LQR/H-infinity control problem with controller uncertainty. It is assumed that the controller has a time-varying norm-bounded uncertainty. The controller solving the discrete-time non-fragile control problem is designed. Necessary and sufficient conditions for the existence of such a controller are given in terms of an algebraic Riccati equation.

SuA04-4 09:30-09:50

Quantized Dynamic Output Feedback H_∞ Controller Design, pp.3-665~3-669

Che Weiwei

Northeastern Univ.

Yang Guang-Hong

Northeastern Univ.

This paper studies the quantized dynamic output feedback H_∞ control problem for discrete-time linear timeinvariant (LTI) systems with the consideration of quantizer ranges. The quantizers considered here are dynamic and timevarying. An iterative LMI-based optimization algorithm is proposed to optimize the quantizer ranges, and with which a concrete dynamic output feedback control strategy dependent on not only the controller states but also the measurement outputs is proposed with updating quantizer's parameters, such that the quantized closed-loop system is asymptotically stable and with a prescribed H_∞ performance bound. An example is presented to illustrate the effectiveness of the control strategy.

SuA04-5 09:50-10:10

Improvement of Robust Positive Realness for a Class of Uncertain Systems, pp.3-674~3-677

Li Jing

Xiamen Univ.

Zeng Jian ping

Xiamen Univ.

This paper focuses on robust positive realness analysis and synthesis problem for a class of parameter uncertainty, which has a polynomial form and is a natural extension of the norm-bounded uncertainty. A sufficient condition of robust extended strictly positive realness(ESPR) is obtained for the class of linear uncertainty systems. Moreover, the solvability condition to robust ESPR control is provided via output feedback based on LMI. Furthermore, an approach can be given to design the output feedback controller via convex optimal algorithm.

SuA04-6 10:10-10:30

多工作点 PMSM 伺服系统的高精度鲁棒控制器设计
High Precision Robust Controller Design for PMSM Servo System with Multi-operating-points, pp.3-691~3-695

杨书生

清华大学

钟宜生

清华大学

本文针对表贴式 PMSM 伺服系统提出了一种高精度鲁棒控制器的设计方法。此方法首先利用反馈线性化方法将电动机模型变换为带有等价扰动项的线性模型, 然后针对此模型利用基于信号补偿的鲁棒控制原理设计鲁棒控制器。由于电动机伺服系统的一些参数受环境

影响变化范围很大, 但彼此之间又具有相关性, 因此对其建立多工作点模型以减少保守性。本文证明了所设计的闭环控制系统的鲁棒特性, 并对其进行了仿真实证。

In this paper we propose a high precision robust controller design method for surface mounted PMSM servo system. Feedback linearization method is first applied to transfer the motor plant into a linearized model with an equivalent disturbance. Then a robust controller is designed to compensate the equivalent disturbance. Although some parameters of the control system may deviate seriously from the nominal value when the environment changes, they have relativity. We set up multi-operating-point model to reduce the conservation. Robust properties of the closed-loop system are proven and simulation results are shown.

SuA05 08:30-10:30 Meeting Room 5

自适应控制与学习控制 (1)

Adaptive Control and Learning Control (1)

Chair: 张天平

扬州大学

Co-Chair: 孟 斌

北京控制工程研究所

SuA05-1 08:30-08:50

高超声速飞行器基于特征模型的自适应控制
Adaptive Control Based on Characteristic Model for a Hypersonic Flight Vehicle, pp.3-720~3-724

孟 斌

北京控制工程研究所

吴宏鑫

北京控制工程研究所

本文中, 我们考虑含有大范围时变参数的高超声速飞行器基于特征模型的自适应控制问题。对于零动态是全局 Lipschitz 和指数稳定的非线性系统, 给出了其误差特征模型, 提出了基于特征模型的内 - 外环控制律设计方法。理论证明, 本文所提出的控制律可以实现跟踪目标, 并且可以保证系统状态有界。基于上述理论分析, 我们考虑高超声速飞行器的跟踪问题。针对含有大范围时变惯性和气动参数的非线性、多变量、并且不稳定的高超声速飞行器纵向动力学模型, 设计上述基于特征模型的内 - 外环控制律。仿真结果表明, 本文所提出的控制方法在一定的控制限制下, 不仅可以实现跟踪目标, 而且可以保证攻角的变化满足一定的约束条件, 从而可以达到很好的控制效果。

In this paper, the adaptive control problem based on characteristic model is considered for a hypersonic flight vehicle with time varying parameters over large ranges. An error characteristic model is given and an inner-outer loop adaptive control method based on characteristic model is presented for the nonlinear systems with time varying parameters as well. It is proved theoretically that the proposed control law can not only track the set targets, but guarantee the bound of the system states. Based on the theory analysis, the inner-outer loop controller is designed for the longitudinal dynamics of such a generic hypersonic air vehicle that is nonlinear, unstable, multi-variable, and contains time varying uncertain parameters over large ranges. Simulations illustrate that the proposed controller meets the performance requirements and the constraint of the attack angle using relatively low-amplitude control inputs.

SuA05-2 08:50-09:10

仿人智能 MFA 控制在过热蒸汽温度系统中的应用
Model-free Adaptive with Human-simulated Intelligent Control and Its Application in Super-heated Steam Temperature System, pp.3-725~3-728

徐爱东

山东电力工程咨询院

李传庆

山东电力工程咨询院

陈艳军

山东电力工程咨询院

刘广生

东北电力大学

韩 莉

东北电力大学

火电厂过热蒸汽温度系统是个典型的高阶大惯性过程, 机组负荷的变化又使模型参数表现出时变、不确定和非线性等特征, 大大降低了传统 PID 串级控制的品质。无模型自适应控制 (MFAC) 是一种先进的控制策略, 具有很强的适应性和鲁棒性, 但对于高阶大惯性系统响应较慢, 克服大干扰能力有限。文中提出了融合仿人智能 MFA 控制,

即 HSIC 位于控制上层, 利用系统动态过程提供的特征信息, 进行启发和直觉推理, 不断修正 MFAC 中的惩罚因子, MFAC 直接对系统进行定量精确控制。仿真研究表明, HIS-MFA 控制对过热蒸汽温度系统控制的可行性和有效性。

The superheated steam temperature system is a typical element with high-order inertia process in thermal power plant. Especially in case of load changes, the parameters show obvious time-varying, uncertain and nonlinear property, which markedly reduces the quality of the traditional PID cascade control. MFAC is an advanced control strategy with excellent self-tune and robustness. However, the drawback of MFAC are low response speed and couldn't overcome extraneous disturbance. MFA with human-simulated intelligent control (HSIC) is therefore being presented. Characteristic information of dynamic process is used to heuristic and instinct inference in HSIC, and modifying the penalty factor in MFAC continuously. MFAC is used precise control directly. Simulation results show the feasibility and effectiveness of the HIS-MFA control in superheated steam temperature system.

SuA05-3 **09:10-09:30**
Adaptive Constrained Predictive PID Controller via Particle Swarm Optimization, pp.3-729~3-733

Song Ying Nankai Univ.
 Chen Zengqiang Nankai Univ.
 Yuan Zhuzhi Nankai Univ.

As an alternative to GA, particle swarm optimization (PSO) is a new population-based evolutionary technique and has been attracting much attention to apply in different fields, such as nonlinear programming problems and neural network training. In this paper, a novel time-varying adaptive constrained predictive PID controller via PSO is proposed. This is based on the optimization of the GPC criterion with considering the constraints on the parameters of PID structures and control signal. Furthermore, PSO and non-differentiable exact penalty function technique are utilized to obtain the adaptive constrained predictive PID controller parameters. The proposed controller is suitable for different order systems and does not require the control horizon to be equal to one. As PSO is robust under the presence of nonlinear structures in the performance index and constraints, the proposed controlled can be easily applied to different problems. The simulation results show that the proposed controller is effective.

SuA05-4 **09:30-09:50**
基于动态面控制的间接自适应神经网络控制
Indirect Adaptive Neural Network Control Using Dynamic Surface Control, pp.3-756~3-760

张天平 扬州大学
 李红春 扬州大学
 王芹 扬州大学

针对一类具有未知虚拟控制增益函数的摄动严格反馈非线性系统, 基于动态面控制技术, 提出一种间接自适应神经网络控制器的设计方案. 该方案利用 1 阶滤波器的微分代替了虚拟控制的微分, 结果在下一步的虚拟控制器的设计中微分运算被简单的代数运算所代替, 由此消除了后推设计中由于反复对虚拟控制的求导而导致的复杂性问题, 并避免了反馈线性化方法可能出现的控制器奇异性问题, 参数估计无需使用投影算法. 利用李亚普诺夫方法, 证明了闭环系统是半全局一致终结有界, 通过适当选取设计常数, 跟踪误差可收敛到原点的一个小邻域内.

Based on dynamic surface control, a novel design scheme of adaptive neural network controller is proposed for a class of perturbed strict-feedback nonlinear systems with unknown virtual control gain functions in this paper. The approach utilizes the differentiation of the first-order filter to replace the quantity of the differentiation of the virtual control in determining the next virtual control at each step of recursion. As a result, the operation of differentiation can be

replaced by simpler algebraic operation. Therefore, the problem of explosion of complexity in traditional backstepping design, which is caused by repeated differentiations of certain nonlinear functions such as virtual control, is overcome by introducing the first order filter. Moreover, the possible controller singularity in feedback linearization is avoided without projection algorithm. Using Lyapunov method, the closed-loop systems is shown to be semi-globally uniformly ultimately bounded, with tracking error converging to a small neighborhood of origin by appropriately choosing design constants.

SuA05-5 **09:50-10:10**
一类高阶非线性系统的自适应重复学习控制
Adaptive Repetitive Learning Control for a Class of Nonlinear Time-varying Systems, pp.3-766~3-770

孙云平 西安电子科技大学
 李俊民 西安电子科技大学
 张果 西安电子科技大学

针对控制方向是时变的并含有混合未知参数的高阶非线性系统, 提出了一种新的自适应控制方法, 该方法结合了反馈线性化, 可以处理参数在一个未知紧集内周期性快时变的非线性系统, 通过引进单一的离散型参数周期自适应律, 设计了一种自适应控制策略, 使广义跟踪误差在误差平方范数意义下渐近收敛于零, 通过构造 Lyapunov 泛函, 给出了闭环系统收敛的一个充分条件. 实例仿真结果说明了该方法的可行性和有效性.

A novel adaptive repetitive learning control for high-order nonlinear systems with Unknown time-varying control direction and mixed parameters is proposed by combining the feedback linearization approach. It can be applied to the time-varying parametric uncertainty systems with unknown compact set, rapid time-varying, periodic and where the prior knowledge is the periodicity only. A discrete-type adaptive law and an adaptive repetitive learning control law are constructed to ensure the asymptotic convergence of the extended tracking error in the sense of square error norm. And also, a sufficient condition of the convergence of the method is given. A simulation example illustrates the the feasibility and effectiveness of the proposed method.

SuA05-6 **10:10-10:30**
基于 AdaBoost 的手写体汉字相似字符识别
Handwritten Chinese Similar Characters Recognition Based on AdaBoost, pp.4-576~4-579

张彬 华南理工大学
 金连文 华南理工大学

自适应提升算法作为一种有效的统计学习工具已经广泛应用于模式识别的各个领域. 针对手写汉字识别中类别数大, 相似字识别率低的问题, 我们提出了新的二级手写汉字识别系统, 即在传统识别系统的识别结果的相似字集合中, 应用自适应提升算法对相似字符进行二次识别. 实验表明, 在相似字集合中, 自适应提升算法比传统的距离分类器的识别率有较大的提高

As an effective statistical learning tool, AdaBoost has been widely used in the field of pattern recognition. Considering the large categories of Chinese characters and the recognition rate is low for similar character set, we propose a two-stage booting based scheme for Chinese character recognition. The AdaBoost procedure is applied to the similar character sets' recognition after the traditional distance classifier. Experimental results show that AdaBoost is much better than conventional distance classifier

SuA07	08:30-10:30	Meeting Room 7
非线性系统及其控制 (5)		
Nonlinear System and Control (5)		
Chair: Tan Yonghong	Guilin Univ. of Electronic Tech.	
Co-Chair: Wang Jing	Peking Univ.	

SuA07-1 **08:30-08:50**
Model Reduction for a Class of Nonlinear Systems, pp.2-390~2-394

Wang Jing Department of Mechanics & Engineering Sci.,
Peking Univ.
Huang Lin Peking Univ.

This paper focuses on the model reduction problem for pendulum-like systems based on the Truncated Balanced Realization (TBR) method. It is proven that the stability and the gradient-like property can be preserved in the reduced systems if the original system is stable and gradient-like. A numerical example is used to demonstrate the validity of the proposed method.

SuA07-2 08:50-09:10

Stationary Set and Stability: a Case Study for Mechanical Systems with Discontinuities, pp.2-429~2-433

Zheng Kai Harbin Inst. of Tech.
Shen Tielong Sophia Univ.
Yao Yu Harbin Inst. of Tech.

This paper focuses on the position control of a class of mechanical systems with static friction force. A discontinuous mapping is introduced to represent the static friction such that the closed-loop systems are described by the differential equations with discontinuous right-hand side. Based on the Filippov's framework, it's proved the equilibrium set of the closed-loop systems under PD control corresponds to a stationary mode, and the size of the equilibrium set can be regulated as small as possible with feasible feedback gain. Furthermore, we will show that the positioning error can be rendered into such equilibrium set. To demonstrate the presented theoretical results, the experiments tested on a three-axis flight simulation table are carried out.

SuA07-3 09:10-09:30

Backstepping Based Constrained Control of Nonlinear Hydraulic Active Suspensions, pp.2-463~2-466

Ma Miaomiao Jilin Univ.
Chen Hong Jilin Univ.
Cong Yanfeng Jilin Univ.

In the combination with backstepping techniques, this paper suggests a constrained control approach for active suspension, which is based on nonlinear quarter-car model fully considering the dynamics of hydraulic actuator. The detailed procedure includes two steps: firstly the constrained H_∞ control is designed based on the conflicting performance requirements, and then the nonlinear dynamics caused by the hydraulic actuators are dealt with backstepping techniques. Analysis and simulation results show possible improvements on ride comfort, while respecting time-domain hard constraints.

SuA07-4 09:30-09:50

Modeling Inverse-Hysteretic Systems Based on Expanded Input Space, pp.2-444~2-447

Tan Yonghong Guilin Univ. of Electronic Tech.

In order to improve the performance of the system with piezoelectric actuators, one of the approaches is to construct an inverse model of the hysteresis to cascade with the actuator so as to compensate for the effect of hysteresis involved in the piezoelectric actuators. In this paper, a neural-network-based inverse model for the hysteresis is proposed. In this scheme, an inverse hysteretic operator is proposed to extract the change tendency of the hysteresis inverse. Thus, an expanded input space that involves the inverse hysteretic operator as well as the input of the inverse hysteresis is constructed. This expanded input space is able to transform the multi-valued mapping of the inverse hysteresis into a kind of one-to-one mapping so that the neural networks are capable of implementing identification for the hysteresis inverse.

SuA07-5 09:50-10:10

Adaptive Tracking Control for Uncertain Robot Manipulator with Ad-

ditive Disturbance, pp.2-332~2-336

Xian Bin Tianjin Univ.

In this paper, we present a continuous control mechanism that compensate the parameter linearizable uncertainty in a 6-link robot manipulator system under both repeating and non-repeating disturbance. The control strategy is based on limited assumption on the system nonlinearities. A smei-global asymptotic tracking result is achieved while all the closed-loop states remain bounded.

SuA07-6 10:10-10:30

Generating Hyperchaos via a Simple Periodic Forcing Signal, pp.2-380~2-384

Li Yuxia Shandong Univ. of Sci. & Tech.
Tang Wallace K. S. City Univ. of Hong Kong
Chen Guanrong City Univ. of Hong Kong

Very recently, a new method of generating hyperchaos via a simple periodic forcing signal was introduced and a new hyperchaotic system was formulated by controlling a three-dimensional autonomous Chen chaotic system with a periodic driving signal. The hyperchaotic attractor is not only verified with bifurcation analysis but also demonstrated by computer simulations. In this paper, we further investigate its bifurcation behaviors and electronic circuit implementation. A good qualitative agreement between the simulation and the experimental results is observed.

SuA08 08:30-10:30 Meeting Room 8

工业系统 (2)

Industrial Systems (2)

Chair: 李春文 清华大学
Co-Chair: Li Lanjun Univ. of South China

SuA08-1 08:30-08:50

On MEMS Design Automation, pp.4-774~4-778

Zhao Xin Nankai Univ.
Sun Guangyi Nankai Univ.
Ren Liang Nankai Univ.
Lu Guizhang Nankai Univ.

General approach to the design of MEMS process flow and mask layout relies on purely experience and prior knowledge of the similar devices. It is a quite challenging and hard task, since a variety of professional knowledge and iterative attempts are required. This paper puts forward a novel approach based on feedback-based expert system (FBES) to the auto-design of process flow and layout according to the abstract geometry description of MEMS device. FBES involves feedback verification facility on the basis of conventional expert system, and has shown significant superiority on applicability, flexibility, and expansibility in comparison with the latter, especially for MEMS process flow auto-design. This paper describes the representation of 3D geometry of device, framework of FBES, rules of MEMS process matching, and an example of layout autogeneration and process matching system.

SuA08-2 08:50-09:10

基于切换线性系统的三相 APF 建模与保性能控制

Modeling and Guaranteed Cost Control of Three-phase APF Based on Switched Linear System, pp.6-180~6-184

汤洪海 清华大学
李春文 清华大学
郑雪生 清华大学
戎袁杰 清华大学
刘艳红 郑州大学

为研究具有典型混杂动态特性的三相 APF 高性能控制问题, 首先基于 PWM 调制原理将单相 APF 的不确定混杂系统模型转化为包含切换开关动态的不确定线性系统, 经在平衡流形邻域近似线性化后得到以脉宽为输入函数的线性等效离散不确定系统, 最后对该系统设计了能够实时跟踪补偿指令电流的最优二次保性能鲁棒控制器。该

控制器以 PWM 脉宽作为控制量, 避免了以往对周期平均模型进行控制器设计时的等效占空比环节, 物理意义清晰, 设计更加合理, 在工程应用中易于实现, 具有潜在的应用价值。仿真结果验证了本文所提出的系统模型和控制器设计方法的正确性和有效性。

The high performance control of three-phase APF with hybrid dynamics is investigated in this paper. First, the hybrid dynamic uncertain model of the APF is transformed to a equivalent discrete-time switch linear uncertain systems (EDSLS) based on the pulse-width modulator (PWM) theory. Then, the EDSLS is further transformed to a linear equivalent discrete-time switch linear uncertain system by linearization at some neighborhood of the equilibrium manifold with respect to the pulse width. Finally a robust guaranteed cost controller is designed with on-time tracking property, where, in order to avoid the equivalent duty cycle treatment in the conventional controller design, the pulse width is adopted as the control variables. The proposed control scheme has clearer and more rational physical significance and can be easily adopted in practice. Simulation results illustrate the effectiveness of the proposed APF model and the control strategy.

SuA08-3 **09:10-09:30**

总线技术在汽车车门系统中的应用
BUS Technology Application in Automobile, pp.6-185~6-188

解小华 吉林大学
马彦 吉林大学
陈虹 吉林大学

CAN 是一种先进的现场总线, 支持分布式控制。LIN (局部互连网络) 总线是一个低成本的新协议, 是对汽车中分布式 CAN 网络的补充。本文采用这两种现代总线实现对汽车车门的控制系统的网络化控制。介绍了系统的软硬件设计。该项技术已经进入实际装车试验阶段。

CAN is an advanced live bus, which supports distributed control. LIN(local network)is a new low-cost protocol, which reinforces the distribution CAN network in automobile .Two kinds of protocols are presented in this paper. The hardware and software system were designed. The new technology has put in real experiment.

SuA08-4 **09:30-09:50**

DCS-Based Process Control Simulating System, pp.5-261~5-263

Li Lanjun Univ. of South China
Yu Shouyi Central South Univ.
Luo Wu Guangzhou Inst. of Railway Tech.
Gao Song Univ. of South China

A distributed control system (DCS) based on two-layer networks for experimental teaching is presented in this paper. Three sets of equipments are used as process objects with their parameters such as pressure, temperature, level and flow rate being controlled variables. This system has multiform training functions. Students can not only set up basic experiments about the process control, but can also design complicated control system. The result of 4 years' use shows: it is an ideal engineering simulating system for students major in industrial automation.

SuA08-5 **09:50-10:10**

航材维修商评估决策过程模型及实现
Decision Model and Implementation of Evaluation and Selection to MRO Enterprise, pp.4-805~4-809

陈静杰 中国民航大学
陈玖圣 中国民航大学
张晓瑜 中国民航大学

在民航维修企业评估中建立了影响维修质量的层次结构模型, 并利用层次分析法 (AHP) 对其进行了分析, 通过选用合适的标度和利用数据包络分析法 (DEA) 结合专家调查法建立判断矩阵, 对 AHP 方法进行了改进, 在 .NET 平台实现了评估模型, 仿真实例验证结果表明了该方法的有效性。

A hierarchy model is established about the evaluation of servicing process. When the model is analyzed by analytical hierarchy

process (AHP), the weighted coefficients influencing the evaluation and selection process are obtained, and the evaluation matrix is established by data envelopment analysis (DEA). The hierarchy structure model is implemented based on .NET, the simulation credibility of this method is proved validity.

SuA08-6 **10:10-10:30**

区域供冷系统三级逆向冷量调节和控制技术
Triple Reverse Cool Adjustment and Control Technology with DCS, pp.6-418~6-421

周璇 华南理工大学
闫军威 华南理工大学
朱冬生 华南理工大学
梁列全 广东商学院

针对区域集中供冷系统低温供水带来主机效率下降, 系统运行成本增加的问题, 本文提出了一种区域集中供冷三级逆向式调节和控制技术, 分别对建筑空调末端、二级冷量交换站、冷冻站的冷量进行逆向调节和控制, 其关键技术包括恒流量、变温差调节方法及基于专家经验的自调整 PID 算法。上述方法用于广州大学城区域供冷系统的改造, 大幅度提高了供冷管网冷冻供水温度及主机制冷效率, 同时显著改善了整个区域供冷效率。

A kind of new regulative and control technologies is proposed in this article, which is used to adjust the temperature and cool of supply water reversely from air conditional terminal equipment, second cooling station to centralized cooling station in tune. The cold energy regulative technology of constant flow rate and variable temperature difference with self tuning PID algorithm based on expertise is used to increase the supply chilled water, furthermore improves the efficiency of refrigerating compressor. This method has been put into operation with district cooling system in Guangzhou University town with great satisfactory and would be widely used in the future.

SuA09 08:30-10:10 Meeting Room 9

智能机器人 (3)
Intelligent Robot (3)

Chair: 田玉平 东南大学
Co-Chair: 刘磊 华中科技大学

SuA09-1 **08:30-08:50**

基于单目视觉的机器人动态目标识别与跟踪
Robotic Dynamic Target Recognition and Tracking Based on the Monocular Vision, pp.5-193~5-197

刘磊 华中科技大学
王永骥 华中科技大学

利用单目视觉传感器采集环境信息。用 HSV 颜色模型的 H 和 S 分量, 通过一种基于二值图像分割的快速聚类算法, 从环境中分离出具有某种特定颜色的目标物。利用三维重建算法和分段控制策略计算目标物距离, 融合激光传感器信息获得目标物的精确距离。设计视觉伺服系统, 以实现机器人对运动目标的跟踪。最后通过实验验证该方法的有效性。

Gather the information of the environment by the monocular vision. Using the H and S weight of the HSV color model, separate the target from the environment with a certain color, by a fast clustering algorithm for two-value image segmentation. Calculating the distance between the camera and target by the 3D reconstruction algorithm and sub-control strategy, and raise its veracity by laser information fusion. Furthermore, a vision servo system has been designed and utilized to achieve the robot's dynamic track. At last, some experiments were used to certification its availability.

SuA09-2 **08:50-09:10**

Design of a VSC Controller of Reduced Inputs for Satellite Formation Flying, pp.4-22~4-26

Wang Zhaokui Tsinghua Univ.

Zhang Yulin

Tsinghua Univ.

A modified linear equation of formation is given as the control system model of formation keeping control, which includes the influences of J2 perturbations. Based on system performance analysis of the control model, a control scheme was proposed which using thrusts without radial direction. Guarantee Cost Control (GCC) method based on LMI method was introduced to design the sliding surface, then a VSC control law for discrete-time linear system with mismatched uncertainty was given. A numeric simulation was given after a design example for LEO satellite formation to validate the robust of the control algorithm.

SuA09-3**09:10-09:30**

具有冗余自由度的移动操作臂逆运动学分析

Inverse Kinematics Analysis for a Mobile Manipulator with Redundant DOFs, pp.5-118~5-122马博军
方勇纯
张雪波南开大学
南开大学
南开大学

移动操作臂由移动机器人和一个固定在机器人上的操作臂组成。本文针对一类具有冗余自由度的移动操作臂,提出了一种逆运动学求解策略,它将操作臂末端的自由度在移动机器人与操作臂各关节间进行了合理分配:通过移动机器人转动自由度和操作臂的一、四、五两个关节来实现操作臂末端的姿态要求;通过移动机器人的两个平动自由度和操作臂的二、三关节来实现操作臂末端的位置要求。根据该自由度分配方案,本文对移动操作臂系统引入了两个约束条件,在保障了操作臂末端工作空间完整性的同时,极大地方便了逆运动学的求解。本文最后通过实验对所得到的逆运动学分析结果进行了验证。在实验中,利用固定在移动机器人上的 CCD 摄像机对目标物体进行定位,然后根据目标物体的位姿信息,通过逆运动学分析的结果控制移动操作臂实现了对目标物体的抓取操作。

A mobile manipulator is a manipulator mounted on a mobile robot. This paper proposed an inverse kinematics analysis method for a mobile manipulator with redundant degrees of freedom(DOFs). The DOFs of the end-effector are assigned properly among the mobile robot's 3 DOFs and the manipulator's 5 DOFs: the rotation freedoms of the mobile robot and the manipulator's 1st, 4th and 5th joint contribute to the orientation of the end-effector; while the two translation freedoms of the mobile robot and the rotation freedoms of the manipulator's 2nd and 3rd joint contribute to the position of the end-effector. Based on this DOFs assignment method, two restrictions are introduced for inverse kinematics calculation without changing the work space of the end-effector. Experiment results are included to demonstrate the performance of the results obtained by this inverse kinematics analysis. In these experiments, based on the information of the target's position and orientation obtained from an on-board CCD camera, the mobile manipulator is controlled to catch the target by utilizing the inverse kinematics analysis strategy proposed in this paper.

SuA09-4**09:30-09:50***An Adaptive Localization Method for Autonomous Digging Robot*, pp.5-46~5-49Sun Yi Beijing Inst. of Civil Engineering & Architecture
Lu Haijun Universal Pioneering Tech. Co., LTD

Digging robot is a kind of autonomous robot, which can move in mud according to the prearranged trajectory. Owing to the bad environment in the mud, the location system is pivotal for digging robot. By the working principle of digging robot, its location system with relative location is designed. The Location error of relative location is accumulated with the increase of move distance, so the total error of location system is increased. LMS adaptive algorithm is a data processing algorithm with low quantity of calculation. Therefore LMS adaptive filter is applied to process the location information to improve the accuracy of location system. The adaptive

algorithm of location system is simulated in the computer. The simulation result shows that LMS adaptive algorithm can improve the accuracy of location system effectively.

SuA09-5**09:50-10:10**

多移动机器人的分布式编队与避障控制

Distributed Formation Control of Multiple Nonholonomic Mobile Robots, pp.5-278~5-282陈杨杨
田玉平东南大学
东南大学

本文主要针对含有非完整约束的多移动机器人系统,讨论了多机器人的分布式编队控制问题。通过连续时变状态反馈控制方法和图论知识,设计了一种能够实现机器人编队的队形控制律,利用位置相关的势能函数的避障控制律使得机器人与其相邻机器人和外界障碍物不发生碰撞,仿真说明了这两种控制律的有效性。

This paper deals with the distributed formation control problem of multiple nonholonomic mobile robots. By using smooth time-varying feedback control approach and graph theory, a distributed formation control law is designed, which can achieve formation of a system of multiple nonholonomic mobile robots. Based on potential function, a control law for obstacle collision avoidance is constructed. Simulation results prove the validity of the proposed control laws.

SuA10

08:30-10:30

Meeting Room 10

故障诊断 (1)

Fault Diagnosis (1)

Chair: 胡绍林

南京理工大学

Co-Chair: Tang Wenhui

The Univ. of Liverpool

SuA10-1**08:30-08:50**

计算机巡回检测控制系统的容错设计

Fault-tolerant Design of Computer Cyclic Check and Control System, pp.5-426~5-430

胡绍林

南京理工大学

Karl Meinke

Royal Inst. of Tech. of Sweden

陈如山

南京理工大学

巡回检测是计算机应用于过程控制最广泛形式之一。本文详细分析了普通巡回检测算法存在的局限,提出并且建立了分别适用于设定值控制系统与操作指导式控制系统巡回检测的两组新型巡回检测算法。理论分析和仿真计算证实,新型巡回检测算法具有强的容错能力,可直接用于构建高可靠性的巡回检测系统,有广泛实用价值。

Computer Cyclic Check is widely used in many different fields. Some limitations as well as bugs of classical algorithms in the computer cyclic check system are analyzed in detailed. In order to overcome these advantages, two series of new algorithms are set up in this paper, one of which is built for the computer cyclic check system with fixed reference value and the other for the computer cyclic check under operation steering with variant directive trajectory. Theoretical analysis and simulation result shows that these new algorithms are fault-tolerant and safe. These new algorithms can be widely used in engineering to improve safety of computer cyclic check system.

SuA10-2**08:50-09:10**

基于尺度 - 小波能量谱、粗糙集和神经网络集成的内燃机故障诊断方法

Fault Diagnosis Method to Internal-combustion Engine Based on Integration of Scale-wavelet Power Spectrum, Rough Set and Neural Network, pp.5-431~5-435

陈保家

三峡大学

李力

三峡大学

赵新泽

三峡大学

为了对内燃机气门及活塞 - 连杆组故障进行有效地诊断,通过实验测取内燃机在不同故障下的振动信号,利用连续小波变换得到信号在不同尺度上的能量分布,即信号的尺度 - 小波能量谱。其能量主要分

布于尺度范围 1 32, 且相同故障模式下的尺度 - 小波能量谱呈现出相似性, 不同故障模式之间的尺度 - 小波能量谱存在很大的差异性。利用粗糙集简化理论提取出对信号特征敏感性最强的尺度小波能量, 以此作为不同故障模式的信号特征, 结合 BP 神经网络方法, 实现了对待检信号的正确识别。本文所提出的尺度 - 小波能量谱、粗糙集和神经网络集成的故障诊断方法, 为复杂机械的故障诊断提供了一种新的方法, 具有很强的工程实用价值。

In order to diagnose the faults of the valve and the piston-connecting rod of internal-combustion engine (ICE), the vibration signals under normal and abnormal models were measured by experiments. Through continuous wavelet transform (CWT), the scale-wavelet power spectrum (SWPS) of signals was obtained. The wavelet power (WP) distribution on different scales of each model is observed to be similar and mainly concentrated in particular scope of 1 32. By analyzing the diversity of SWPS distribution, the WP that is most sensitive to the characteristic of each model were extracted by rough set (RS) theory as feature and taken as input to train the back-propagation neural network (BPNN). By the trained BPNN to diagnose the fault signals under detection, the correctness rate is 100%. The fault diagnosis method based on the integration of the SPWS, RS and neural network demonstrates to be efficient and feasible. It has preferable engineering applicability and referenced value to diagnosis for complex machines.

SuA10-3 **09:10-09:30**
An FDI Approach for Aircraft Actuator Partial Failure, pp.5-440~5-444

Wang Dan	Dalian Maritime Univ.
Wu Zhiliang	Dalian Maritime Univ.
Yao Yubin	Dalian Maritime Univ.
Niu Xiaobing	Dalian Maritime Univ.

In this paper, an adaptive observer approach is developed to detect and isolate aircraft actuator faults. Particularly, actuator partial failure is considered. In a multiple-model scheme, a bank of parallel observers are constructed, each of which is based on a model that describes the system in the presence of a particular actuator fault. The observers are designed by eigenstructure assignment based on a modified form of the standard observer to generate fault-dependant residual signals, such that when a model matches the system, the residual signal will be zero. Otherwise, the residual will be non-zero and governed uniquely by the faulty signal. When an actuator is in partial failure status, its effectiveness rate is additional unknown. We develop an adaptive scheme to estimate the unknown parameter. We prove that the proposed adaptive algorithm guarantees the convergence of residual signal when a model matches the plant. By further designing a model-matching index, the fault can be isolated accurately.

SuA10-4 **09:30-09:50**
 基于 Lyapunov 指数的一类轴承故障检测研究
One-class Bearings Fault Detection Model Based on Lyapunov Exponent Spectrum, pp.5-445~5-450

陶新民	哈尔滨工程大学
杜宝祥	哈尔滨工程大学
徐勇	哈尔滨工程大学

为了解决轴承故障检测应用中, 异常数据样本分布不均且不易收集的实际问题, 以及计算 Lyapunov 指数的同时需计算嵌入维度和时间间隔的问题. 本文提出利用正常样本形成相空间参数, 不同运行状态下的样本在该空间上的投影形成轨迹的 Lyapunov 指数作为特征, 并用遗传算法进行阈值优化的一类轴承故障检测模型. 实验结果表明基于 Lyapunov 指数为特征可以有效地进行轴承故障检测. 同时, 我们将 Lyapunov 指数为特征同 Lyapunov 指数谱熵为特征的检测器性能进行了比较, 实验结果验证了基于 Lyapunov 指数为特征的检测效果更加明显. 最后, 将本文建议的算法同时域序列值为特征的 MLP 及其

他算法进行了比较, 结果表明建议的算法在检测率上有明显提高。

In order to avoid the practical application problems, abnormal data insufficiency and unavailability, and solve the difficulty of calculating embed dimension and time tag before calculating Lyapunov exponent, an one-class Bearings fault detection model based on Genetic Algorithm and Lyapunov Exponent Spectrum is proposed in this paper. The normal training samples are used to decide reconstructed phase space. Then the signals with different conditions will be projected into RPS, the Lyapunov exponent is calculated which is classified as features. The optimum decision threshold values are determined by Genetic Algorithm. The results show that Lyapunov exponent for fault detection is more efficient than for fault diagnosis. In experiment, the performance of detector with largest Lyapunov exponent and Lyapunov exponent spectrum entropy is compared. The results evaluate the effectiveness of the proposed approach. This proposed approach is compared against MLP and other detection techniques. The results show the relative effectiveness of the proposed classifiers in detection of the bearing condition with some concluding remarks

SuA10-5 **09:50-10:10**
Fault Diagnosis of Hydro-Generator Unit via GA-Nonlinear Principal Component Analysis Neural Network, pp.5-468~5-472

Ji Qiao-Ling	Wuhan Univ.
Qi Wei-Min	Wuhan Univ.
Cai Wei-You	Wuhan Univ.

Based on the complicated relationships between the symptoms and the defects of hydro-generator units, An approach to diagnosing the faults in hydro-generator units via a neural networks combined with Genetic algorithm(GA) and nonlinear principal analysis neural network (NLPCA NN) is presented in this paper. At first, both the structure and the connection of the NLPCA NN are optimized by GA. The so called GA-NLPCANN is employed to extract main features from high dimension samples. And then the Bayesian neural network (BNN) is also added to test the final diagnosis performance. Finally, the proposed scheme is applied to diagnose the faults samples of hydro-generator unit and the simulation results have proved the effectiveness of this method.

SuA10-6 **10:10-10:30**
Transformer Dissolved Gas Analysis Using Least Square Support Vector Machine and Bootstrap, pp.5-482~5-486

Tang Wenhui	The Univ. of Liverpool
SHINTEMIROV ALMAS	The Univ. of Liverpool
Wu Q. H.	The Univ. of Liverpool

This paper presents a least square support vector machine (LS-SVM) approach to dissolved gas analysis (DGA) problems for power transformers. Two methods are employed to improve the diagnosis accuracy for DGA analysis. Firstly, bootstrap preprocessing is utilised to equalise the sample numbers for different fault types. Then, the preprocessed samples are inputted to a classifier for fault classification. For comparison purposes, four classifiers are utilised, i.e. artificial neural network (ANN), K-nearest neighbour (KNN), simple SVM and LS-SVM. The classification accuracy of LS-SVM is then compared with the ones of ANN, KNN and a simple SVM. The results indicate that the LS-SVM approach can significantly improve the diagnosis accuracies for transformer fault classification.

SuA11 08:30-10:30 Meeting Room 11
 建模、辨识与信号处理 (5)
 Modeling, Identification and Signal Processing (5)

Chair: Zhang Jifeng	Chinese Acad. of Sci.
Co-Chair: 周彤	清华大学

SuA11-1 **08:30-08:50**
Identification for Multivariate ARMA Systems without SPR Condi-

tion, pp.3-140~3-144

Chen Han-Fu

Chinese Acad. of Sci.

When the ELS algorithm is applied to identifying the multivariate ARMA system $A(z)y_k = B(z)w_k$, the SPR condition is usually required and the covariance matrix R_w of w_k is normally not estimated. In this paper the recursive algorithms are proposed for estimating coefficients of $A(z)$, $B(z)$, and the covariance matrix R_w of w_k by recursively approximating the solution to the algebraic equation satisfied by the estimated parameters. The conditions imposed on the system are natural: stability of $A(z)$, identifiability of the system, and iid for $\{w_k\}$. The restrictive strictly positive realness condition (SPR) is not required and the algorithm is easily computable.

SuA11-2

08:50-09:10

线性分式扰动下奇异系统的鲁棒卡尔曼滤波

Robust Kalman Filtering of Descriptor Systems Subject to Linear Fractional Uncertainties, pp.3-212~3-216

张光磊

清华大学

周彤

清华大学

当奇异系统参数存在非结构加性不确定性时, 前人已经提出了一种卡尔曼形式的递推鲁棒滤波算法。本文将其中的参数不确定性模型扩展到具有结构约束的线性分式表示的不确定模型。研究表明, 滤波过程中的线性分式不确定性可以表示为一系列依赖系统真实状态的加性不确定性的交集。本文采用了一个不依赖于系统真实状态的加性不确定性来包含该交集。描述该加性不确定性的参数可以通过离线凸优化得到。数值仿真结果表明, 当奇异系统参数存在线性分式不确定性时, 该算法能够实现递推状态估计。当线性分式不确定性退化为有结构约束的加性不确定时, 该算法的性能优于现有算法。

A robust Kalman type recursive filter has been proposed for descriptor systems subject to unstructured additive uncertainties, which is generalized to linear fractional structured uncertainties in this paper. It is proved that the linear fractional uncertainties during filtering can be represented by the intersection of a series of additive uncertainties relying on the actual plant. A set of additive uncertainties independent of the actual states is utilized in this paper to include this intersection, whose parameters can be obtained offline through convex optimizations. Numerical simulations show that for linear fractional uncertainties, the algorithm can be realized recursively. Moreover, for structured additive uncertainties, the algorithm performs better than the available one.

SuA11-3

09:10-09:30

平移不变小波快速算法在电力通信消噪中的研究

Power Communication Denoising Based on Fast Algorithm of Translation Invariant Wavelet, pp.3-306~3-309

王炬

长沙理工大学

樊绍胜

长沙理工大学

电力干扰噪音是影响电力线载波通信质量的重要因素之一。在小波去噪的方法中, 应用最为广泛的是非线性小波变换阈值法。但在有些情况下, 如在信号不连续点处, 运用阈值法去噪会产生伪吉布斯(Pseudo-Gibbs)现象。在阈值法基础上加以改进的平移不变量小波去噪方法不仅能有效的抑制伪吉布斯现象, 而且能减小原始信号和估计信号之间的均方根误差改善信号的信噪比, 通过仿真实验可以看出, 该方法比阈值法有更好的去噪效果。

Interfering noise of power line is one of the important factors, which affects the quality of power line communication. In wavelet denoising methods, the most popularly used is nonlinear wavelet transform thresholding method. But in some cases, such as in the neighborhood of discontinuities of signal, the wavelet transform thresholding methods may exhibit Pseudo-Gibbs phenomena. Translation invariant wavelet denoising is an improvement for this method. It can not only suppress Pseudo-Gibbs phenomena, but also diminish RMSE between original signal and improving SNR. Simulated experiment shows that translation invariant wavelet denoising

method is better than thresholding denoising method.

SuA11-4

09:30-09:50

Online Multivariable Identification of a MIMO Distillation Column Using Evolving Takagi-Sugeno Fuzzy Model, pp.3-328~3-332

Molazem Sanandaji Borhan

Petroleum Univ. of Tech.

Salahshoor Karim

Petroleum Univ. of Tech.

In this paper, an evolving Takagi-Sugeno (eTS) fuzzy model has been utilized for online identification of a multi-input, multi-output (MIMO) distillation column. In this approach, the rule-base structure and the model parameters of the consequent parts of fuzzy IF-THEN rules gradually evolve during the online identification process. In addition, an exponential time-varying weight is included in the original rule generation condition in order to control the rate of rule generation at the start of the training process and consequently reduce the total number of generated rules in comparison with the original MIMO eTS algorithm. Recursive-Least Squares (RLS) algorithm is employed to estimate the consequent part of each rule. The results show that the modified condition reduces the total number of generated rules for a certain data set with lower RMSE error in comparison with the original eTS method.

SuA11-5

09:50-10:10

Robust FIR Filters for Linear Continuous-time State Space Models with Uncertainties, pp.3-341~3-344

Quan Zhonghua

Seoul National Univ

Han Soohee

Seoul National Univ.

Kwon Wook Hyun

Seoul National Univ.

This paper proposes robust finite impulse response (FIR) filters for linear continuous-time state space models with bounded uncertainties. A set of all reachable current states under bounded uncertainties is determined from inputs and outputs on a recent finite time interval. If some condition is met, this set is shown to be represented in an ellipsoidal form. The derivation procedure is much simplified by utilizing the result on the optimal tracking control with an indefinite cost function. In order to minimize the maximum estimation error due to uncertainties, the center of the reachable ellipsoidal set is chosen as an estimated state. It is shown through simulation that the proposed robust FIR filter achieves a more robust performance than existing robust infinite impulse response (IIR) filters.

SuA11-6

10:10-10:30

Parametric Identification of Input-delay Systems with Unknown Time Delay, pp.3-246~3-250

Najafi Majd Aldin

Isfahan Univ. of Tech.

Kamali Marzieh

Isfahan Univ. of Tech.

Askari Javad

Isfahan Univ. of Tech.

In this paper, a method is presented for on-line identification of systems with unknown time delay. This method is based on two parametric models of system that one of them is defined for transfer function parameters estimation and the other one is defined for delay value estimation. Gradient algorithm is used for estimating transfer function parameters and a new algorithm is suggested for estimating delay value. The effectiveness of this method has been demonstrated through simulation. Also this method has been used for identifying laboratory CNC system parameters. The delay in this system is due to signal transmission between the CNC and the network.

SuB01

10:45-12:25

Meeting Room 1

Invited Session: Advanced Control Theory and Applications (II)

Chair: Liu Kang-Zhi

Chiba Univ.

Co-Chair: Shen Tielong

Sophia Univ.

SuB01-1

10:45-11:05

Beyond the Small-gain Paradigm: How to Make Use of the Phase Information of Uncertainty, pp.6-627~6-631

Liu Kang-Zhi Chiba Univ.
This paper tries to open a new field for robust control. The celebrated small-gain approach to robust control only makes use of the gain information of uncertainty. This results in a limitation on the achievable control bandwidth in system design. To relax this limitation associated with small-gain approach, we explore the possibility of utilizing the phase information of uncertainty in robust control. This paper discusses the modeling of uncertainty accounting for both gain and phase, robust stability conditions and their state space characterization.

SuB01-2 11:05-11:25
A Switching Control Scheme for the Synchronization of Serially Connected Multi-Stage Systems, pp.6-632~6-636

Lu Di Harbin Univ. of Sci. & Tech.
Shen Tielong Sophia Univ.
Fu Minyue The Univ. of Newcastle

Synchronization of multi-stages is a typical systems widely used in manufacturing industry which provides many challenges and opportunities for applications of motion control. This paper presents a switching based control scheme for the synchronization of multi-stage systems. The switching control applies different control gains when the system states lie in different regions. Several simulations will be demonstrated carried on a higher order experimentally validated model with a manufacturing industry background.

SuB01-3 11:25-11:45
Structural Insights and Constructive Procedures for Multidimensional Realization and LFR Uncertainty Modeling, pp.6-637~6-641

Xu Li Akita Prefectural Univ.

In this work, we review some new developments accomplished by the author and co-workers very recently for multidimensional (nD) realization and LFR uncertainty modeling. In particular, we shall show some substantial structural insights to this difficult problem that have not been clarified previously and new constructive procedures that can generate a low-order, possibly minimal Roesser model realization for a rational or polynomial nD transfer matrix with numerical or/and symbolic coefficients. It will also be demonstrated by non-trivial examples that the proposed procedures are simple both conceptually and methodologically, and much more effective than the existing ones.

SuB01-4 11:45-12:05
Equivalent-Input-Disturbance Method Improves Disturbance Rejection Performance: the MIMO Case, pp.6-642~6-647

She Jin-Hua Tokyo Univ. of Tech.
Xin Xin Okayama Prefectural Univ.

This paper extends the equivalent-input-disturbance method to disturbance rejection in an MIMO servo system. It explains the configuration of a control system with a disturbance estimator and a design method based on the concept of perfect regulation. Simulations on the tracking control of a dual-stage system demonstrated the validity of the method.

SuB01-5 12:05-12:25
Modeling and Control of an Underactuated Helicopter Experimental Ssystem, pp.6-648~6-651

Deng Mingcong Okayama Univ.
Inoue Akira Okayama Univ.
Kishida Takuya Okayama Univ.
Ueki Nobuyuki Okayama Univ.

In this paper, modeling of an underactuated helicopter experimental system is shown. The modeled system has two inputs and three outputs, namely, this system is underactuated. For the modeled system, PD-based controller is designed, and an analysis to show the possibility of the proposed controller for the underactuated sys-

tem is also given. Simulation shows the effectiveness of the proposal.

SuB02 10:45-12:25 Meeting Room 2
稳定性与镇定
Stability and Stabilization

Chair: Nian Xiaohong Central South Univ.
Co-Chair: 张国琪 北京控制工程研究所

SuB02-1 10:45-11:05
BMI Approach to Decentralized and Cooperative Control of Large-scale System, pp.3-5~3-9

Cao Li Central South Univ.
Nian Xiaohong Central South Univ.
Tang Wenyan Central South Univ.

Based on the bilinear matrix inequalities (BMI) technique, a new design method is proposed for the decentralized and cooperative control of large-scale systems, and the necessary and sufficient conditions are given to decentralized stabilizability and cooperative stabilizability of large-scale system. The problem of designing decentralized and cooperative controllers are formulated into the problem with BMI constrains. To solving this problem, an optimal alternate algorithm is proposed, and the proof of the algorithm is presented. Several examples are given to illustrate the results. The results in this paper show that the systems can be easily decentralized and cooperative stabilized even if the subsystems are not stable. It's not need presumer of the subsystems's stable.

SuB02-2 11:05-11:25
An MPC Approach to Networked Control Design, pp.3-10~3-14

Wu Jing Univ. of Alberta
Zhang Liqian Univ. of Alberta
Chen Tongwen Univ. of Alberta

This paper investigates the problem of model predictive control for a class of networked control systems. Both sensor-to-controller and controller-to-actuator delays are considered and described by Markovian chains. The resulting closed-loop systems are written as jump linear systems with two modes. The control scheme is characterized as a constrained delay-dependent optimization problem of the worst-case quadratic cost over an infinite horizon at each sampling instant. A linear matrix inequality approach for the controller synthesis is developed. It is shown that the proposed state feedback model predictive controller guarantees the stochastic stability of the closed-loop system.

SuB02-3 11:25-11:45
状态反馈传输滞后情形下线性离散系统的镇定
Stabilization of Linear Discrete Systems with Transmission Delay, pp.3-15~3-18

朱建栋 南京师范大学

本文讨论了带传输滞后的线性离散系统的状态反馈镇定问题,在一般情况下给出了系统可镇定的一个内部限制条件.为了克服带传输滞后的线性离散系统的内部限制条件,提出了两种方法,一种是充分地利用滞后状态的信息,另一种是设计带有递推动态的状态反馈控制器.结果表明,如果系统在没有传输滞后时能通过状态反馈被镇定,则存在传输滞后时,一定能通过设计新的控制器被镇定.

In this paper, it is discussed that the problem of stabilization by state feedback for linear discrete systems with transmission delay. For the general case, an inherent limitation for the stabilization problem is obtained. In order to overcome the inherent limitation, two methods are proposed. One is using enough information of delayed states. The other is designing recursive state feedback controller. Obtained results show that if a system without transmission delay can be stabilized by state feedback, then with transmission delay the system still can be stabilized by a redesigned state feedback controller.

SuB02-4

11:45-12:05

单输入单输出 LTI 系统一类部分状态反馈镇定控制律的存在性及应用

On Existence of a Class of Partial States Feedback Stabilizing Law for Single-Input-Single-Output Linear LTI Systems and Its Applications, pp.3-43~3-48

张国琪

北京控制工程研究所

本文研究对于相对阶已知,但对对象零点数目及在复平面上分布均不确定的 SISO 线性定常对象,是否存在某些特定类型部分状态反馈控制律指数镇定该类对象。结果表明,对于最小相位系统以及开环指数稳定系统,一定存在该特定形式的控制律指数镇定该类对象;对于开环不稳定的非最小相位系统或者相对阶不大于 2 的三种临界对象,均不一定存在该类型的控制律。当该类型的反馈控制律存在时,也一定存在相应阶数的线性补偿器。将上述结果应用于一类特定类型的自适应控制器的存在性以及挠性结构比例-微分型控制律的存在性问题中,得到了相应的结果。

In this paper, the existence of a certain class of partial states feedback stabilization law for single input single output linear time-invariant (LTI) systems with the only knowledge of its relative degree is discussed. The results show that for minimum phase systems or open-loop asymptotic stable systems, there always exists such feedback control law and for non-minimum unstable systems or three types of special systems with relative degree not greater than 2, there doesn't always exist such control law. The results also show that if the supposed stabilization law exists, then there will always be LTI compensators with the same order of such control law. The results is applied to study the existence of proportional-derivative like control for flexible structures and the existence of a certain type of adaptive stabilization law.

SuB02-5

12:05-12:25

Stability Analysis for Spatially Distributed Dynamic Systems, pp.3-54~3-58

Zhou Tong

Tsinghua Univ.

In this paper, a sufficient condition is derived for the stability of a spatially invariant distributed dynamical (SIDD) system, based on the geometrical structure of the null space of a matrix polynomial. This condition is less conservative than the available computationally feasible criteria. Moreover, using the idea of parameter dependent linear matrix inequalities (LMI), a necessary and sufficient condition is obtained. Both of these two conditions are expressed by LMIs, and can therefore in principle be computationally verified. While the necessity of the latter condition is lost if the degree of the related multivariate matrix polynomials is small, its conservatism can be sequentially reduced through increasing this degree step by step.

SuB03

10:45-12:25

Meeting Room 3

系统理论与控制理论 (5)

System Theory and Control Theory (5)

Chair: Duan Guangren

Harbin Inst. of Tech.

Co-Chair: Jin Huiyu

Univ. of Sci. & Tech. of China

SuB03-1

10:45-11:05

不确定离散时滞系统分散鲁棒 H_∞ 控制: LMI 方法*Robust Decentralized H_∞ Control for Uncertain Discrete Time-delay Systems: LMI Approach*, pp.2-725~2-729

桂卫华

中南大学

陈宁

中南大学

谢永芳

中南大学

本文研究多通道不确定离散时滞大系统的分散鲁棒 H_∞ 控制问题。假定不确定性具有数值界,且存在于系统、时滞和输出矩阵中。主要针对动态输出反馈控制问题。基于 Lyapunov 稳定性理论,通过设定 Lyapunov 矩阵为合适的块对角结构,采用矩阵替换的方法推导出了使多通道不确定离散时滞大系统可鲁棒镇定,且满足一定的扰动水平的时滞无关充分条件即线性矩阵不等式有可行解。并且给出了具

有期望阶数的分散鲁棒控制器的设计方法。

This paper considers a robust decentralized H_∞ control problem for uncertain multi-channel discrete time-delay systems. The uncertainties are assumed to be value-bounded, and exist in the system, time-delay and output matrices. Our interest is focused on dynamic output feedback. A sufficient condition for the uncertain multi-channel discrete time-delay system to be robustly stabilizable with a specified disturbance attenuation level is derived based on the theorem of Lyapunov stability theory. By setting the Lyapunov matrix as block diagonal appropriately according to the desired order of the controller, which is reduced to a feasibility problem of a linear matrix inequality.

SuB03-2

11:05-11:25

New Consistency Condition for Exponential Stabilization of Sampled-data Nonlinear Systems, pp.3-84~3-87

JIN HuiYu

Univ. of Sci. & Tech. of China

Yin Baoqun

Univ. of Sci. & Tech. of China

Exponential stability of sampled-data nonlinear systems is investigated via the systems' Euler approximations. New consistency condition and its sufficient conditions are presented. Under the consistency condition the exponential stable controllers for Euler approximations also exponentially stabilize the exact discrete-time models. These conditions may be verified with the continuous-time models, the control laws and the Euler approximations of the systems so that the sampled-data controllers could be designed based on the Euler approximations of the systems while the exact discrete-time models are unknown.

SuB03-3

11:25-11:45

Analyzing Quantization Effect of Digital Control System by Cell Mapping Method, pp.2-97~2-99

Wang Liang

Huazhong Univ. of Sci. & Tech.

Wang Bing wen

Huazhong Univ. of Sci. & Tech.

Guo Yi Ping

Huazhong Univ. of Sci. & Tech.

The research of quantization effect in digital control system attracts much attention in these years. Normally, the statistical and optimization methods are applied to study this effect. These methods all belong to the indirect method. In this paper, we use the cell mapping method, a novel theory in dynamical system area, to study this effect. Through some classical examples, we could find this method is more precise and effective in describing the quantization effect. Apply cell mapping, we also find a new realization method for digital system. This research may open a new avenue for the research of quantization effect.

SuB03-4

11:45-12:05

一类线性时不变广义系统的完全能观性

Complete Observability of a Class of Linear Time-invariant Descriptor Systems, pp.2-200~2-204

谭冲

黑龙江大学

张显

黑龙江大学

本文研究了一类输出中有导数项的线性时不变广义系统的完全能观性问题,给出了该类广义系统完全能观的充分必要条件,建立了简单的充分性判别准则。而且,通过具体例子说明了输出中有导数项的广义系统与输出中无导数项的广义系统在完全能观性中存在的差别。

The complete observability problem of a class of linear time-invariant descriptor systems with a derivative in the output is studied. For the systems, we give necessary and sufficient conditions for the complete observability. From which, several simple sufficient criteria for the complete observability are established. Furthermore, we explain differences of the complete observability between the systems with a derivative and those without a derivative in the output.

SuB03-5

12:05-12:25

Closed Form Solutions for Matrix Linear Systems Using Double

Matrix Exponential Functions, pp.2-123~2-127

Zhou Bin Harbin Inst. of Tech.
Duan GuangRen Harbin Inst. of Tech.

The paper presents closed form solutions for a class of matrix linear systems whose state variable is a matrix. The formulation evaluates the state response of the system in terms of the original system matrices. The proposed solutions naturally fit systems which are most conveniently described by matrix processes. Its formulation uses a compact notation referred as double matrix exponential functions, which is an extension of matrix exponential function, for aiding both intuition and mathematical manipulation. It is a straightforward extension of the solutions for ordinary vector linear systems studied in the past several decades and will play an important role in the design of matrix linear systems using original system matrices.

SuB04 10:45-12:25 Meeting Room 4
鲁棒控制与 H_∞ 控制 (3)
Robust and H_∞ Control (3)

Chair: Mei Shengwei Tsinghua Univ.
Co-Chair: 蒋朝辉 中南大学

SuB04-1 10:45-11:05

离散区间 2-D 系统的二次镇定
Quadratic Stabilization of Discrete Interval 2-D Systems, pp.3-696~3-699

刘征宇 合肥工业大学
韩江洪 合肥工业大学
张利 合肥工业大学
郭祺君 桂林电子科技大学

本文针对离散区间 2-D 系统的二次镇定问题, 给出了离散区间 2-D 系统的二次可镇定的定义, 推导出判定离散区间 2-D 系统是否二次可镇定的判定条件, 得到二次镇定控制律的设计方法. 定理的必要性证明过程说明该结论的保守性小. 计算过程运用线性矩阵不等式, 可以通过 Matlab 的 LMI 工具箱方便地求解, 实用性强. 数值算例表明了结论的有效性.

For discrete interval 2-D systems, based on definition of quadratic stabilizability, sufficient and necessary quadratically stabilizable condition is given in terms of linear matrix inequalities. Quadratically stabilizing controller designing method is also proposed in this paper. The illustrative example shows the results are effective and less conservative.

SuB04-2 11:05-11:25
Robust Stabilization and Disturbance Attenuation of a Class of MIMO Nonlinear System with Multi-operation Points, pp.3-700~3-704

Zhong Yisheng Tsinghua Univ.

In this paper stabilization problem for a class of MIMO nonlinear systems with multi-operation points is considered. A nominal plant is introduced and the controlled plant is described as the nominal one with an equivalent disturbance which denotes the effect of property uncertainties of the plant at different operating point. A nominal controller is first designed to stabilizing the closed-loop system with the nominal plant, then a robust compensator is added to reduce the influence of the equivalent disturbance to achieve robust stabilization and disturbance attenuation.

SuB04-3 11:25-11:45
 H_∞ Analysis Method for the Small Signal Stability of Power System, pp.3-705~3-710

Mei Shengwei Tsinghua Univ.
Che Wenyang Tsinghua Univ.

This work is concerned with the small signal stability problem in multi-machine systems. By means of H_∞ theory, firstly the math model with disturbances is constructed; and secondly, the excita-

tion control law for each generator is designed based on solving Riccati Equation. Finally, simulations performed on 4-machine system shows that the proposed H_∞ method has more advantages over LQR method in both damping ratio and H_∞ norm of the corresponding closed-loop system and so can enhance the small signal stability of power system greatly.

SuB04-4 11:45-12:05

一类不确定非线性系统的鲁棒输出调节问题
Robust Output Regulation for a Class of Uncertain Nonlinear Systems, pp.2-514~2-517

陈作贤 中国科学技术大学
季海波 中国科学技术大学
何德峰 中国科学技术大学

研究了一类具有动态不确定的非线性系统的鲁棒输出调节问题. 设计过程主要分为两部分, 首先构造内模方程扩展系统使得鲁棒输出调节问题转化为鲁棒镇定问题, 然后结合已有的 backstepping 和小增益设计方法来处理系统中相应的未知非线性和动态不确定. 证明了所设计控制律在确保系统全局信号一致有界情况下调节误差至零.

This note deals with the robust output regulation problem for a class of nonlinear systems with dynamic uncertainties. The design procedure is mainly divided into two parts. Firstly, the internal model part is proposed to extend system equations and convert the robust output regulation to robust stabilization problem. Then, the combined backstepping and small-gain approach is introduced to tackle with the corresponding unknown nonlinearities and dynamic uncertainties. It has been demonstrated that the proposed controller regulates the error signal to zero while maintaining overall signals uniform boundedness.

SuB04-5 12:05-12:25

不确定关联大系统输出反馈分散鲁棒 H_∞ 控制
Decentralized Robust H_∞ Output Feedback Control for Interconnected Large-scale Systems with Uncertainties, pp.2-740~2-744

蒋朝辉 中南大学
桂卫华 中南大学
谢永芳 中南大学

利用 Lyapunov 稳定性理论与线性矩阵不等式 (LMI) 方法, 得到了关联大系统的一个新有界实引理, 基于此引理研究了一类状态矩阵、控制矩阵及关联矩阵存在参数不确定性关联大系统的分散鲁棒 H_∞ 动态输出反馈控制问题, 推导出了该类系统存在分散鲁棒 H_∞ 输出反馈控制器的充分条件, 即一组矩阵不等式有解. 通过固定不同变量, 提出了一种构建分散控制器的同伦迭代线性矩阵不等式方法. 所获得的控制器使闭环大系统鲁棒渐进稳定, 并且满足给定的 H_∞ 性能指标. 最后用数值算例说明了设计的可行性和有效性.

A new bounded real lemma for interconnected large-scale systems is obtained by using Lyapunov stability theory and LMI method. Based on the new bounded real lemma, the problem of decentralized robust H_∞ control is investigated via output feedback for interconnected large-scale systems with norm-bounded parameter uncertainties in state, control and interconnected matrices. Sufficient conditions for the existence of a decentralized robust H_∞ output feedback controller are obtained in terms of a set of matrix inequalities. The controller is solved iteratively by homotopy method, which enables the closed loop large-scale system robust asymptotically stable and satisfies the given H_∞ performance. Finally, a numerical example is provided to illustrate the effectiveness and the availability for the design.

SuB05 10:45-12:25 Meeting Room 5
自适应控制与学习控制 (2)
Adaptive Control and Learning Control (2)

Chair: 陈彭年 中国计量学院
Co-Chair: 方勇纯 南开大学

SuB05-1 10:45-11:05

基于极大极小方法的一类非线性系统的自适应控制
Adaptive Control of a Class of Uncertain Nonlinear Systems Based on a Max-Min Method, pp.3-806~3-810

陈彭年
秦化淑

中国计量学院
中国科学院

本文研究了一类具有非线性不确定参数的非线性系统的自适应模型参考跟踪问题. 假设系统的非线性项关于不确定参数是凸或凹的. 基于一种极大极小方法, 提出了一种自适应控制器的设计方法. 该控制器是连续的, 能保证闭环系统的所有变量有界, 且渐近精确跟踪参考模型. 举例说明了本文结果的有用性.

This paper deals with the problem of model reference adaptive tracking of a class of nonlinear systems with an uncertain parameter. The nonlinear term of the system is assumed to be either convex or concave with respect to the uncertain parameter. Based on a max-min method, an adaptive control law for the system is proposed. The adaptive control law is continuous. Boundedness of all signals of the closed loop system and the asymptotic exact tracking are guaranteed. An example is proposed to illustrate utility of the results in this paper.

SuB05-2 11:05-11:25

基于学习控制的 AFM 快速扫描模式研究
A High-speed AFM Scanning Mode Based on Learning Control, pp.3-815~3-819

方勇纯

南开大学

原子力显微镜 (AFM) 是进行纳米测量和操作的一种主要工具. 本文针对原子力显微镜系统, 提出了一种基于学习控制的快速扫描模式. 具体而言, 论文首先构造了一种适用于 AFM 的学习控制系统, 它由对于扫描动态特性的最优逆控制补偿器和对于样品表面特性的学习算法两部分组成. 然后, 针对样品测量过程中, 扫描线之间出现的偏移问题, 通过将常见的比例-积分控制算法与这种学习控制系统相结合, 实现了一种基于学习算法的快速扫描模式. 对于具有周期性特点的样品而言, 采用这种模式对其进行扫描, 可以显著提高测量的速度和精度, 并且将样品与探针针尖的距离控制在一个合适的范围之内, 以避免损坏样品或探针. 因此, 这种快速扫描模式可以用于实现对快速生物过程的实时监测, 同时也可以用来完成重复刻写等纳米操作.

Atomic Force Microscopy (AFM) is a main instrument for nano-scale measurement and manipulation. This paper proposes a learning control based high-speed scanning mode for an AFM system. Specifically, a learning-based control scheme is designed for the AFM system, which consists of an optimal inverse compensator for the AFM scanner dynamics, and a learning algorithm attacking the surface profile of the detected sample. Then, based on the observation of the offset among neighboring scanning lines, the aforementioned learning-based control scheme is combined with a conventional proportional-integral (PI) controller to achieve a high-speed AFM scanning mode. For periodic samples, this mode can be utilized to largely increase the measurement speed and precision, and simultaneously maintains the distance between the cantilever tip and the detected sample within a reasonable range to avoid the possible harm to them. Therefore, the proposed high-speed scanning mode can be employed for on-line inspection of fast biologic processes, and it can also be utilized to implement such nano-manipulation as repetitive writing.

SuB05-3 11:25-11:45

Higher-order Adaptive Iterative Control for Uncertain Robot Manipulators, pp.3-825~3-829

Quan Quan
Wang Xinhua
Cai Kai-Yuan

Beihang Univ.
Beihang Univ.
Beihang Univ.

This paper presents higher-order adaptive iterative learning control for trajectory tracking of uncertain robot manipulators. The proposed control schemes have been given rigorous proof of conver-

gence under some assumptions. The schemes are based upon the use of a proportional-derivative (PD) feedback structure, for which an iterative term is added to cope with the unknown parameters and disturbances. Higher-order adaptive iterative learning control has potential to give a better convergence performance than the first-order scheme algorithms, because of using past system control information from more than one past iterative cycle. The effectiveness of the proposed method is shown through numerical simulation results.

SuB05-4 11:45-12:05

Output-feedback MRAC for Continuous State Delay Systems: the Relative Degree Two Case, pp.3-830~3-834

Kamali Marzieh
Askari Javad

Isfahan Univ. of Tech.
Isfahan Univ. of Tech.

In this paper, Model Reference Adaptive Control (MRAC) of linear continuous-time state delay systems is presented with the assumption that the relative degree of the system without delay be two. Recently, a new two component controller structure was developed for state delay systems in which the relative degree of system without delay was assumed to be one. We have combined the two component controller structure with the well known Monopoli 担 algorithm for systems with relative degree two, to extend the design for the relative degree two case. Closed-loop system stability and error convergence is proved by using a suitable Lyapunov-Krasovskii functional. The effectiveness of the theoretical results has been illustrated through simulation results.

SuB05-5 12:05-12:25

Adaptive Control of Flexible Satellite, pp.3-771~3-776

Arif Thawar

Al-Isra Private Univ.

The Minimal Controller Synthesis (MCS) is an extension of hyperstable Model Reference Adaptive Control (MRAC) algorithm. The aim of MCS is to achieve excellent closed-loop control despite the presence of system parameter variations, external disturbances, dynamic coupling within the system and system nonlinearities. The MCS was successfully applied to the problem of decentralized adaptive schemes. A modification on the decentralized MCS algorithm is proposed in this paper, to highly enhance the stability and robustness of the decentralized adaptive control systems. The proposed algorithm is applied successfully for controlling the attitude of flexible satellite.

SuB07 10:45-12:25 Meeting Room 7

非线性系统及其控制 (6)

Nonlinear System and Control (6)

Chair: Hong Yiguang
Co-Chair: Xi Zairong

Chinese Acad. of Sci.
Chinese Acad. of Sci.

SuB07-1 10:45-11:05

Numerical Realization of Plane CW Complexes under a Given 'Flow Condition' in Gradient-like Morse-Smale Controlled Systems, pp.2-508~2-513

Enomoto Ryuji
Hamaguchi Saori

Toba National College of Maritime Tech.
Toba National College of Maritime Tech.

In this paper, we discuss a global stabilization problem for a 2-dimensional nonlinear system from the perspective of 'the realization problem of global compact attractors' in the theory of gradient-like Morse-Smale controlled systems. We give the topological structure of a desired compact attractor by a graphic data of the corresponding normal CW complex. We call the direct-product of the state space and the input space, the configuration space of the control system. From the topological intersection theory in the configuration space, we derive a topological obstruction for controlled systems and we call this 'the flow condition'. We propose a solving algorithm for this realization problem and discuss some numerical results.

SuB07-2 11:05-11:25
Fault Tolerant Control Based on Sliding Mode Control Approach with Application to Water Tank System, pp.2-415~2-418

Rafi Youssef Central South Univ.
 Peng Hui Central South Univ.

Recent advanced application technologies have appeal to fault tolerant control due to the crucial consequence that might be caused by faulted system. This paper is subjected to fault tolerant control under sliding mode technique and present the tool needed to achieve the design controller when the fault information is inserted into equivalent control part.

SuB07-3 11:25-11:45
A Two Level Non Linear Inverse Control Structure for Rotorcraft Trajectory Tracking, pp.2-321~2-325

Mora-Camino Felix ENAC French Civil Aviation Inst.

The purpose of this communication is to investigate the usefulness of the non linear inverse control approach to solve the trajectory tracking problem for a four rotor aircraft. After introducing simplifying assumptions, the flight dynamics equations for the four rotor aircraft are considered. A trajectory tracking control structure based on a two layer non linear inverse approach is then proposed. A supervision level is introduced to take into account the actuator limitations.

SuB07-4 11:45-12:05
Nonlinear Control for Synchronization Scheme to Chaotic Fractional Order Chen-Lee Systems, pp.2-267~2-269

Toossian Shandiz Heydar Shahrood Univ. of Tech.
 Hajipoor Ahmad Shahrood Univ. of Tech.

In this work nonlinear control theory is successfully extended to fractional-order Chen-Lee systems to achieve synchronization. The analytical results are derived based on the Laplace transformation theory. Moreover, numerical simulations are shown to verify the effectiveness of the proposed synchronization schemes.

SuB07-5 12:05-12:25
Using Sequential Kalman Filters for State Estimation of Nonlinear Systems, pp.2-258~2-261

Mohammadi Sirous Islamic Azad Univ.
 Mohammadi Ali Islamic Azad Univ.
 Keivani Hamid Islamic Azad Univ.
 Askari Mohammad Islamic Azad Univ.
 Kavehnia Farzad Islamic Azad Univ.
 Ghanbarian Mahdi Islamic Azad Univ.

Modal series is a new approach for modelling and analysis of nonlinear systems. This paper provides application of modal series to state estimation of nonlinear systems and introduces a new state estimation approach for nonlinear systems. We use classical Kalman filter to estimate each terms of modal series. The proposed state estimation method has been used to improve LQG (Linear Quadratic Gaussian) controller response of a nonlinear system. To validate the proposed approach, results of simulation of LQG control of a cart and pole using proposed approach has been compared with the classical LQG control.

SuB08 10:45-12:25 Meeting Room 8
 混杂系统与 DEDS
 Hybrid Systems and DEDS

Chair: Sun Zhendong South China Univ. of Tech.
 Co-Chair: Kang Yu Chinese Acad. of Sci.

SuB08-1 10:45-11:05
Converse Lyapunov Theorem for Switched Stability of Switched Linear Systems, pp.2-678~2-680

Sun Zhendong South China Univ. of Tech.

In this work, we prove that any switched asymptotically stable

switched linear system admits a Lyapunov function that strictly decreases among at least one non-trivial state trajectory of the switched system. A stabilizing switching law is proposed based on the Lyapunov function.

SuB08-2 11:05-11:25
 一类分层非结构化 P2P 系统的随机优化

Stochastic Optimization for a Class of Hierarchical Unstructured P2P System, pp.2-693~2-696

徐陈锋 中国科学技术大学
 奚宏生 中国科学技术大学
 江琦 中国科学技术大学
 殷保群 中国科学技术大学

对于一类利用中心式构架和分布式构架各自优点的分层非结构化 P2P 系统, 通过定义一种 Markov 切换空间模型来描述其动态组划分切换行为, 从而导出相应的系统性能优化问题. 同时还在 Markov 决策过程理论的基础上给出了关于性能指标的参数化梯度优化算法, 其中包括两种参数简化方法, 并通过相应的实例仿真验证了算法的有效性.

For a class of hierarchical unstructured P2P systems, a Markov Switching-Space model is introduced to describe their behavior of dynamic grouping. It is also formulated as a optimization problem based on Markov Decision Processes. And parameterized gradient algorithms are provided to optimize the performance, where two parameter reductions are mentioned. Following them are the corresponding simulations and discussions.

SuB08-3 11:25-11:45
Study of QoS Based on Flow Classification in Multi-Layer Switch, pp.5-622~5-625

Cheng Chuanqing Wuhan Univ. of Tech. & Sci.
 Wang Li Wuhan Univ.

With the description of the multi-layer switch and qos principle, we introduce the flow classification technology to implement QoS and put the implementation way and workflow. Then we introduce the experiment steps and the result and give related analysis.

SuB08-4 11:45-12:05
Stochastic Stabilization of Markovian Jump Systems with State and Input Delays, pp.2-716~2-720

Kang Yu Chinese Acad. of Sci.

This paper is concerned with the stability and control problem of Markovian jump systems with state and input delays. For differentiable time-varying delays in each system modes of operation, we provide a time delay upperbound such that the stochastic stability of ordinary delay-free system ensures the stochastic stability of the corresponding delayed system with memoryless state feedback control. For constant delays in each system modes of operation, a sufficient condition for stochastic stabilizability of such systems with delayed feedback control is proposed based on the reduction method.

SuB08-5 12:05-12:25
Variable Structure Control for Interval Systems, pp.4-46~4-50

WANG Cuihong Southwest Jiaotong Univ.
 HAO Guang Southwest Jiaotong Univ.
 HUANG Tianmin Southwest Jiaotong Univ.

A variable structure control method is proposed for a class of interval systems. In terms of linear matrix inequalities (LMIs), a sufficient condition is given for the existence of linear sliding mode surface guaranteeing asymptotic stability of the reduced-order equivalent sliding mode dynamics. An LMI parameterization of such sliding mode surface is designed and a switched feedback control strategy is accordingly given to drive the system state trajectories reach the sliding surface. Finally, the simulation example shows the effectiveness of proposed method.

SuB09 10:45-12:25 Meeting Room 9
神经网络

Neural Networks

Chair: Liu Meiqin Zhejiang Univ.
Co-Chair: Che Yan-Qiu Tianjin Univ.

SuB09-1 10:45-11:05

Supervisory Control of Chaotic Systems Using Online GA Tuning Neural Networks, pp.4-193~4-197

Che Yan-Qiu Tianjin Univ.
Wang Jiang Tianjin Univ.
Zhou Si-Si Tianjin Univ.

In this paper, we present a controller for the supervisory backstepping control of a class of general nonlinear systems using online GA tuning neural networks (GNSB controller). The weights of the neural networks (NNs) approximator employed in the backstepping controller can successfully be turned via an online genetic algorithms (GAs) approach. The genetic algorithm has the capability of directed random search for global optimization. A simplified form of GA (SGA) approach is proposed to accelerate the search speed, and a new fitness function is established by the Lyapunov design method for the requirement of tuning the weights of the NNs online. A supervisory controller is used to guarantee the stability of the close-loop nonlinear system. Examples of Duffing chaotic system controlled by the presented controller are shown to illustrate the effectiveness of the proposed controller.

SuB09-2 11:05-11:25

Standard Neural Network Model for the Feedback Stabilization of Intelligent Systems, pp.4-104~4-108

Liu Meiqin Zhejiang Univ.
Zhang Senlin Zhejiang Univ.
Yan Gangfeng Zhejiang Univ.

A novel neural network model termed standard neural network model (SNNM) is advanced. Based on the stability analysis of the SNNM, state-feedback control law is then designed for the SNNM to stabilize the closed-loop system. The control design equation is shown to be a set of linear matrix inequalities (LMIs) which can be easily solved by various convex optimization algorithms to determine the control signal. Most recurrent neural network (RNNs) and nonlinear systems modelled by neural networks or Takagi and Sugeno fuzzy models can be transformed into the SNNMs to be stability analyzed or stabilization controller synthesized in a unified SNNM's framework. Finally, some examples are presented to illustrate the wide application of the SNNMs to the feedback stabilization of nonlinear systems.

SuB09-3 11:25-11:45

H_∞ Control for Chaotic System with Cooperative Weights Neural Network, pp.4-198~4-202

Sun Li Tianjin Univ.
Wang Jiang Tianjin Univ.
You Hao Tianjin Univ.
Deng Bin Tianjin Univ.

In the paper, a novel type of neural network, referred to as neural network with cooperative weights is proposed to achieve H-infinity tracking performances for a class of unknown nonlinear dynamic system with external disturbance. By Lyapunov method, the overall closed-loop system is shown to be stable. In the article, the effect of both approximate error and external disturbance on the tracking error is attenuated to a prescribed lever by adequately selecting the weight factor ; the changes of weights are consistent by online adjusting the cooperative factor. Thus, the realization is easy. The simulation results of the Duffing chaotic system are given to confirm the control algorithm is feasible for practical application In this paper, the active sliding mode control is proposed to realize

the synchronization of two Fitz-Hugh-Nagumo (FHN) neurons under external electrical stimulation in master-slave structure. After describing the periodic and chaotic dynamics of FHN model for individual neuron under external electrical stimulations, we design an active sliding mode controller to synchronize two FHN neurons and stabilize the chaotic trajectory of the slave system to the desired periodic orbit of the master system. Asymptotic synchronization can be obtained by proper choice of the control parameters. The simulation results demonstrate the effectiveness of the proposed control method..

SuB09-4 11:45-12:05

NN-ANARX Structure for Control of Nonlinear SISO and MIMO Systems: Neural Networks Based Approach, pp.4-138~4-144

Petlenkov Eduard Tallinn Univ. of Tech.
Belikov Juri Inst. of Cybernetics at Tallinn Univ. of Tech.

An application of Neural Networks based Additive Nonlinear Autoregressive Exogenous (NN-ANARX) structure for modeling and control of nonlinear SISO and MIMO systems is presented in the paper. A novel neural network based approach for calculation of control signals by using NN-ANARX based dynamic output linearization algorithm is proposed in the paper. The effectiveness of the approach proposed in the paper is demonstrated on examples.

SuB09-5 12:05-12:25

最小覆盖算法

The Least Covering Algorithm, pp.4-181~4-185

赵 姝 安徽大学
张燕平 安徽大学
张 铃 安徽大学
徐 峰 华安证券公司

机器学习所述的学习系统旨在根据教师所提供的一组概念样本和背景知识, 确定特定概念的描述。从认识论观点来看, 对样本进行学习, 其知识都集中在样本集上, 我们无法“无中生有”, 换句话说, 当我们只有少量样本时, 对其学习后, 只能得到有限的知识, 不可能由此对所有的未知情况进行识别。本文对机器学习问题提出“最小覆盖原理”, 以此作为多层前向网络的覆盖算法追求的目标, 以获得尽可能与学习样本接近的规则; 并研究了最小覆盖的若干性质, 在此基础上提出一个求“最小覆盖”的几何算法; 最后从规划方法的角度给出最小覆盖的求解过程。

Learning system in machine learning is conducted to confirm the description of specific concept, according to a set of samples and background knowledge that teachers offer. In the point of epistemology, when study the samples, we always focus on the sample set, so nothing can be fabricated, in other words, if we only have a few samples, we can get limited knowledge after learning them, then it is impossible to distinguish every unknown situation. To get the principle which is close to the sample as much as possible, this paper puts forward the least covering principle of machine learning, which is the aim of the covering algorithm of multi-layered feedforward neural network; it also makes a study of the properties of least covering, then brings forward a geometry algorithm to get the least covering that is based on this; at last it gives the solving process of least covering using the programming method.

SuB10 10:45-12:25 Meeting Room 10

故障诊断 (2)

Fault Diagnosis (2)

Chair: 陈 杰 北京理工大学
Co-Chair: 刘士荣 杭州电子科技大学

SuB10-1 10:45-11:05

基于观测器的 Delta 算子系统故障检测

Observer-Based Fault Detection for Delta Operator Systems, pp.5-492~5-495

张瑞金 郑州大学

张爱玲 郑州大学
研究 Delta 算子描述的离散时间系统故障检测问题。基于传统移位算子的 Luenberger 观测器, 提出 Delta 算子系统的故障检测观测器设计方法, 推导出该观测器的存在条件和显式表达式, 给出基于观测器的 Delta 算子系统故障检测算法。仿真结果表明本文方法的有效性。
The problem of fault detection for the delta operator formulated discrete time system is considered. Based on the traditional Luenberger observer using the shift operator, a new observer design approach to fault detection for delta operator system is proposed. Both the existence conditions and explicit expression of the desired observer are developed. The algorithm of observer-based fault detection for delta operator systems is also given. The simulation results show the effectiveness of the proposed approach.

SuB10-2 11:05-11:25
Modeling of a Power Transformer Winding for Deformation Detection Based on Frequency Response Analysis, pp.5-506~5-510
SHINTEMIROV ALMAS The Univ. of Liverpool
Tang Wenhui The Univ. of Liverpool
Wu Q. H. The Univ. of Liverpool

The paper presents a mathematical model of disc-type power transformer winding for frequency response analysis (FRA) based on traveling wave and multiconductor transmission line theories. Each disc of the model is described by traveling wave equations, which are connected to each other in a form of multiconductor transmission line model. The model is applied to FRA simulation in order to study winding axial and radial deformation and its detectability. Comparison of the simulated winding deformation cases with the reference FRA traces is given and discussed to explore the potentials of the proposed model for winding fault detection.

SuB10-3 11:25-11:45
基于模糊概率 SDG 模型的复杂系统故障诊断研究
Research on Fault Diagnosis Based on Fuzzy Probability SDG in Complex System, pp.5-516~5-519
朱琳 北京理工大学
陈杰 北京理工大学
陈文颀 北京理工大学
邓方 北京理工大学

针对大规模复杂系统中故障关联关系复杂并随系统工作状态变化的特性, 本文在 SDG 模型中引入了状态关联概率和模糊信息, 并结合面向对象技术提出了一种新的故障描述模型——模糊概率 SDG 模型。在分析了这一故障模型的信息传递特性后, 提出了此模型的建模方法和诊断流程。并在此基础上进一步通过引入消息节点和支路, 连接复杂系统各子实体对象的模糊概率 SDG 模型, 构成整个复杂系统的模糊概率 SDG 系统。该模型能有效对复杂系统故障诊断中存在的复杂关联关系进行建模与故障诊断。最后利用本文提出的方法建立了某武器平台的故障诊断系统, 该系统的试验结果表明了本文提出方法的有效性与实用性。

In large-scale complex system, the fault association is completed and varies with the system working status. In this paper, a new fault description — fuzzy probability SDG model (FPSDG) is proposed by introducing the status association probability and fuzzy information. The modeling method and procedure of diagnosis is also proposed after analyzing the information transfer characteristic of the proposed model. On this basis, the message node and route is introduced to connect the FPSDG of those subsystems, and then the FPSDGs model of whole complex system is constructed. The model can model the complicated association of system malfunction and diagnose. Finally, with the proposed method, a fault diagnosis system of a weapon carrier is built. The experiment result of this system proved the effectivity and utility of this model.

SuB10-4 11:45-12:05
基于强跟踪粒子滤波器的非线性系统故障诊断
Strong Tracking Particle Filter Based Fault Diagnosis for Nonlinear

Systems, pp.5-539~5-543
刘士荣 杭州电子科技大学
何文波 宁波大学

提出一种强跟踪粒子滤波器, 并将其应用于非线性动态系统的故障诊断。将强跟踪滤波器的特点与粒子滤波器算法结合, 形成了强跟踪粒子滤波器。对于非线性动态系统故障模型不确定的情况, 由粒子滤波器的状态估计值与强跟踪粒子滤波器的状态估计值之间的差来进行故障诊断。仿真研究表明所提出的故障诊断方法能有效地对系统故障进行检测与诊断。

A strong tracking particle filter is presented that is used to make fault diagnosis for nonlinear dynamic systems. strong tracking particle filter is consisted of strong tracking filter and particle filter. Because of the uncertainty of the fault models of nonlinear dynamic system, the errors between the values of the state estimation with particle filter and ones with strong tracking particle filter are used to judge the faults of the system. Simulations show that the proposed method is capable of the fault detection and diagnosis of the systems.

SuB10-5 12:05-12:25
工程机械设备远程监控故障诊断系统的设计与实现
Design and Implementation of Remote Supervisory Control and Fault Diagnostic System for Construction Equipments, pp.6-445~6-448
周璇 华南理工大学
梁列全 广东商学院

现代工程机械设备的性能与复杂程度不断提高, 传统的现场故障诊断手段和方法已无法满足工程机械故障诊断需要, 针对上述问题, 本文提出了一种基于混合架构的工程机械设备远程监测与故障诊断系统设计及实现方法, 探讨了系统实现的软、硬件关键技术: 基于 CAN 总线的嵌入式服务器设计方法, C/S、B/S 的混合架构, GSM/GPRS, GIS 应用服务, 传感器数据融合以及故障树诊断等先进技术; 实现工程机械的远程监控和故障诊断, 及时发现和排除设备故障, 协助工程机械制造商为用户提供及时有效的售后服务, 最大程度避免或缩短故障停机, 为企业和用户带来巨大的经济效益。

To meet information oriented demand in construction machinery and equipment industry, a kind of design and implementation of remote supervisory control and fault diagnostic system for construction equipment is proposed in this article. With the technologies of embedded server design based on CAN bus technique, C/S and B/S Hybrid Architecture, GSM/GPRS, GIS application services, multi-sensors information fusion algorithm and fault tree, the faults of construction equipment would be diagnosed as soon as possible to avoid economic losses.

SuB11 10:45-12:25 Meeting Room 11
随机系统
Stochastic Systems
Chair: 王远 北京信息工程学院
Co-Chair: Ma Shuping Shandong Univ.

SuB11-1 10:45-11:05
非线性时变随机控制系统的能控性判据
The Algebraic Criterion for Nonlinear Stochastic Control Systems Which the Coefficient is Time-dependent, pp.2-754~2-756
刘峰 北京交通大学
彭实戈 山东大学

本文研究了时变随机控制系统的随机精确能控性问题, 利用倒向随机微分方程的方法, 给出了系统随机精确能控性的充要条件。而且当随机系统退化为确定性系统时, 那么这个随机精确能控性的代数判据就变成了确定性系统的能控性判据。

This paper is devoted to stochastic exact controllability of stochastic control system, whose coefficient is time-dependent. The problem is studied from the viewpoint of Backward Stochastic Differential Equations, we give a sufficient and necessary condition of stochas-

tic exact controllability for stochastic control systems. If stochastic systems degenerate to deterministic systems, the algebraic criterion for stochastic exact controllability becomes the counterpart for complete controllability of linear deterministic control systems.

SuB11-2 **11:05-11:25**

Repeated N-Person Stochastic Cooperative Games: Superadditivity, Convexity, pp.2-762~2-765

E Cheng-guo Yanshan Univ.
Gao Zuo-feng Yanshan Univ.
Mao Ali Qinhuangdao Foreign Language Professional College

This paper takes the model of stochastic cooperative games, which introduced by Suijs et al in 1999 as a base, then defines the conception of repeated stochastic cooperative games. It applies the notion of certainty equivalents of stochastic cooperative games, which introduced by Suijs et al (1999) and defines the conception of superadditivity and convexity of repeated stochastic cooperative games. It shows that such a repeated stochastic cooperative games satisfies properties like superadditivity and convexity if and only if the corresponding deterministic repeated cooperative games satisfies these properties.

SuB11-3 **11:25-11:45**

Delay-Dependent Stability and Stabilization for Uncertain Discrete Markovian Jump Singular Systems with Mode-Dependent Time-Delay, pp.2-766~2-770

Ma Shuping Shandong Univ.
Zhang Chenghui Shandong Univ.

The robust stochastic stability and stabilization problems for mode-dependent time-delay discrete Markovian jump singular systems with parameter uncertainties are discussed. Based on the restricted system equivalent (r.s.e.) transformation and by introducing new state vectors, the singular system is transformed into a standard linear system, and delay-dependent linear matrix inequality (LMI) condition for the mode-dependent time-delay discrete Markovian jump singular systems to be regular, causal and stochastically stable is obtained. With this condition, robust stability and stabilization problems are solved, and the LMI sufficient conditions are obtained. A numerical example illustrates the effectiveness of the method given in the paper.

SuB11-4 **11:45-12:05**

State Feedback Stabilization of Nonlinear Stochastic Systems, pp.2-784~2-788

Zhang Weihai Shandong Univ. of Sci. & Tech.
Yan Zhiguo Shandong Inst. of Light Industry

This paper studies the feedback stabilization of nonlinear affine stochastic systems, for which, sufficient conditions for the locally and globally asymptotic stabilization in probability are presented by means of Hamilton-Jacobi inequalities (HJIs). As corollaries, some previous results are improved. One example is given to show the validity of the developed theory.

SuB11-5 **12:05-12:25**

带有有色观测噪声系统 Kalman 滤波算法的稳定性研究
The Stability of the Kalman Filter for Systems with Colored Observation Noises, pp.3-71~3-75

王 远 北京信息工程学院
李 忱 北京信息工程学院

本文研究带有有色观测噪声的随机时变线性系统 Kalman 滤波算法的稳定性问题, 首先给出一个适当的随机可观测条件, 保证随机 Riccati 方程的 Lr-稳定性, 同时又可以保证它的指数稳定性, 然后进一步给出 Kalman 滤波算法稳定的一个充分条件.

The stability of the Kalman filter for the stochastic time varying linear systems with colored observation noises has been treated. In

this paper, we first introduce a suitable stochastic observability (or excitation) condition to guarantee both the Lr- and exponential stability of random Riccati equations. Then we give a sufficient condition to ensure the stability of Kalman filter.

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Zhao Zhuwei	PFRB-39	96	张晋	PSaB-19	133
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Zheng Kai	SuA07-2	144	张历卓	FrB10-3	80
Zheng LuHai	PSaB-16	132	张利	SuB04-1	151
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张秀华	PfFrB-43	96	PSaA-27	125
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