Paper ID: CCC07-1805  
Title: Information Architecture and Control Design for Rigid Formations  
Authors: Anderson Brian D. O., Yu Changbin, Fidan Baris  
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.

Paper ID: CCC07-1810  
Title: Systems Biology and Complex Diseases  
Authors: Wu Jiarui  
Abstract:  
After “Human Genome Project” has been accomplished, the life science comes to a new era, the post-genome era. In the post-genome era, the “big sciences” such as genomics, proteomics and metabolomics (so-called “omics”) gradually become a new popular research methodology to provide global pictures of cells or organisms, although the classical experimental biology (small sciences) such as molecular biology or cell biology is still the mainstream in life sciences. The concept and strategy of omics is completely different from the classical experimental biology. The omics is called a “discovery science”, of which the goal is to identify all the genes or proteins in the organisms, whereas the classical experimental biology such as molecular biology is called a “hypothesis-driven science”, since the researches of these disciplines are initiated based on the scientific hypothesis and focus on studying the structure and functions of individual gene or protein.

Systems Biology is a newly born discipline in the post-genome era, which integrates the research strategy of classical experimental biology such as molecular biology with the new research strategy of “omics”. Systems Biology is also a new interdisciplinary frontier based mainly on the integration of the “wet” experiments such as molecular biology or “omics” with the “dry” experiments such as bioinformatics and computational biology. Technology of Systems Biology includes the “omics” platforms such as proteomics-platform and the theoretical platforms for computing and modeling. From these properties, Systems Biology is defined as an integrating methodology for analyzing the components and dynamical behavior of biological systems as a whole. More importantly, these properties have made Systems Biology as a powerful analytical tool to reveal the complex diseases such as cancer and diabetes.

Although the complex diseases have been extensively studied for a long term, it is far beyond
understanding the mechanisms of the disease-process and curing these diseases. The difficulties for dealing with the complex diseases arise from the aspects of the complex diseases: 1) the causes of the initiation and development of the complex diseases involve multiple genetic factors, environment factors and the interaction of these two kinds of factors. 2) the different kinds of cells or tissues involve in the diseases. For example, the brain, pancreas, liver, skeletal muscle and adipose tissue mainly involve in the type 2 diabetes. 3) the molecular defects for the complex disease disrupt the normal behaviors of the complex molecular networks of genes and proteins.

The classical bio-medicine based on molecular biology, cell biology, genetics and other experimental biology has made significant progress for against disease in general. However, the researchers on the bio-medicine area still face the great challenge for against the complex diseases such as cancer and diabetes since the methodology of the classical experimental biology is based on studying individual gene and protein and treat the organisms as a simple and linear system, which is not good enough to solve such problems of the complex diseases. Therefore, it is clear that the methodology and techniques of system biology must be applied for analyzing the molecular mechanisms of the complex diseases, and provide new solutions for preventing and curing the diseases.

Paper ID: CCC07-1807
Title: From Infinite Horizon to Receding Horizon for Controls, Estimations and Optimizations
Authors: Kwon Wook Hyun
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 minimaximization 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.

Paper ID: CCC07-1806
Title: Systems and Control Impact in a Changing World
Authors: Djafaris Theodore E.
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.

Paper ID: CCC07-1809
Title: Hybrid Dynamical Systems: Robust Stability and Control
Authors: Cai Chaohong, Goebel Rafal, Sanfelice Ricardo, Teel Andrew
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.

Paper ID: CCC07-1808
Title: Analysis and Control of Discontinuous Dynamical Systems
Authors: Shen Tielong
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.
Title: 区域经济系统的模糊集成监控方法及仿真研究(Fuzzy Integration Monitor Method in Regional Economic System and Its Simulation)
Authors: 郑时，郑文，金霞
Abstract:
本文通过构建具有二重空间整合特征的区域经济竞争力新的指标体系,提出了基于模糊评判与模糊控制的区域经济评价方法。该方法的思路是首先给出了广泛收集统计数据和征求专家意见后的模糊评价方法,随后设计模糊控制器。应用 Matlab 图形界面工具与 Simulink 设计模糊控制器并进行系统仿真。仿真结果表明,这一方法能够动态跟踪并比较区域竞争力的发展状况,并且用 5 条规则,即可实现控制,该方法控制效果明显优于模糊评判方法。

The purpose of this paper is to track the Regional Economic Development dynamically, and realize its fuzzy control. This paper presents a new fuzzy integration method. The method is, firstly, Fuzzy Evaluation method and fuzzy control rule based on lots of statistical data and expert's experience was proposed. Secondly, Fuzzy Controller was designed. Finally, simulation of this method was carried out by applying MATLAB GUI and Simulink. The result shows that this method can track the trace of Regional Economic Competitiveness, realize the Fuzzy Control only by 5 rules, and acquire the better result than Classical Fuzzy Evaluation Method evidently.

Title: 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)
Authors: 王国胜，刘峰，梁冰，段广仁
Abstract:
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.

Title: Eigenstructure Assignment in Second-order Linear Systems: A Parametric Design Method

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.
Authors: Wang Guosheng, Liang Bing, Lv Qiang, Duan Guangren
Abstract:
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.

Paper ID: CCC07-0151
Title: 迭代反馈整定方法综述(Overview of the Iterative Feedback Tuning)
Authors: 王卫红, 侯忠生, 金尚泰
Abstract:
在此我们综述了迭代反馈整定（Iterative feedback tuning-IFT）方法的发展历程。首先给出了IFT的基本概念、原理和算法。然后，从IFT算法的改进算法、IFT算法的研究现状以及IFT算法与其他控制方法的比较研究等方面进行考察。最后指出IFT方法今后可继续研究的方向。

In this article we review the resent advances in iterative feedback tuning method. First insight is provided into the concept and principle associated with IFT. Then a briefing is given to the initial algorithm of IFT. Subsequently we summarize several aspects of the IFT method, such as, the improved algorithm of it, the extension of it, the combination with others algorithm, the comparison with others algorithm and the application of it. Finally,

this paper gives the remarks on future direction.

Paper ID: CCC07-0179
Title: Delay-dependent Robust Passive Control for Uncertain Systems with Time-varying Delays
Authors: Qiu Jiqing, Gao Zhifeng, Shi Peng, Yang Hongjiu
Abstract:
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.

Paper ID: CCC07-0234
Title: Robust Filtering and Fixed-lag Smoothing for Linear Uncertain System with Single Delayed Measurement
Authors: Zhao Hongguo, Zhang Huanshui, Zhang Chenghui, Song Xinmin
Abstract:
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.

Paper ID: CCC07-0241
Title: 一种基于M序列的噪声模型辨识方法(A Method of Noise Model Identification Based on M-Series)
Authors: 李会军，王启刚，季刚，马增良
Abstract: 在使用辨识的方法建立系统的数学模型时，一般要求测量到的输出信号具有较高的信噪比。如果输出信号中噪声功率较大，辨识出的数学模型和系统实际情况就会有较大偏差，以此模型为基础设计的控制器的控制效果也不会很理想。在这种情况下，需要先对噪声模型进行辨识，然后根据噪声模型对输出信号进行数据预处理。本文假设M序列是噪声模型的输入信号，给出了噪声模型的最小二乘类参数辨识方法。

It is necessary that the Signal-to-Noise Ratio of the measured output signals must be large enough when we use the methods of identification to establish the mathematical model of the system. If the power of the noise in the output signals is too large, the model established through system identification will not reflect the fact, and the controller based on the model will not get expectant effect. In this application, we need establish the model of noise, and preprocess the output signals according to the model. This paper provided a Least-Square Method to identify the noise model using M series as the input signal of the noise model.

Paper ID: CCC07-0293
Title: SP(C+E+G+J)模型在市场经济控制与决策中的应用(The Application of SP(C+E+G+J) Model for Market Economics System to Controlling and Decision)
Authors: 周泽南，贺仲雄
Abstract: 本文将集对分析、可拓学、灰色系统、界壳论有机的融合起来构造了SP(C+E+G+J)模型，并讨论了应用于复杂市场经济系统的控制与决策。
This paper has introduced Set Pair Analysis, Theory of Extension, Grey Theory, Theory of Jieke, then combined all of them to construct Sp(E+G+J) model. Besides, the paper has discussed the application of Sp(E+G+J) model to the controlling and decision in the market economic system.

Paper ID: CCC07-0323
Title: 基于过剩需求估计的动态资产分配策略(Dynamic Asset Allocation Strategy Based on Estimated Excess Demand)
Authors: 甘敏，彭辉，梁亮
Abstract: 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分配策略。选取了香港股票市场中的长江实业作为实证对象。
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.
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.

Paper ID: CCC07-0415
Title: Multivariate Perturbed Padé Approximation
Authors: Zheng Chengde, Zhang Huaguang
Abstract:
In the present work, a new definition of multivariate Padé approximation of a given function which has a convergent power series form is introduced. This approximation is called multivariate perturbed Padé approximation. The error of the introduced approximation vanishes at some points in the square $[0,0.5]^2$. A comparison of the results obtained by our introduced approximation and the well-known Canterbury Approximation (proposed by J. Chisholm and his colleagues) is given.

Paper ID: CCC07-0440
Title: 仿人智能控制策略的研究(Control Strategy of Human-Like Intelligent Control)
Authors: 王培进, 慕志强, 马文明
Abstract:
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.

Paper ID: CCC07-0489
Title: Stability Analysis for Discrete-time Switched Systems Based on Multiple Lyapunov Functions
Authors: Li Huimin, Bai Xiaoming, Yang Xiaosong
Abstract:
In this paper by combining the method of multiple Lyapunov functions with the comparison principles of discrete-time systems we present some new results on stability in terms of two measures for discrete-time switched systems.

Paper ID: CCC07-0542
Title: 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)
Authors: 王亮, 汪秉文, 郭一平
Abstract:
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.

Paper ID: CCC07-0604
Title: 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)
Authors: 孙鹤旭, 梁涛, 雷兆明
Abstract:
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.

Paper ID: CCC07-0620
Title: 线性奇异时滞系统的干扰解耦(Disturbance Decoupling for Linear Singular Systems with
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-输出干扰解耦问题即输入-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
zerolization 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.

Paper ID: CCC07-0672
Title: 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)
Authors: 赵刚, 张贺
Abstract:
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.

Paper ID: CCC07-0673
Title: The New Variable-period Sampling Scheme for Networked Control Systems with Random
Time Delay Based on BP Neural Network Prediction
Authors: Liu Jiangang, Liu Biyu, Zhang Ruifang, Li Meilan
Abstract:
This paper focus on the new variable-period sampling scheme for networked control systems
with random time delay based on BP neural network prediction so as to alleviate the influence of
the time delay on networked control systems. How to model, analyze and control networked
control systems adopting BP neural network are specially presented in this passage. The time
delay that can be predicted online using BP neural network tool is chosen as the sampling period.
The key point is that the new generalized model that can be applied in the practical condition is
strongly recommended.

Paper ID: CCC07-0717
Title: Further Results on Robust Stability/Stabilization of Uncertain Linear Delayed Systems
Authors: Zhang Xianming, Wu Min, She Jinhua, He Yong
Abstract:
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.

Paper ID: CCC07-0730
Title: 被于二维混合模型的最优重复控制 (Optimal Repetitive Control Based on Two-Dimensional Hybrid Model)
Authors: 兰永红, 吴敏, 佘锦华
Abstract:
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，从而使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.

Paper ID: CCC07-0745
Title: 一类滞后奇异线性切换系统解的性态 (Behaviours of Solutions for a Class of Linear Singular Switched Systems with Time Delay)
Authors: 谢湘生, 胡刚
Abstract:
滞后奇异切换系统的切换时，由于切换前后两个子系统可能不相容，切换系统的解在切换点会出现不连续间断。我们考虑了一类滞后奇异线性切换系统的不连续解，建立了该系统所有
Since there may be inconsistency between the subsystems, the solutions are discontinuous at the switched points for singular switched systems. The discontinuous solutions for a class of linear singular switched systems with time delay are considered in this paper. Some criteria are established to guarantee all solutions of the systems converge to zero. An example is given to illustrate the application of the presented results.

Paper ID: CCC07-0756
Title: Analyzing Quantization Effect of Digital Control System by Cell Mapping Method
Authors: Wang Liang, Wang Bingwen, Guo Yiping
Abstract:
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.

Paper ID: CCC07-0757
Title: 区间变时滞切换系统的指数稳定分析(Delay-dependent Exponential Stability of Switched Systems with the Interval Time-varying Delay)
Authors: 王东，王伟
Abstract:
研究了一类区间变时滞切换系统的指数稳定问题，其特点是变时滞参数的下界可以在一个时间区间内变化。使用线性矩阵不等式方法和平均驻留时间法，给出了切换变时滞系统的指数稳定的充分条件和切换律的设计方法，并且利用线性矩阵不等式求解的矩阵估计了系统状态的衰减率。所获得的指数稳定性指标也适用于变时滞的导数已知和未知的情况，且比现存的结果具有更多的保守性。仿真结果验证了算法的有效性。
The exponential stability problem is addressed in this paper for a class of switched systems with interval time-varying delay where the delay parameters are variable in a time interval. Based on linear matrix inequalities (LMIs), delay-dependent exponential stability is guaranteed for such systems under the switching signals with average dwell time. The estimate of state decay rate is given by solving the corresponding matrices. The exponential stability criteria are obtained whether the upper bound of the derivation of the delay is restricted or not. The results obtained are less conservative than those in the current literatures. Two examples are given to show the effectiveness of the proposed method.

Paper ID: CCC07-0797
Title: 单亲遗传算法的最优群体规模(Optimal Population Size for Partheno-genetic Algorithm)
Authors: 贺勇
Abstract:
通过研究单亲遗传算法每一次遗传迭代所处理的有效图式的数量，建立研究单亲遗传算法
最优群体规模的数学模型，论证单亲遗传算法最优群体规模的存在性。在应用单亲遗传算法解决实际问题时应该选择适当的群体规模才能使算法有较高的计算效率。

By reviewing the number of efficient schemas that are disposed by partheno-genetic algorithm during every genetic operation, the mathematics formula researching the optimal population size of partheno-genetic algorithm is presented, and then the existence of optimal population size of partheno-genetic algorithm is demonstrated. One of the key problems in the application of partheno-genetic algorithm is reasonable selection of the population size.

Paper ID: CCC07-0876
Title: Kalman Filtering in the Presence of State Space Equality Constraints
Authors: Gupta Nachi
Abstract:
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.

Paper ID: CCC07-0906
Title: 一类具有 Markov 跳变参数的不确定系统弹性滤波(Resilient Filtering for Uncertain Systems with Markov Jump Parameters)
Authors: 何舒平, 刘飞
Abstract:
针对一类具有未知输入的范数有界的不确定 Markov 跳变系统，研究了系统的弹性滤波器设计问题。在滤波器参数出现弹性扰动时，将滤波器的设计问题转化为一个 H-infinity 滤波问题。利用构造的 Lyapunov 函数和线性矩阵不等式，在保证系统渐近稳定的条件下，设计了系统的弹性滤波器，证明并给出了滤波器有解的充分条件，并将滤波器的设计转化为一个优化问题。仿真示例显示了设计方法的有效性。

The design problem of resilient filter is studied for a class of uncertain Markov jump systems with norm-bounded unknown inputs. It's formulated as the H-infinity filtering problem while considering the resilient disturbance of filter parameters. In the precondition of the systems' asymptotically stable, a sufficient condition for the solvability of the H-infinity filtering problem and the resilient filter design approach are presented and proved by proper Lyapunov function and linear matrix inequalities. The design problem of the filter is described as an optimization one. Simulation results demonstrate the validity of the proposed approach.

Paper ID: CCC07-0912
Title: Distributed Remote Control System of UAV Based on Man-in-loop Real-time Operation
Authors: Zhang Fengqing, Kong Quancun
Abstract:
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.

Paper ID: CCC07-0948
Title: Closed Form Solutions for Matrix Linear Systems Using Double Matrix Exponential Functions
Authors: Zhou Bin, Duan Guangren
Abstract:
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.

Paper ID: CCC07-1043
Title: Controllability of Switched Linear Systems
Authors: Qiao Yupeng, Cheng Daizhan
Abstract:
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.
Title: 基于两足步行椅机器人的在环控制(基于两足步行椅机器人的在环控制)
Authors: 唐矫燕, 赵群飞, 黄杰, 杨汝清
Abstract: 本文在以助残为目的开发的两足步行椅机器人的基础上，对其在环中的助残机器人控制系统进行了分析和研究。首先对人在环中的机器人系统进行分析和建模。探讨了人在环中的机器人步态和路径规划，并运用 ZMP 理论对人在环中的两足步行机器人的系统稳定性进行了仿真试验和总结分析并对未来的工作进行了展望。

Title: Stability and Stabilization of Discrete-time Linear Systems Over Networks with Control Input Quantization
Authors: Guo Yafeng, Li Shaoyuan
Abstract: 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.

Title: Control System Development of the One-axis Hydraulic Road Simulator Using QFT
Authors: Kim Jin Wan, Xuan Dong Ji, Zhang Jing Yi, Kim Young Bae
Abstract: 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.
Paper ID: CCC07-1125
Title: On the Trapping Region of the Trajectories of Chaotic Lorenz-type System
Authors: Sun Fengyun, Zhao Yi
Abstract:
In this paper, it is shown that all solutions of the chaotic system are contained in a trapping region. For the typical parameters values that the chaotic attractor is bounded is displayed. By constructing a suitable Lyapunov function, we show that for the system parameters in some specified regions, the solutions of the chaotic system are globally bounded.

Paper ID: CCC07-1141
Title: Time-Delay Dependent Robust Passive Control for a Class of Nonlinear Time-Delay Systems
Authors: Yang Li, Zhang Qingling
Abstract:
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.

Paper ID: CCC07-1145
Title: A Proof of the Discrete-Time KYP Lemma Using Semidefinite Programming Duality
Authors: Cheng Yiping
Abstract:
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.

Paper ID: CCC07-1209
Title: PMID Observer Design of Descriptor Linear Systems
Authors: Wu Aiguo, Duan Guangren
Abstract:
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.

Paper ID: CCC07-1224
Title: A Simplified and Practical Life-Cycle Design System Based on Feature-Based Modeling
Authors: Xu Xiaoming, Deng Yi
Abstract:
In this article, a new and simplified life-cycle design system is presented. With feature-based modeling technology, this design system analyzes life-cycle inventory data and therefore generates life-cycle assessment (LCA) data. Then, the system can feed back the data to the design process in order to improve the machining plan. In the end of this article, an example is cited to improve the feasibility of the design system.

Paper ID: CCC07-1239
Title: On All Sets of Optimal Controls for a Control System with State Feedback
Authors: Jimenez Serrano Eleazar, Araki Keijiro, Kusakabe Shigeru
Abstract:
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, posses 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.

Paper ID: CCC07-1275
Title: 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)
Authors: 纪志成, 卢星海, 谢林柏
Abstract:
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.

Paper ID: CCC07-1358
Title: 广义系统的同时镇定研究(Simultaneous Stabilization for Singular Systems)
Authors: 马静，高志伟
Abstract:
基于广义系统稳定因子理论，得到了广义系统稳定的右逆和右零化系统，给出了广义系统同时镇定控制器的设计方法，最后用一个算例说明了方法的有效性。
On the basis of stable fractional theory to singular systems, stable right inverse and stable right null space are derived for singular systems. Simultaneous stabilization problem is discussed and a design approach is proposed in terms of stable right inverse, stable right null space, and controller parameterization for singular systems. A numerical example is given to illustrate the design procedure.

Paper ID: CCC07-1388
Title: 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)
Authors: 王秀红，刘梦良
Abstract:
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，将约束最优化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.

Paper ID: CCC07-1399
Title: Time-Lag Effect on the Capture Capability of Pursuit-Control
Authors: Wu Wenhai, Qu Jianling
Abstract:
The time-lag problem is one of the most important problems in both the fields of mathematics and control...

Paper ID: CCC07-1492
Title: Complete Parametric Approach for Output Regulation Problems of Matrix Second-Order Systems via Full Information Feedback
Authors: Teng Yu, Wei Yiyin, Duan Guangren
Abstract:
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.
Title: 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)

Abstract:
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.

Title: 供热锅炉控制决策管理系统的研究 (On Control Decision Management System for Heating Boilers)

Abstract:
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可靠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.
Title: 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)

Authors: 钟震，段广仁

Abstract:
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性的三个等价性条件。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.

Title: 反馈线性时变多变量控制回路性能评价
(Linear Time-Variant Multivariable Feedback Control Loop Performance Assessment)

Authors: 张彤，王庆林

Abstract:
针对一类具有可确定“时滞”的线性时变多变量(LTV MIMO)控制系统的性能评价方法进行研究，定义了该类系统中相当于单回路“过程滞后”的矩阵因子——关联矩阵。利用该关联矩阵和正常相乘的方法，提出一套建立 LTV MIMO 过程反馈最小方差(MV)基准的系统算法和过程。估计 MV 基准时，需要考虑到 LTV 系统特有的计算特性，利用实际最小方差输出而不是关联滤波最小方差输出获得 MV 基准。为了避免估计关联矩阵所带来的困难并实现准确评价，建立了 LTV MIMO MV 基准上界，该上界利用过程数据和关联矩阵阶数即可获得。理论和仿真研究表明，上述方法能够正确和有效的评价 LTV MIMO 系统。

This paper is focusing on study of performance assessment methods of a kind of linear time-varying multiinput-multioutput (LTV MIMO) control systems which time delays can be decided. It defined a matrix factor named interactor matrix correspond to process delay in univariate control loops. Using this interactor matrix and normal multiplication, this paper put forward a set of systematic algorithm and process to set up feedback minimum variance (MV) benchmarking of LTV MIMO process. Taking account of particular characteristic of LTV systems, it is essential to take advantages of actual MV output but not interactor filter MV output to acquire MV benchmarking. In order to avoid the trouble of estimate interactor matrix and achieve accurate assessment, a LTV MOMO MV benchmarking upper bound is built. It can be obtained with process data and interactor matrix rank. Research on theory and simulation show the methods above can assess LTV MIMO process accurately and effectively.

Title: 基于有界性的非线性反馈指数稳定混沌同步
(Chaotic Synchronization of Exponent Stability by Nonlinear Feedback Based on the Bounded Property)

Authors: 陈明杰，王常虹，张红梅
Abstract:

Exponent stability is considered as a higher level of stability than asymptotic stability. To realize chaotic synchronization with better synchronization capability, a theory of exponent stability was introduced to the research of chaotic synchronization, and an approach of chaotic synchronization with exponent stability of the synchronization error system was discussed. On the premise that the states of the aim chaotic system were observable, an approach of exponent stability by nonlinear feedback control based on the bounded property of the tracks was proposed for the chaotic synchronization, which made the chaotic synchronization errors satisfy exponent stability, and realized the chaotic synchronization in according to exponent stability. That is to say, the capability of chaotic synchronization was improved, while the chaotic systems arrived at the chaotic synchronization. Theory analysis and simulation results had proved the feasibility and validity of the approach. When applied in the fields of chaotic secure communication and others, the prospect will be perfect.

Paper ID: CCC07-0046

Title: Inverse Optimal Stabilization of a Class of Nonlinear Systems

Authors: Ji Guojun

Abstract:

In this paper, an approach for constructing optimal feedback laws is for regulation of a class of nonlinear system. The inverse optimal control approach was applied which circumvents the task of solving a Hamilton-Jacobi equation and results in a controller optimal with respect to a meaningful cost functional. The inverse optimality approach requires the knowledge of a control Lyapunov function and a stabilizing control law of a particular form. For the over-voltage nonlinear mathematical models appeared in power system, using the method of integrator backstepping was constructed. A characterization of nonlinear stability margins achieved with the inverse optimal control law was given in this paper.

Paper ID: CCC07-0101

Title: 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)

Authors: 王冰, 季海波, 奚宏生

Abstract:

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.

Paper ID: CCC07-0104
Title: Comparisons of Two Sufficient Conditions for Chaos Synchronization
Authors: Cai Jianping, Wang Jiangen, Wu Xiaofeng, Chen Shuhui
Abstract:
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.

Paper ID: CCC07-0135
Title: 一类不确定非线性系统的二次稳定模糊控制
(Quadratically Stable Fuzzy Control for a Class of Uncertain Nonlinear Systems)
Authors: 杜贞斌, 曲子芳, 任俊义
Abstract:
针对一类不确定非线性系统, 综合了模糊 T-S 模型和自适应模糊逻辑系统, 提出一种二次稳定控制方案.首先, 应用模糊 T-S 模型对非线性系统建模.其次, 应用自适应模糊逻辑系统作为补偿器来消除建模误差和不确定非线性部分的影响.控制方案保证了闭环系统的二次稳定性和数界.仿真结果表明了该方案的可行性.
Combining fuzzy T-S model with adaptive fuzzy logic systems, this paper presents a quadratically stable control scheme for a class of uncertain nonlinear systems. Firstly, the fuzzy T-S model is used to model the nonlinear systems. Secondly, the effect of the modeling errors a and the modeling errors and the uncertain nonlinear parts are eliminated by a compensator based on the adaptive fuzzy logic systems. The control scheme guarantees the quadratic stability of the closed loop system and the norm bound. The simulation results demonstrate that the control scheme is effective.

Paper ID: CCC07-0139
Title: 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)
Authors: 李树荣, 杨青, 薛秀莉
Abstract:
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
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.

Paper ID: CCC07-0285
Title: The Stability of Discrete Impulsive Control System
Authors: Liu Feng, Guan Zhihong, Wang Hua O.
Abstract:
The stability of equilibria of discrete impulse control systems is discussed. The conclusion was drawn under general conditions by using the method of the Lyapunov method, it was shown that there always existed an impulse control such that discrete systems were stable under some conditions. An examples of discrete logistic system was given to illustrate the methodology and verify the theoretical results.

Paper ID: CCC07-0290
Title: 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）
Authors: 韦彦秀, 梁新荣
Abstract:
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求权值进行调整，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.

Paper ID: CCC07-0300
Title: Using Sequential Kalman Filters for State Estimation of Nonlinear Systems
Authors: Mohammadi Sirous, Mohammadi Ali, Keivani Hamid, Askari Mohammad, Kavehnia

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。
Farzad, Ghanbarian Mahdi

Abstract:
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.

Paper ID: CCC07-0312
Title: 五自由度无轴承异步电机的 a 阶逆系统解藕控制(Decoupling Control of the 5 Degree-of-Freedom Bearingless Induction Motor Based on a-th Order Inverse System Method)
Authors: 刘贤兴, 董磊, 范文进, 孙宇新

Abstract:
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 a 阶逆系统的方法进行动态解藕控制。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 a 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 a-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 a-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.

Paper ID: CCC07-0325
Title: Nonlinear Control for Synchronization Scheme to Chaotic Fractional Order Chen-Lee Systems
Authors: Toossian Shandiz Heydar, Hajipoor Ahmad

Abstract:
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.
Abstract:
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.

Abstract:
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.

Abstract:
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.

Paper ID: CCC07-0447
Title: 离轴式拖车移动机器人的路径跟踪控制(Path Following Control of Tractor-trailers with Off-axle Hitching)
Authors: 周火凤, 马保离
Abstract:
本文研究带 n 节离轴式拖车移动机器人的几何路径跟踪问题。首先推导出系统的时间-状态线性化模型; 进而基于内模原理设计了动态反馈路径跟踪控制律, 该控制律可以保证系统的所有状态一致和毕竟一致有界, 且指定的任意一节拖车的路径跟踪误差的模正比于期望外部输出信号模的平方。仿真结果证实了所提出控制方案的正确性和有效性。

This paper investigates the geometric path following problem of mobile robot towing n off-axle trailers. First, the time-state linearization model of the tractor-trailer system is derived, then a dynamic feedback tracking control law is proposed based on internal model principle, guaranteeing all the states uniformly bounded and ultimately uniform bounded (BUUB) with the norm of final tracking error of the given trailer proportional to the squared norm of the desired external output signals. Simulation results show the effectiveness of the proposed control scheme.

Paper ID: CCC07-0470
Title: State Observers for Nonlinear Dynamic Systems
Authors: Dong Yali
Abstract:
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 present. 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.

Paper ID: CCC07-0488
Title: Stabilization of a Class of Nonlinear Switched Systems with Continuous-time and Discrete-time Subsytems
Authors: Bai Xiaoming, Li Huimin, Yang Xiaosong
Abstract:
In this paper we present some new results on stabilization of a class of nonlinear switched systems with continuous-time and discrete-time subsystems.

Paper ID: CCC07-0513
Title: 双臂自由漂浮空间机器人关节空间的增广变结构鲁棒控制(Robust Variable Structure Control for Free-floating Space Robot System with Dual-Arms in Joints Space)
Authors: 陈力, 唐晓腾
Abstract:
讨论了载体位置与姿态均不受控制情况下，双臂自由漂浮空间机器人系统的控制问题。结合系统动量守恒关系进行的运动学、动力学分析表明，可以得到一组与适当选择的惯性参数呈线性函数关系的、欠驱动形式的系统动力学方程。以此为基础，并采用变量的思想，克服了通常情况下，空间机器人系统动力学方程关于系统惯性参数呈非线性关系的难点，针对双臂空间机器人末端爪手所持载荷参数不确定，但误差范围可确定的情况，设计了漂浮基双臂空间机器人关节运动的变结构鲁棒控制方案。该控制方案的优点在于：不需要反馈、测量漂浮基的位置、移动速度及移动加速度；且与自适应控制方案相比，化积分运算为简单四则运算，计算量大为减少，有利于实时应用。通过对一个平面双臂空间机器人系统的数值仿真，证实了算法的有效性。

Abstract: In this paper, the kinematics and dynamics of free-floating space robot system with dual-arms are analyzed, and it is shown that the Jacobian matrix and the dynamic equations of the system are nonlinearly dependent on inertial parameters. In order to overcome the above problems, the system is modeled as under-actuated robot system, and the idea of augmentation approach is adopted. It is demonstrate that the dynamic equations of the system can be linearly dependent on a group of inertial parameters. Based on the results, a robust variable structure control scheme for free-floating space robot system with dual-arms with uncertain inertial parameters to track the desired trajectory in joint space is proposed, and a planar space robot system with dual arms is simulated to verify the proposed control scheme. The advantage of the control scheme proposed is that it requires neither measuring the position, velocity and acceleration of the floating base with respect to the orbit nor controlling the position and attitude angle of the floating base. In addition to this advantage, it is computationally simple, because we choose to make the controller robust to the uncertain inertial parameters rather than explicitly estimating them online.

Paper ID: CCC07-0543
Title: 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)
Authors: 梅建东, 张天平, 王芹

Abstract:
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终结局界。

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 minify 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.

Paper ID: CCC07-0606
Title: Global Synchronization of Complex Lur'e Networks
Authors: Li Zhongkui, Duan Zhisheng, Huang Lin
Abstract:
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.

Paper ID: CCC07-0666

Title: 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)
Authors: 齐义文, 张显
Abstract:
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。

离散-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.

Paper ID: CCC07-0678

Title: Synchronization of Lur'e Networks with Time Delay
Authors: Xu Shiyun, Yang Ying, Huang Lin
Abstract:
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.

Paper ID: CCC07-0700

Title: Optimal Nonlinear Dynamic Problem with Stochastic Impulse and Regular Control Laws
Authors: Yang Ruicheng, Huang Shiying, Qin Xuezhi
Abstract:
By combining a regular control with an impulse control into the dynamic process of a non-linear system, we formulate an optimal hybrid control problem. In order to obtain the maximal value of the objective function and associated optimal impulse and regular control laws, relying on both stochastic calculus and the classical hybrid control theory, we derive its quasi-variational inequality solution. Moreover, under some limitations, we also derive its closed forms of optimal hybrid control laws and objective function. Based on some explicit parameter values, we give some simulations and numerical examples.

Paper ID: CCC07-0749
Title: A Two Level Non Linear Inverse Control Structure for Rotorcraft Trajectory Tracking
Authors: Mora-Camino Felix
Abstract:
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.

Paper ID: CCC07-0760
Title: Attitude Control Based on the Lie-group Structure of Unit Quaternions
Authors: Han Dapeng, Wei Qing, Li Zexiang
Abstract:
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.

Paper ID: CCC07-0821
Title: Adaptive Tracking Control for Uncertain Robot Manipulator with Additive Disturbance
Authors: Xian Bin
Abstract:
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.
Title: Robust $H_\infty$ Tracking Control of Output Probability Density Function
Authors: Luan Xiaoli, Liu Fei
Abstract:
针对一类随机动态系统，提出一种具有 $H_\infty$ 干扰抑制的输出概率密度函数（PDF）鲁棒跟踪控制新方法。在利用 B样条神经网络逼近随机动态系统的输出 PDF 的基础上，建立带有时滞的不确定概率密度权动态模型；然后在考虑外部扰动的情况下，引入增广控制作用，设计基于误差反馈的鲁棒 $H_\infty$ 跟踪控制器，该控制器不仅具有 $H_\infty$ 范数下的干扰抑制作用，而且能实现 PDF 跟踪目的，并能保证闭环系统稳定和一定的线性二次型性能指标上界。数值仿真表明了上述设计方法的有效性。

A new kind of robust tracking controller of output probability density function (PDF) which satisfies H-infinity disturbance attenuation level is proposed for a class of dynamic stochastic systems. Based on the B-spline neural network model to represent the output PDF, a dynamic weighting model is established, where uncertainties and time-delays are included. Considering the exterior disturbance, we design a robust H-infinity tracking controller via error feedback. The desired controller can not only satisfy the H-infinity disturbance attenuation level, but also realize the perfect tracking and make the closed-loop dynamic stochastic system asymptotically stable and the closed-loop value of linear quadratic cost function satisfy a specified upper bound. The simulation results show that the presented method is valid.

Title: RBF-ARX Modeling and Predictive Control Strategy Applied to a Liquid Level System
Authors: Inoussa Garba, Peng Hui, Ren Lin
Abstract:
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).

Title: Globally Asymptotical Controllability of Nonlinear Systems
Authors: Sun Yimin, Mei Shengwei
Abstract:
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.

**Paper ID:** CCC07-0903  
**Title:** A Fault-tolerant Controller for Unknown Nonlinear System Based on Neural Networks  
**Authors:** Wang Wei, Li Jingjing, Zhang Qingzhen, Ren Zhang  
**Abstract:**  
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.

**Paper ID:** CCC07-0925  
**Title:** 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)  
**Authors:** 李海军, 黄显林, 班晓军  
**Abstract:**  
本文中将导弹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 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.

**Paper ID:** CCC07-0978  
**Title:** 考虑状态时滞的 SISO 非线性系统输出干等解耦控制(Output Disturbance Decoupling Control of SISO Nonlinear Systems with Time Delay in State Variable)  
**Authors:** 宾洋, 陈恳, 陈娜娜  
**Abstract:**  
摘 要：针对一类状态变量存在时滞的单输入-单输出（SISO）非线性系统输出干扰解耦问题，本文首先应用时滞算子描述该状态时滞 SISO 非线性系统，在此基础上利用扩展李导数、
Abstract: In this paper, the output disturbance decoupling problem (ODDP) for a single input single output (SISO) nonlinear systems with time delay in state variable is studied. The time delay operator is addressed and used to describe the nonlinear time delay systems. Then, the necessary and sufficient conditions for ODDP are achieved by applying extension Lie derivative and extension Lie bracket, and the input-output linearization of decoupling subsystem is also realized at the same time. Furthermore, two decoupling feedback control algorithms under the disturbance is available and unavailable for measurements are discussed. At last, the effectiveness of algorithms is verified by an illustration.

Paper ID: CCC07-1010
Title: 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)
Authors: 张承慧, 孙晓明, 刘睿, 刘志军
Abstract: 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.

Paper ID: CCC07-1046
Title: Insensitizing Controls for Semilinear Evolution Systems
Authors: Yan Yuqing, Zhao Yi, Sun Fengyun
Abstract: In this paper, we obtain the abstract result concerning the insensitizing controllability of semilinear systems. We prove the null local insensitizing controllability of semilinear first-order systems by means of the contraction mapping principle. Our main result shows that the observability of the dual of the linearized cascade system implies the local insensitizing controllability of the original semilinear system.

Paper ID: CCC07-1056
Title: 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
Authors: 張雪菲, 田彦涛, 王红睿, 丁策
Abstract:
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 online. 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.

Paper ID: CCC07-1063
Title: Generating Hyperchaos via a Simple Periodic Forcing Signal
Authors: Li Yuxia, Tang Wallace K. S., Chen Guanrong
Abstract:
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 behavior and electronic circuit implementation. A good qualitative agreement between the simulation and the experimental results is observed.

Paper ID: CCC07-1067
Title: Input-to-state Stabilization of Feedforward Systems with Dynamic Uncertainties
Authors: Chen Tianshi, Huang Jie
Abstract:
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.

Paper ID: CCC07-1072
Title: Model Reduction for a Class of Nonlinear Systems
Authors: Wang Jing, Huang Lin
Abstract:
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.

Paper ID: CCC07-1115
Title: Hierarchy Modeling for Component-based Complex Control Software
Authors: Zhang Jing, Zhang Yunsheng, Xiang Fenghong
Abstract:
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.

Paper ID: CCC07-1164
Title: Simulation Study on Tracking Control of Mobile Robot Based on Cascaded Adaptive Approach
Authors: Chen Pengcheng, Ji Zhicheng
Abstract:
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 $\kappa$-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 validate the effectiveness and feasibility of the proposed controller both in kinematics and dynamics models.

Paper ID: CCC07-1165
Title: Generalized Point Wise Min-Norm Control Based on Control Lyapunov Functions
Authors: He Yuqing, Han Jianda
Abstract:
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.

Paper ID: CCC07-1166
Title: 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)
Authors: 刘杰
Abstract:
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.

Paper ID: CCC07-1207
Title: Fault Tolerant Control Based on Sliding Mode Control Approach with Application to Water Tank System
Authors: Rafi Youssef, Peng Hui
Abstract:
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.

Paper ID: CCC07-1231
Title: Linearization of Switched Nonlinear Systems
Authors: Yuan Yanyan, Cheng Daizhan
Abstract:
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.

Paper ID: CCC07-1257
Title: Stabilizing a Class of Dynamical Complex Networks Based on Decentralized Control
Authors: Gao Qing, Liu Xian

Abstract:
This paper focus on a stabilization problem for a class of dynamical complex networks with each node being a general Lur'e system. By using some results of absolute stability theory and a special decentralized control strategy, we address the problem of designing a linear feedback controller such that states of all nodes are globally stabilized onto an expected homogeneous state. A controller design method based on parameter-dependent Lyapunov function is proposed in order to reduce the conservativeness and the controller can be constructed via feasible solutions of a certain set of linear matrix inequalities (LMIs). A network composed of identical Chua's circuits is adopted as a numerical example to demonstrate the effectiveness of the proposed results.

Paper ID: CCC07-1323
Title: Stationary Set and Stability: a Case Study for Mechanical Systems with Discontinuities
Authors: Zheng Kai, Shen Tielong, Yao Yu

Abstract:
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.

Paper ID: CCC07-1338
Title: 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)
Authors: 赵敏，李少远

Abstract:
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。算法以线性不确定性系统作为桥梁，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 tailor 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.

Paper ID: CCC07-1364
Title: 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)
Authors: 刘艳红, 李春文, 汤洪海
Abstract: 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.

Paper ID: CCC07-1379
Title: Modeling Inverse-Hysteretic Systems Based on Expanded Input Space
Authors: Tan Yonghong
Abstract: 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.

Paper ID: CCC07-1452
Title: 不确定非线性系统的鲁棒耗散控制(Robust Dissipative Control for Nonlinear Systems with Uncertainties)
Authors: 曾涛, 赵胜凯
Abstract:
针对一类基于T-S模型表示的非线性系统，考虑系统具有范数有界不确定性的鲁棒耗散模糊控制器设计问题。对一类有范数有界参数不确定性的T-S模型表示的非线性系统，应用并行分布式控制方法，得到系统稳定且严格耗散的模糊控制器存在的充分条件。进一步建立和求解LMI（线性矩阵不等式）约束的凸优化问题，给出了系统稳定且严格耗散的模糊控制器律的设计方法。数值算例表明了此方法的可行性和有效性。

The problem of designing a fuzzy stable and dissipative controller is studied for a class of nonlinear systems with norm-bounded uncertainty based on T-S model. The sufficient conditions are first derived for the existence of fuzzy controllers. Furthermore, a convex optimization problem with LMI constraints is formulated to design the controller. Simulation shows the feasibility and validity of this method.

Paper ID: CCC07-1455
Title: 非线性微分代数系统的耗散Hamilton实现(Dissipative Hamiltonian Realization of Nonlinear Differential Algebraic Systems)
Authors: 刘艳红，李春文
Abstract:
基于Hamilton函数方法对非线性微分代数系统进行分析和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.

Paper ID: CCC07-1456
Title: The Passive Energy Tracking Control Law of the Compass Bipedal Robot
Authors: Liu Zhenze, Zhang Peijie, Tian Yantao, Zhou Changjiu
Abstract:
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.
Paper ID: CCC07-1501
Title: Backstepping Based Constrained Control of Nonlinear Hydraulic Active Suspensions
Authors: Ma Miaomiao, Chen Hong, Cong Yanfeng
Abstract:
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 $H_\infty$ 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.

Paper ID: CCC07-1531
Title: Prevention of Limit Cycle for Nonlinear Control Systems with Parametric Uncertainties
Authors: Wang Yuan-Jay, Hsi Shu-I, Yen Ting-Ju, Liang Chih-Chung
Abstract:
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 nonlinearity. 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.

Paper ID: CCC07-1575
Title: 一类带有未知控制方向的三阶非线性系统的自适应输出反馈控制(Adaptive Output Feedback for a Class of Three-order Nonlinear Systems with Unknown Control Directions)
Authors: 郑云峰, 杜嘉立, 孙洪波
Abstract:
针对带有未知控制方向和带有附加仿射输出导数的一类三阶非线性系统，未知参数不但允许存在于输出非线性项前，而且允许出现在以输出非线性函数为系数的仿射输出导数项之前，采用基于参数的坐标变换和参数重定义将该系统转化为虚拟控制增益函数为已知输出非线性函数的参数输出反馈形式。为处理高频控制增益符号未知的情况，将 Nussbaum 增益技术融入自适应 Backstepping 方法中设计自适应输出反馈控制器。采用调节函数法设计参数自适应律以避免过参数估计。该方法所设计的自适应输出反馈控制器可确保闭环系统的所有信号一致有界及跟踪误差渐进收敛。A global adaptive output-feedback control scheme is proposed for a class of third-order relative degree nonlinear system with unknown control directions and affine additive output derivative. Through parameter-dependent coordinate transformation and parameter redefinition, the system considered is transformed into the parametric output-feedback form with known output functions as the virtual control gain functions. To tackle the situation that the unknown high frequency gain
A global adaptive output-feedback control scheme is proposed for a class of nonlinear system in output-feedback form with additive output derivative. Unknown parameters are allowed to multiply not only the output nonlinearities but also affine functions of the derivative of the measured output with coefficients that are smooth nonlinear functions of the measured output. Through coordinate transformation and parameter redefinition, the system considered is transformed into the parametric output-feedback canonical form with unknown high-frequency gain sign. To tackle this situation, Nussbaum gain is incorporated in the adaptive backstepping technique. Tuning function method is employed to design the parameter adaptive law to avoid overparametrization. All the signals involved in the closed-loop system can be guaranteed globally uniformly bounded and the asymptotic tracking is achieved. The results of this paper extend the class of uncertain nonlinear systems for which global adaptive output-feedback control can be designed. The simulation results show the effectiveness of the proposed method.
部精细结构，突出异常局部的变化特征。同时，结合商空间粒度计算理论，对多重分形方法中的加权因子进行粗粒度处理，使得二维空间 \((deta(a),\max(c_q))\) 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 \((deta(a),\max(c_q))\), and it presented good efficiency in structure classing, which is favor of predicting protein structure class.

Paper ID: CCC07-1606
Title: An Open-plus-closed-loop Control for Chaotic Mathieu-Duffing Oscillator
Authors: Shen Jianhe, Chen Shuhui, Cai Jianping
Abstract:
Utilizing the idea of the open-plus-closed-loop control, a simple continuous controller composed of periodic external excitation and linear feedback is designed to entrain the chaotic trajectory of Mathieu-Duffing oscillator to converge to its inherent periodic and multi-periodic trajectories. By means of Lyapunov stability theory, the global basin of entrainment of the open-plus-closed-loop control is established. Numerical simulations are presented to demonstrate the application of the theoretical result.

Paper ID: CCC07-1625
Title: 非完整移动机器人的集合镇定控制(Set Stabilization of Nonholonomic Mobile Robots)
Authors: 杨杰，李世华
Abstract:
传统的关于非完整系统的镇定控制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.

Paper ID: CCC07-1633
Title: An Iterative Learning Control with Alignment Initial Condition for a Class of Nonlinear Systems
Authors: Yang Zaiyue, Chan C. W.

Abstract:
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.

Paper ID: CCC07-1658
Title: Numerical Realization of Plane CW Complexes under a Given ‘Flow Condition’ in Gradient-like Morse-Smale Controlled Systems
Authors: Enomoto Ryuji, Hamaguchi Saori

Abstract:
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.

Paper ID: CCC07-1703
Title: 一类不确定性系统的鲁棒输出调节问题(Robust Output Regulation for a Class of Uncertain Nonlinear Systems)
Authors: 陈作贤，季海波，何德峰

Abstract:
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 boundness.
Paper ID: CCC07-1750
Title: Control Location Selection Strategy for Power System Emergency Control
Authors: Zhang Xuemin, Mei Shengwei
Abstract:
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.

Paper ID: CCC07-1753
Title: Solution of Singularity Problem in Motion Control of Acrobots
Authors: Lai Xuzhi, She Jinhua, Wu Min, Yang Simon X.
Abstract:
This paper gives an integrated fuzzy-control solution of singularity problem in the motion control of an acrobot. 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.

Paper ID: CCC07-1759
Title: Stability of Polynomial Systems via Polynomial Lyapunov Functions
Authors: Qi Hongsheng, Cheng Daizhan
Abstract:
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 it 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 vise 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.

Paper ID: CCC07-1760
Title: PSO-based Parameter Estimation of Nonlinear Systems
Authors: Ye Meiying, Wang Xiaodong
Abstract:
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.

Paper ID: CCC07-1792

Title: Nonlinear $H_\infty$ Control of Switched Homogeneous Nonlinear Systems

Authors: Zhang Lijun, Xue Suqin

Abstract:

In this paper, the problem of $L_2$ stability and $H_\infty$ control of switched homogeneous 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 $H_\infty$ control of switched linear systems, a condition for global control laws to solve $H_\infty$ 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.

Paper ID: CCC07-0055

Title: 一类互联单调控制系统的全局渐近稳定性判据(Global Asymptotic Stability Criteria for the Interconnection of Monotone Control Systems)

Authors: 孙超, 何希勤

Abstract:

本文通过将不具有单调性特性的系统拆分成多个单调控制系统反馈连接的形式来研究非单调系统的全局渐近稳定性问题。在文中给出了一类互联单调控制系统全局渐近稳定性的判据,由原有多互联单调控制系统间的单一反馈推广到更具一般形式的反馈连接。仿真结果进一步证明了结论的正确性。

By decomposing the systems not with monotonicity property into the interconnection of many monotone control systems with inputs and output, we study the global stability of non-monotone systems. In this paper, criteria for global asymptotic stability of the interconnection of monotone control systems which the unitary feedback is replaced by the arbitrary feedback form is presented. A simulation example illustrates the effectiveness of the proposed method.
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）

刘杰，陆君安

Abstract:
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.

群体行为与自组织合作（Collective Behaviors and Self-organizing Cooperation）

王龙，伏锋，陈小杰，楚天广，谢广明

Abstract:
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对合作演化的影响。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 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.

A Prospective Study of the Price Behaviors of Chinese Stock Markets

郑风，张润通，何凌云

Abstract:
Based on Analogous Zipf Analysis method, our paper presents the similarities and differences of
price behaviors between Shanghai and Shenzhen Stock market. We have analyzed the up-down information of the price fluctuations in two markets, and identified two critical points, at which the heterogeneous agents transit their trading behaviors, and three phases in them respectively. Although two markets present similarities in phase transactions, there exist differences in the price behaviors and formation mechanisms of price. Furthermore different phase is controlled by noise traders or fundamentalists; the behavior of them induces the structure of markets.

Paper ID: CCC07-0490
Title: 基于加权网络的 Internet 流量模型 (Internet Bandwidth Model Based on Weighed Networks)
Authors: 焦青，杨洪勇，吕海航
Abstract:
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.

Paper ID: CCC07-0580
Title: 机电复杂系统的智能控制 (Intelligent Control of Electromechanical Complex System)
Authors: 喻洪流，钱省三，关慎远
Abstract:
机电复杂系统是复杂系统在工程技术领域的重要研究对象。本文从复杂性研究的新角度出发，在讨论了复杂系统与机电复杂系统的关系特性的基础上，分析总结了当前机电系统智能控制的发展状况，并设计了一种步速跟随控制的 CMAC 智能假肢系统对复杂机电系统的控制进行分析。由于假肢机电系统具有非线性、时变性和不确定性的复杂动力学特性，应用模糊小脑模型神经网络对其有效控制表明，智能控制技术是解决复杂机电系统及其它复杂系统控制问题的重要手段。
As one type of complex system applied in the field of engineering and technology, electromechanical complex system (MCS) is discussed for its properties at an new angle of view in this paper. The development of the intelligent control for electromechanical complex system is analyzed and summarized, and a scheme of intelligent control for above-knee prosthesis is designed based on CMAC neural network model to demonstrate the electromechanical complex system and its control. The conclusion of analysis in the paper shows that electromechanical complex system can be controlled well with intelligent control technology which is a promising way to control electromechanical complex system or other complex systems.

Paper ID: CCC07-0795
Title: Synchronization of Networked Systems and Laplacian-Spectrum Modification
Authors: Wu Jianxin, Qin Huashu, Hong Yiguang
Abstract:
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.

Paper ID: CCC07-0895
Title: Distributed Consensus Control for Second-Order Agents with Fixed Topology and Time-Delay
Authors: Lin Peng, Jia Yingmin, Du Junping, Yuan Shijing
Abstract:
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.

Paper ID: CCC07-0971
Title: 连续碳酸化分解过程智能控制系统 (An Intelligent Control System for Continual Carbonation Decomposition Process)
Authors: 胡志坤, 桂卫华, 阳春华, 张作良, 王晓丽
Abstract:
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奋斗目标，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 exits 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 combines 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 the system which is feedback modified the output of the 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 the eligible ratio of decomposition ratio increases by 4%, and the average value of decomposition ratio increases by 0.95%. The system is always running well.

Paper ID: CCC07-1028
Title: 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)
Authors: 邓方, 陈杰, 陈文頡, 朱琳
Abstract:
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阔的应用。

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.

Paper ID: CCC07-1489
Title: Derivative Feedback Control for Singular Systems
Authors: Ren Junchao, Zhang Qingling, Zhang Xuefeng
Abstract:
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.

Paper ID: CCC07-1491
Title: 基于网格的复杂战争系统仿真研究(On Grid-based Complex Warfare System Simulation)
Authors: 李雄, 党生
Abstract:
建立模型并通过仿真实验演示、检验和评估是研究复杂战争系统的一种有效方法。由于战争系统与一般的物理系统相比，其仿真条件、要求与过程有着明显的不同，在阐述基于网格的仿真相关研究工作的基础上，通过采用从需求、目标映射结构、方案的方法，分析了基于网格的复杂战争系统仿真的需求与目标、体系结构和关键技术解决方案，并进一步探讨了基于网格的复杂战争系统仿真的运行模式、运行过程，设计了一个复杂陆战仿真示例系统。研究
Modeling and demonstrating, validating and evaluating by simulation experiment is an effectual method to study a complex warfare system. There are such obvious differences in the condition, demand and process of simulation between warfare system and general physical systems that this paper dissertates the relative research development of grid-based simulation, sets up a mapping from requirement and objective to framework and blue print to analyze the requirement, objective, framework and the key technical solution to the problem, and furthermore analyzes the running mode and process of grid-based complex warfare system simulation. A case study for land warfare system simulation is presented in this paper. The research fruit shows that grid-based simulation supports complex warfare system technology demonstrations in theory and practice, and provides a feasible approach.

Paper ID: CCC07-1639
Title: Hopf Bifurcation Analysis in the Lorenz-type System
Authors: Yang Qigui, Liu Mengying
Abstract:
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.

Paper ID: CCC07-1652
Title: Aggregation and Pattern Formation of Multi-Agent Systems
Authors: Chen Zhifu, Chu Tianguang
Abstract:
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.

Paper ID: CCC07-1657
Title: 群体动力学与协调控制(Swarm Dynamics and Coordinated Control)
Authors: 楚天广, 陈志福, 王龙, 谢广明
Abstract:
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，以及时间变拓扑与连通性、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 direction in the field of systems and control. We review some swam 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.

Paper ID: CCC07-1742
Title: 基于势函数的具有多 LEADER 的多智能体系统的运动控制 (Movement Control of Multi-Agent System with Multiple Leader Based on Potential Function)
Authors: 王莉, 陈增强, 刘忠信, 袁著祉
Abstract: 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和目标相关的势函数，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.

Paper ID: CCC07-0190
Title: Boundary Element Method for Boundary Control Problems
Authors: Yan Ningning
Abstract: 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.

Paper ID: CCC07-0378
Title: Global Smooth Solutions for Quasilinear Wave Equation with Locally Internal Damping
Authors: Zhang Zhifei, Yao Pengfei
Abstract: 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.

Paper ID: CCC07-0506
Title: Model Predictive Control of a Powder Coating Curing Process: an Application of the MPC@CB Software
Authors: Abid Kamel, Dufour Pascal, Bombard Isabelle, Laurent Pierre
Abstract:
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.

Paper ID: CCC07-0655
Title: 带有位势和不定阻尼项的板方程能量的衰减速率(Energy Decay Rate of the Plate Equation with Potential and Indefinite Damping)
Authors: 武英涛
Abstract:
我们考虑带有零阶位势项和不定阻尼项的板方程的能量衰减问题,运用整体 Carleman 估计和普通能量估计方法,我们得到了在一定条件下它的能量是指数衰减的;另外,通过经典的扰动理论,我们还给出了为保证其能量指数衰减它的负阻尼项的一个上界。
We consider the plate equation with an indefinite sign damping and a zero order potential term. By means of the global Carleman-type estimate and the usual energy estimate, we show that the energy of the system decays exponentially. Also, using the classical perturbation theory, we give an explicit upper bound estimate on the negative damping to guarantee the exponential decay rate.

Paper ID: CCC07-0746
Title: 树形网络 Timoshenko 梁系统的镇定(Stabilization of Tree-shaped Network of Timoshenko Beams)
Authors: 韩忠杰, 许跟起
Abstract:
文章研究三根 Timoshenko 梁按树形网络连接的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
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.

Paper ID: CCC07-1372
Title: Asymptotic Stability of Software Systems with Rejuvenation Policy
Authors: Xu Houbao, Wang Junmin
Abstract:
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.

Paper ID: CCC07-1401
Title: Development of Evolution Equations (Periodic Controllability of Evolution Equations)
Authors: Li Hongheng, Zhang Xu
Abstract:
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.

Paper ID: CCC07-1622
Title: Riesz Basis Property for Generic Network of Strings
Authors: Guo Yanni, Xu Genqi, Yang Lingling
Abstract:
In this paper, we study the generation problem of Riesz basis for a general network of strings with joint damping at all vertices. First we give spectral basic property of system operator $A$. Under certain conditions we prove that the spectrum of $A$ distributes in a strip parallel to the imaginary axis. By the discussion of completeness of the generalized eigenvectors of operator $A$, we prove...
further that there exists a sequence of generalized eigenvectors of A that forms a Riesz basis with parentheses in the state Hilbert space.

Paper ID: CCC07-0036
Title: 一类脉冲跳变系统的最优控制 (Optimal Control Problems of Impulsive Jumping Transition Systems)
Authors: 郭磊
Abstract: 对于脉冲跳变系统，提出了其最优控制问题，当系统的光滑性条件较强时，用变分学的方法证明了混合控制达到最优时所满足的必要条件，确切给出了跳变时刻协态向量的跳变规律以及离散控制的计算方法证明。

Under the unified model of hybrid control systems, we put forward the optimal control problem of impulsive jumping transition systems. The hybrid control and hybrid Hamilton function are defined. Making use of variation methods, we prove the essential conditions when hybrid controls are optimal.

Paper ID: CCC07-0420
Title: On Exponential Stability of Switched Systems with Delay: Multiple Lyapunov Functions Approach
Authors: Cong Shen, Qian Wei, Fei Shumin
Abstract: The switched system composed of several linear time-delay systems is considered. The problem is to find the constraint conditions on subsystems and switching sequences to preserve the exponential stability. The multiple Lyapunov functions approach is generalized to the time-delay case, it is verified that the specified stability criterion for subsystems implies the exponential stability of whole system whenever the segments between two consecutive switching instants are greater than a prescribed constant. Our results include the correspondent conclusion of stability analysis in the case without after-effect. Numerical examples are given to demonstrate our results.

Paper ID: CCC07-0426
Title: Reachability Realization for a Class of Switched Impulsive Control Systems by Means of Periodic Switchings
Authors: Ji Zhijian, Feng Gang, Guo Xiaoxia
Abstract: 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.

Paper ID: CCC07-0511
Title: 时滞切换系统指数稳定性分析: Lyapunov 函数方法 (On Exponential Stability of Switched Systems with Delay: Lyapunov Function Approach)
Authors: 刘娟，钱伟，费树岷
Abstract:
本文考虑由两个线性时滞子系统构成的切换系统, 分析其在任意切换序列作用下保持指数稳定性条件。利用二次型与逐段二次型的 Lyapunov 函数构造方式, 并结合 Halanay 微分不等式, 给出了以线性矩阵不等式所表述的稳定性判据, 进而证明了指数衰减率对于所有切换序列一致成立, 即其完全取决于系统的结构特征。算例证实了本文方法的有效性。
The switched dynamical system consisting of two linear subsystems with delay is considered. The problem is to find conditions guaranteeing exponential stability of the system for any switching sequence. Combining with Halanay differential inequality, both quadratic and piecewise quadratic construction of Lyapunov function is exploited, from which the stability criteria in terms of linear matrix inequalities are derived. Furthermore, it is strictly verified that the exponential decay rate holds uniformly for all switching sequence, and is definitely determined by the structure of subsystems. Numerical examples are given to demonstrate the effectiveness of our results.

Paper ID: CCC07-0674
Title: Converse Lyapunov Theorem for Switched Stability of Switched Linear Systems
Authors: Sun Zhendong
Abstract:
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.

Paper ID: CCC07-0705
Title: 一类离散时滞切换系统的鲁棒 $H_\infty$ 控制 (Robust $H_\infty$ Control for a Class of Discrete Switched Systems with Uncertainties and Delays)
Authors: 韩彦武，汤红吉
Abstract:
本文以一类时滞不确定的离散切换系统为研究对象，系统中的不确定性满足范数有界条件，综合应用 Lyapunov 函数的方法和矩阵不等式，同时引入若干自由矩阵，在切换信号满足一定的平均驻留时间条件下，得出了系统指数稳定并具有一定 $H_\infty$ 性能的充分条件。

A class of discrete switched systems with uncertainties and delays is studied, where the uncertainties satisfies norm bounded conditions. Sufficient conditions are obtained by using multi-Lyapunov functional, matrix inequalities and some slack matrices, which can keep the closed-loop system not only exponential stability but also $H_\infty$ performance for a class of switching signal with average dwell time.

Paper ID: CCC07-0747
Title: 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)

Authors: 王寿光

Abstract:
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，然后就在该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.

Paper ID: CCC07-0881

Title: 一类线性切换系统的鲁棒状态反馈镇定(Robust State Feedback Stabilization of a Class of Switched Linear Systems with Uncertainties)

Authors: 姬兴民

Abstract:
本文研究了一类标称系统存在共同 Lyapunov 函数的不确定线性切换系统的鲁棒状态反馈镇定问题。这类系统不仅包含不确定项，而且在输入通道中也包含不确定性。给出了这种不确定线性切换系统鲁棒状态反馈镇定的充分条件。当某类矩阵是负定时，可以保证系统的鲁棒状态反馈镇定。

The robust state feedback stabilization problem for a class of switched linear systems with uncertainties whose nominal systems exist common Lyapunov function is studied. The systems not only contain uncertainties, but also experience uncertainties in the input channels. The sufficient conditions for robust state feedback stabilization of the switched systems with uncertainties are given. When all of certain family matrices are negative definite, robust state feedback stabilization is obtained.

Paper ID: CCC07-1058

Title: 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)

Authors: 徐陈锋，奚宏生，江琦，殷保群

Abstract:
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.

Paper ID: CCC07-1086
Title: 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)
Authors: 张晶, 张云生
Abstract: 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杂构件机制。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.

Paper ID: CCC07-1539
Title: 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)
Authors: 赵平, 康宇

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.

Paper ID: CCC07-1559
Title: Optimization of Semi-Markov Switching State-space Control Processes for Network
Communication Systems
Authors: Jiang Qi, Xi Hongsheng, Yin Baoqun
Abstract:
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.

Paper ID: CCC07-1714
Title: 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)
Authors: 杨莹, 李俊民, 陈国培
Abstract:
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.

Paper ID: CCC07-1766
Title: Stochastic Stabilization of Markovian Jump Systems with State and Input Delays
Authors: Kang Yu
Abstract:
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.

Paper ID: CCC07-1811
Title: 线性系统可区分性的一些性质(Properties on the Distinguishability of Linear Systems)
Authors: 楼红卫
Abstract: 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。我们在本文中将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 role 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.

Paper ID: CCC07-0621
Title: 不确定离散时滞系统分散鲁棒 $H_\infty$ 控制: LMI 方法(Robust Decentralized $H_\infty$ Control
for Uncertain Discrete Time-delay Systems: LMI Approach)
Authors: 桂卫华, 陈宁, 谢永芳
Abstract: 本文研究多通道不确定离散时滞大系统的分散鲁棒 $H_\infty$ 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 $H_\infty$ 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.

Paper ID: CCC07-0625
Title: 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)
Authors: 陈宁, 桂卫华, 刘碧玉
Abstract: 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 大系统的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.

Paper ID: CCC07-0776
Title: 基于比较原理的 Lurie 型组合系统的分散输出反馈镇定(Output Feedback Stabilizing Composited Lurie Systems Based on the Comparison Principle)
Authors: 陈端来
Abstract: 综合运用比较原理和 LMI 方法。首先通过构造一比较系统, 将组合系统的稳定性问题转化为讨论维数低的比较系统的稳定性问题, 并利用 M 矩阵特性导出了比较系统稳定的一个充分条件; 为了求取输出反馈增益, 建立了等价的稳定条件的 QLMI 表示形式。通过建立 QMI 中一矩阵变量的递推关系, 将 QMI 问题转换为一替代过程的 LMI 求解问题, 进而通过求解这一 LMI 问题来获取可镇定的非线性组合系统输出反馈增益阵。这一方法的特点是使大系统的稳定控制器设计的复杂度保持在子系统一级的水平上, 文末给出的数值实例说明了算法在实际工程应用中是有效的。

A comparing model is introduced to transfer the problem of output feedback for stabilizing the Lurie composited nonlinear systems into output feedback stabilizing the comparison systems of lower dimensions, by employing differential and Lyapunov stability theory integrally. A stability condition is developed in form of M matrix, the corresponding LMI expression is founded, which leads to an iterative approach to obtain the output feedback gain. An algorithm to obtain the output-feedback gain matrix is developed here based on the LMI technique. The key technique of developing iterative law of the matrix variable existing in QMI is discussed also. The character of the results proposed here is decreasing complexity. Finally, a numerical example is given to illustrate our results and its application.

Paper ID: CCC07-0831
Title: 不确定关联大系统输出反馈分散鲁棒 $H_{\infty}$ 控制(Decentralized Robust $H_{\infty}$ Output Feedback Control for Interconnected Large-scale Systems with Uncertainties)
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 $H_\infty$ 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 $H_\infty$ 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 $H_\infty$ performance. Finally, a numerical example is provided to illustrate the effectiveness and the availability for the design.
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 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.

Paper ID: CCC07-0048
Title: 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)
Authors: 刘峰, 彭实戈
Abstract:
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 stochastic 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.

Paper ID: CCC07-0134
Title: Adaptive State-Feedback Stabilization for High-Order Stochastic Nonlinear Systems with Time-Varying Control Coefficients
Authors: Tian Jie, Xie Xuejun
Abstract:
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.

Paper ID: CCC07-0220
Title: Repeated N-Person Stochastic Cooperative Games:Superadditivity,Convexity
Authors: E Chengguo, Gao Zuofeng, Mao Ali
Abstract:
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.

Paper ID: CCC07-0240
Title: Delay-Dependent Stability and Stabilization for Uncertain Discrete Markovian Jump Singular Systems with Mode-Dependent Time-Delay
Authors: Ma Shuping, Zhang Chenghui
Abstract:
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.

Paper ID: CCC07-0668
Title: 一种新的最优制导律(A New Optimal Guidance Law)
Authors: 曾宪伟, 方洋旺, 伍友利, 王洪强, 刘加丛
Abstract:
基于多传感器信息融合理论和结构随机跳变系统最优控制理论, 提出了一种基于主动雷达和红外传感器信息融合空空导弹最优制导新方法, 并通过建立导弹数字模型仿真分析, 验证了方法的有效性。与经典的基于雷达或者红外的比例导引和扩展比例导引进行比较, 经过多次
Based on multisensor information fusion theory and optimal control theory of structure stochastic jump system, a new guidance law is proposed for air-to-air missiles based on information fusion of active radar and infrared sensor, and its validity is testified by analysis on simulation by building digital model of missiles. Compared with proportion navigation law and extended proportion navigation law based on radar or infrared through many Monte Carlo simulations, the results show that the new guidance law reduces errors of tracking target and has smooth trajectory and small over-load, and it is important to theory and engineering application.

Paper ID: CCC07-0735

Title: 广义随机系统观测融合 Kalman 滤波器 (Measurement Fusion Kalman Filters for Descriptor Stochastic Systems)

Authors: 石莹

Abstract:
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.

Paper ID: CCC07-1027

Title: 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)

Authors: 罗琦, 张雨田

Abstract:
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，本文考虑了系统的解关于空间变量的积分作为相应的随机常微分方程的解。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.

Paper ID: CCC07-1270
Title: State Feedback Stabilization of Nonlinear Stochastic Systems
Authors: Zhang Weihai, Yan Zhiguo
Abstract:
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.

Paper ID: CCC07-1632
Title: 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)
Authors: 刘宏亮, 段广仁
Abstract:
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-Krasovskii 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.

Paper ID: CCC07-1696
Title: Impulsive Decentralized Stabilization of Stochastic Large-scale Systems
Authors: Yang Zhichun
Abstract:
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.

Paper ID: CCC07-1720
Title: Robust Performance Rule Design for Stochastic Nonlinear Systems with Model Uncertainty
Authors: Wei Bo, Ji Haibo, Wu Rina
Abstract:
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 $H\infty$ theory. 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 $H\infty$ control law of the system without solving the HJI equation.

Paper ID: CCC07-0042
Title: Stability of Linear Systems with Time Delay: A New Delay Fractioning Approach
Authors: Zheng Min, Fei Shumin
Abstract:
This paper investigates the stability of linear systems with time delay. Both constant delay and varying delay cases are considered respectively. The criteria of stability is derived based on a new type of Lyapunov-Krasovskii functional and is formulated as feasibility problems of Linear Matrix Inequalities. Less conservative stability conditions are obtained through a new delay fractioning approach, and the conservatism can be reduced as the delay fractioning grows. Numerical examples indicate that the performance of conservatism will be improved notably even by coarse fractioning.

Paper ID: CCC07-0100
Title: BMI Approach to Decentralized and Cooperative Control of Large-scale System
Authors: Cao Li, Nian Xiaohong, Tang Wenyan
Abstract:
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.

Paper ID: CCC07-0405
Title: An MPC Approach to Networked Control Design
Authors: Wu Jing, Zhang Liqian, Chen Tongwen
Abstract:
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.

Paper ID: CCC07-0456
Title: 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)

Authors: 朱建栋

Abstract:
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.

Paper ID: CCC07-0464
Title: K-exponential Stabilization of Uncertain High-order Nonholonomic Chained Systems
Authors: Guo Xiaoli, Mu Xiaowu, Li Le

Abstract:
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.

Paper ID: CCC07-0472
Title: 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)
Authors: 叶华文, 彭森第, 桂卫华, 阳春华

Abstract:
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的前馈型系统, 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.

Paper ID: CCC07-0610
Title: 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)
Authors: 黄志武, 单勇腾, 桂卫华, 年晓红
Abstract: 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.

Paper ID: CCC07-0719
Title: Stabilization of Networked Stochastic Systems Subject to Actuator Saturation
Authors: Zhang Xiaomei, Tang Hongji, Lu Guoping
Abstract: This paper deals with the problem of stabilization of networked stochastic systems subject to actuator saturation. The networked control systems(NCSs) are modeled as stochastic systems with time-varying input delays under considering the networked-induced time delay. A delay-dependent sufficient condition for the mean-square stability of NCSs is derived by using Lyapunov-Krasovskii approach and a descriptor model transformation.
An associated solution of the problem can be obtained by solving a set of linear matrix inequalities that is numerically feasible with commercially available software. A simulation example is provided to demonstrate the effectiveness of the proposed method.

Paper ID: CCC07-0744
Title: 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)
Authors: 徐建明, 俞立
Abstract:
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解条件。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限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.

Paper ID: CCC07-0783
Authors: 张国琪
Abstract:
本文研究对于相对阶已知，但对象零极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，均不一定存在该种类型的控制律。当该类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.

Paper ID: CCC07-0784
Title: Robust Stabilization for a Class of Discrete-time Systems with Delays via Delta Operators Approach
Authors: Qiu Jiqing, Yang Hongjiu, Xia Yuanqing, Zhang Jinhui, Gao Zhifeng
Abstract:
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.

Paper ID: CCC07-0959
Title: Stability Analysis for Spatially Distributed Dynamic Systems
Authors: Zhou Tong
Abstract:
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.

Paper ID: CCC07-1126
Title: Robust Stabilization of Networked Control Systems: an LMI Approach
Authors: Yu Mei, Tan Wen
Abstract:
This paper transforms the robust stabilization problem of a class of discrete-time networked control systems (NCSs) subject to non-linear 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.

Paper ID: CCC07-1233
Title: Output Feedback Stabilization for Discrete-time Systems with a Time-varying Delay
Authors: He Yong, Wu Min, Liu Guoping, She Jinhua
Abstract:
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.

Paper ID: CCC07-1274
Title: 带有色观测噪声系统 Kalman 滤波算法的稳定性研究 (The Stability of the Kalman Filter for Systems with Colored Observation Noises)
Authors: 王远, 李忱
Abstract:
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 $L_r$-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.

Paper ID: CCC07-1337
Title: Stability of Linear Constant System with Linear Impulse
Authors: Guo Hongliang, Duang Rong
Abstract:

The stability problem of linear constant system with linear impulse is considered in the paper. By using the motion equation and Lyapunov function method some important sufficient conditions are obtained. With some general limitations, a sufficient and necessary condition is established. Furthermore, the impulsive control matrix of the system could be obtained with the help of the linear matrix inequality (LMI). Finally, an impulsive control matrix design method based on MATLAB software is presented, and a numerical example is given to illustrate the efficiency of the main results in this paper.

Paper ID: CCC07-1361
Title: Stable Region Analysis of Networked Control Systems with Uniform Quantization
Authors: Pan Wei, Jiang Hongmei, Zhu Chaoqun
Abstract:

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.

Paper ID: CCC07-1566
Title: New Consistency Condition for Exponential Stabilization of Sampled-data Nonlinear Systems
Authors: Jin Huiyu, Yin Baoqun
Abstract:
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.

Paper ID: CCC07-1675
Title: 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)
Authors: 何冠男, 王龙, 夏壁灿, 郁文生
Abstract: 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型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 $\delta$ 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 $\delta$ 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 $\delta$ proposed in the literature.

Paper ID: CCC07-1726
Title: 带可收缩挠性附件受控航天器稳定性分析(The Stability Analysis of a Controlled Spacecraft with a Retractable Flexible Appendage)
Authors: 沈少萍, 吴宏鑫, 李智斌
Abstract: 带可收缩挠性附件受控航天器在附件收缩过程中可能因为收缩率设计不当导致系统不稳定, 本文利用李亚普诺夫稳定性定理, 推导出利用姿态角和姿态角速度反馈设计的 PD 控制律来
实现可伸缩挠性附件在收缩过程稳定性控制的充分条件，对设计满足系统稳定性要求的收缩率和控制律具有指导意义。

The controlled spacecraft with a retractable flexible appendage may be unstable during retraction of appendage because of the improper rate of retraction designed. In this paper, according to the Lyapunov second method, the sufficient conditions which guarantee the stability of the system controlled by the PD law in retracting phase are deduced. These conditions are instructive for designing the proper rate of retraction and control law to satisfy the stabilization requirement of this system.

Paper ID: CCC07-0008
Title: 非线性动态系统的 SVR 辨识法 (Identification of Nonlinear Dynamic System with SVR)
Authors: 吴德会
Abstract:
提出一种基于支持向量回归机(SVR)的非线性动态系统辨识方法，并给出了相应的推导过程和学习算法。用非线性静态子环节和线性动态子环节串联——Hammerstein 模型来描述非线性动态系统。然后，通过函数展开将 Hammerstein 模型的非线性传递函数转换为等价的线性形式，从而建立起线性中间模型。再由 SVR 算法辨识出中间模型参数。最后推导出中间模型参数与 Hammerstein 模型参数之间的关系，并通过该关系同时反演出原系统的非线性静态环节和线性动态环节。仿真试验结果均表明该非线性系统辨识方法的可行性。

An identification method for nonlinear dynamic system based on support vector regression(SVR) was discussed and the corresponding deduction processes and learning algorithm were also addressed. Firstly, the Hammerstein model was adopted to describe the nonlinear dynamic system, which was expressed by a nonlinear static subunit followed by a linear dynamic subunit. Then, through the function expansion, the intermediate linear model was established, by which the nonlinear transfer function of Hammerstein model could be convert to the same form as linear one. Thirdly, by SVR algorithm, the coefficients of the intermediate model were gotten. Finally, the relations of the coefficients of intermediate model and that of Hammerstein model were derived, through which the nonlinear static subunit and linear dynamic subunit were identified simultaneously. Simulations results show the identification method for nonlinear dynamic system is effective.

Paper ID: CCC07-0033
Title: 融合改进 UKF/SIFT 信息的自主光学导航方法 (Improved UKF and SIFT Based on Information Fusion Method in Autonomous Optical Navigation)
Authors: 隋树林, 孙立宏, 姚文龙, 袁健
Abstract:
针对绕飞小天体探测器飞行环境变化快，小天体形状不规则的特点，为提高复杂环境下导航精度，提出融合星敏感器及光学导航相机信息，同时结合天文几何关系，来实时确定飞行器轨道状态的一类基于改进 UKF 快速算法和 SIFT 算法的绕飞小天体自主光学导航方案，充分利用 UKF 快速算法对不确定模型的适应性以及 SIFT 图像特征提取算法对尺度、旋转等的鲁棒性，来设计一个联邦卡尔曼滤波器，可以提高轨道参数均值和方差的预报精度，解决复杂环境下自主轨道实时确定的困难。

The shape of planetoid is irregular, and its quality is non-uniform. Moreover, environment of explorers circling round small celestial bodies changes very quickly. In order to improve the orbit
precision, an autonomous optical navigation scheme based on Unscented Kalman Filter and Scale Invariant Feather Transform is proposed to determine the circle orbit state in time, in which star sensor and navigation camera are used to measure special angles between planetoids and explorer, and it can promote parameter mean and predictive precision, which adopts both the UKF for uncertain modeling and the SIFT for scaling and rotating, so it can solve the difficulty of autonomous orbit determination under complicated environment.

Paper ID: CCC07-0069
Title: 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 )
Authors: 刘太元, 贾建芳, 王宏, 岳红
Abstract:
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.

Paper ID: CCC07-0071
Title: 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 )
Authors: 刘太元, 贾建芳, 王宏, 岳红
Abstract:
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.
Title: A New Online-Identification Algorithm for Odometer's Scale Factor

Abstract:
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.

Title: Multisensor Information Fusion Wiener Deconvolution Predictor

Abstract:
By the modern time series analysis methods, based on ARMA innovation model and augmented state space model, a multisensor optimal information fusion Wiener deconvolusion 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.

Title: Self-tuning Measurement Fusion Kalman Predictor

Abstract:
For multisensor system with unknown noise variance and different right factor of the observation matrix, a self-tuning Kalman predictor is proposed. This predictor avoids using the innovation covariance matrix and computes the optimal weighting factors directly from the innovation covariance matrix. Simulation results show the proposed self-tuning Kalman predictor can improve the tracking accuracy and reduce the impact of the observer's noise.
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.

Paper ID: CCC07-0268
Title: Diagnosis for Systematic Errors Using Grey System Theory
Authors: Xia Xintao
Abstract:
It is very important to diagnose systematic errors for improving working performance of manufacture systems. At present, many methods of diagnosis for systematic errors require the certain probability distribution and a great deal of data, primarily based on statistics. Therefore a method using grey relational analysis is proposed to resolve the problem. This method can diagnose systematic errors only with small sample, without special requirements for probability distribution. The concepts, grey confidence level, grey difference, weighting coefficient and weighting function mapping, are defined to test reliability of the diagnosis results. This method is validated by computer simulation and engineering experiments. And the grey confidence level is proved to be 95%.

Paper ID: CCC07-0386
Title: Parameter Identification of LuGre Friction Model for Servo System Based on Improved Particle Swarm Optimization Algorithm
Authors: Zhang Wenjing
Abstract:
LuGre friction model can describe dynamic characteristics of friction in servo system accurately, but because of its high nonlinearity, it is very difficult to estimate the parameters of the model. In this paper, based on particle swarm optimization algorithm, a two-step off-line identification methodology of the LuGre friction parameters is presented to compensate the dynamic friction. Firstly, four static parameters are identified via Stribeck curve. Secondly, two dynamic parameters are estimated by stick-slip response curve. Particle swarm optimization is used in both steps to minimize the identification errors, which can avoid local convergence problem existing in the many linear identification methods. At last, the identification results are applied to a ship-borne gun servo system. Experiments verify the effectiveness of the proposed scheme for high-precision motion trajectory tracking.
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.

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.

A 2D real-valued discrete Gabor transform (RDGT) for image representation is presented in this
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 discrimination.

Paper ID: CCC07-0533
Title: 船体挠曲效应实时估计研究(Real Time Estimating of the Ship Flexure)
Authors: 孙昌跃, 邓正隆
Abstract: 对船体挠曲效应进行恰当地补偿是动态舰基对准的一个关键问题,为此需要实时地估计船体挠曲效应。本文就船体挠曲效应在线估计进行了研究。首先提出了一种从惯性测量单元的数据中提取船体挠曲运动信息的方法；基于相关法,推导出了采用惯性测量数据的船体挠曲模型参数在线辨识算法。数值仿真显示船体挠曲模型参数估计值与真实值表现出相当好的一致性,且所提算法在典型海况下显示出良好的稳定性和鲁棒性。A properly compensating the corrupting influence of ship flexure is a key issue for the dynamic shipboard alignment, thus it is necessary to estimate the effect of ship flexure in real time. In this paper, an approach to on-line modeling of the ship flexure is investigated. For on-line modeling of the ship flexure with inertial measurement units (IMU) data, a method for extracting the ship flexure information from IMU data is firstly presented. Then an algorithm for identifying the required ship flexure model parameters is derived by using the correlation method. Simulation results show a good agreement between the estimated model parameters and its true values, and well stability and robustness of the proposed algorithm under the representative sea conditions.

Paper ID: CCC07-0536
Title: 基于提升小波的GPS信号消噪处理(De-noising Processing of GPS Signal Based on Lifting Wavelet)
Authors: 朱习军, 赵建林, 李志敏
Abstract: 数据后处理技术是解决高精度定位多路径效应的一个有效办法,而基于小波分析的多路径提取和消除技术是其中的一种正在发展中的有效手段之一,本文提出了一种基于提升小波技术的多路径高频噪声的消除方法,实验证实了该种方法是有效的,同时也证明了该方法实现的简单性和计算的高效率。

The data post-processing technique is an effective method to solve multipath effect in the highly accurate positioning with the global positioning system (GPS). And the method of extraction and reduction of multipath effect based on the wavelet analysis is developing to be an effective method. A new method based on the lifting wavelet technique to eliminate the multipath effect is put forward in the paper. Then a practical case is made. The results indicate that the new method is very effective to reduce the multipath effect. It is very simple to realize the method and the method has the merit of highly efficient computation.

Paper ID: CCC07-0591
Title: Adaptive Nonlinearity Compensation for Power Amplifiers Based on Local-Modeling
Approach

Authors: Ding Yuanming, Sano Akira

Abstract:

A new predistortion linearization scheme is proposed to compensate nonlinear power amplifiers (PAs) in orthogonal frequency division multiplexing (OFDM) communication systems. The PA is represented by a Wiener-Hammerstein model. The inverse model of the PA is constructed based on the local modeling techniques. Furthermore, a look-up table (LUT) for constructing a predistorter (compensator) of PA is also given to simplify the proposed compensation scheme. The effectiveness of the proposed scheme is validated by a numerical simulation.

Paper ID: CCC07-0593

Title: UML-RT 模型到实时多任务图形设计环境的变换(From UML-RT Models to a Graphical Design Environment of Real-time Multitasking)

Authors: 刘晓燕, 张云生, Schwarz Jean-Jacques, 李俊昌

Abstract:

为解决把 UML-RT 建模模型平滑过渡到实时多任务图形化的软构件设计开发环境的设计模型，本文提出了从 UML-RT 的结构模型变换到该环境下的高层架构模型以及状态图行为模型转换到该环境下的执行模型的方法。首先介绍 UML-RT 构建模型及状态图建模的概念及笔者研制的设计环境，其次给出从 UML-RT 模型变换到该环境设计模型的具体方法、约束和限制。以一个实例说明了变换方法。

Presents guidelines of mapping UML-RT models to design models of a graphical design of real-time multitasking environment component-based in order to overcome easy translation UML-RT structure models into the high-level architecture models of this design environment, and transformation UML-RT State Diagram behavior model into its execution models. First, concepts of UML-RT modeling structure, State Diagram behavior modeling and the design environment are presented. Second, specific guidelines and constrains of translation UML-RT models to the environment design models are proposed. Finally, an example is given to illustrate mapping methods between them.

Paper ID: CCC07-0618

Title: 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)

Authors: 王一颉, 韩敏

Abstract:

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.

Paper ID: CCC07-0644
Title: 基于支持度的多传感器限定记忆融合(Limited Memory Fusion of Multi-sensor Based on Support Degree)
Authors: 张鹏, 张建业, 孙勇, 李学仁, 张宗麟
Abstract: 提出一种新的基于支持度的多传感器限定记忆融合方法, 该方法能够防止陈旧信息引起的“数据饱和”。算法使用指数函数构建支持度矩阵, 以获得各传感器在不同时刻的一致性度量。同时在迭代融合估计过程中, 通过引入限定记忆控制项保证最近时刻的量测信息得到充分利用, 从而动态确定传感器权系数。与基于均值融合和支持度的一致性融合算法所作的对比实验表明, 使用该算法得到的融合权值分配方式更加合理, 可进一步提高融合精度。

In the case of any prior knowledge is unknown, consistent data fusion algorithm is widely studied. Based on the existing methods, a novel limited memory fusion of multi-sensor based on support degree is proposed to avoid data saturation when the old measurement information increasing. The algorithm takes use of the exponential function to build the support degree matrix, and each sensor’s consistency value of different time can be obtained. In the progress of iterative estimation, the limited memory method is used to just make full use of the last measurement information, and so the weight coefficient for sensor can be determined dynamically. Compare with the mean and support degree based data fusion techniques, the fusion weight assignment is more reasonable and the fusion precision can be improved further by the proposed method.

Paper ID: CCC07-0669
Title: 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)
Authors: 白锦花, 马静, 孙书利
Abstract: 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.

Paper ID: CCC07-0718
Title: On Simplified Model for Activated Sludge Wastewater Treatment Process and Simulation
Based on Benchmark
Authors: Yu Guangping, Yuan Mingzhe, Wang Hong
Abstract:
In order to enhance the practicality of the exiting models for the activated sludge wastewater treatment process (WWTP), a simplified model is developed based on the Activated Sludge Model No.1 (ASM1), which is the most widely studied. The simplified model is suitable for describing the process of carbon removal in the plug-flow activated sludge WWTP. It has a much simpler structure and less time cost in simulation. To validate the effectiveness fairly, the simplified model is applied based on the benchmark. The benchmark is a standard platform-independent simulation environment proposed by the International Water Association defining a plant layout, a simulation model, influent data, test protocols and evaluation criteria. The simplified model replaces the ASM1 to describe the biological-chemical reactions of the reactors in the benchmark plant. The simulation result is closed to the test data using three different weather files and demonstrates the precision of the simplified model.

Paper ID: CCC07-0720
Title: 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)
Authors: 韩敏, 李德才
Abstract:
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.

Paper ID: CCC07-0741
Title: Statistical Characteristics of Stationary Processes in Cyclic Autocorrelation Based PSK Symbol Rate Estimation
Authors: Jin Yan, Ji Hongbing
Abstract:
Statistical characteristics of stationary processes in the cyclic autocorrelation based PSK symbol rate estimation are detailedly studied in this letter. The analytic expressions of the means and the variances of those undesired items which are produced by stationary processes are deduced, and the simplified forms for the Gaussian white noise case are also provided. Simulation results are presented to confirm the theoretical conclusions.
Title: Set Membership State Estimation for Nonlinear Systems in the Presence of Bounded Disturbances
Authors: He Qing
Abstract:
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.

Title: 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)
Authors: 吴敏, 徐辰华
Abstract:
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.

Title: 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)
Authors: 宋海鹰, 桂卫华, 阳春华
Abstract:
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
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.
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.

Paper ID: CCC07-0887
Title: A Dynamic Parzen Window Approach Based on Error-entropy Minimization Algorithm for Supervised Training of Nonlinear Adaptive System
Authors: Wang Zibin, Ren Xuemei, Liu Yan
Abstract:
This paper presents a dynamic Parzen window estimator in the MEE approach for supervised training of nonlinear adaptive system. By adjusting the Parzen window width dynamically so that the overall information force (OIF) among error-samples of each step is as large as possible, the training speed is accelerated and the error is reduced. The simulation result has proved the effectiveness and robustness of this algorithm.

Paper ID: CCC07-0908
Title: 基于 SystemC 的离散事件系统仿真(Discrete Event Dynamic System Simulation Base on SystemC)
Authors: 刘颖, 刘全利, 王伟
Abstract:
介绍了 SystemC 仿真建模平台的特点，分析了其对于求解离散事件仿真系统的优势，提出了一种基于 SystemC 的离散事件仿真的建模方法。通过典型的排队系统为例，给出了基于 SystemC 的排队系统的性能指标，说明了基于 SystemC 的仿真系统的有效性，并阐明了该方法应用于其它仿真调度问题的可行性。
This paper includes the introduction of the features of simulation method based on SystemC and the analysis of its advantage to discrete event system simulation, meanwhile, a new simulation model based on SystemC is proposed. A detailed example of the queue system is given with application of DEVS to prove the new module is valid and facilitated. It can be adopted in applications for other simulation scheduling problems.

Paper ID: CCC07-0930
Title: 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)
Authors: 尹海，刘志远
Abstract:
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得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. Further 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.

Paper ID: CCC07-0949
Title: Modeling and Analysis of SMT Motion Control System
Authors: Zhang Yachen, Hu Yueming, Yuan Peng
Abstract:
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.

Paper ID: CCC07-0987
Title: Identification for Hammerstein Systems Using Extended Least Squares Algorithm
Authors: Zhao Wenxiao
Abstract:
The extended least squares (ELS) algorithm is applied to identifying 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.

Paper ID: CCC07-0993
Title: Parametric Identification of Input-delay Systems with Unknown Time Delay
Authors: Najafi Majd Aldin, Kamali Marzieh, Askari Javad
Abstract:
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.

Paper ID: CCC07-1062
Title: On Multiplex Combination Forecasting Model Based on GA and ANN
Authors: Li Junfeng, Yang Aiping, Dai Wenzhan, Pan Haipeng
Abstract:
In this paper, a new idea of the multiplex combination forecasting method based on genetic algorithm and artificial neural network is put forward. First, the frame of ANN for forecasting is constructed. Second, the algorithm for solving the weight of ANN by using of GA is presented. Finally, the method proposed in this paper is applied and results show its effectiveness.

Paper ID: CCC07-1066
Title: 制导炸弹误差模型的仿真与分析 (Error Model Simulation and Analysis for Guided Bomb)
Authors: 穆育强, 钱龙军, 盛安冬
Abstract:
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.

Paper ID: CCC07-1130
Title: 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)
Authors: 宋海鹰, 柠卫华, 阳春华
Abstract:
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
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.

Paper ID: CCC07-1150
Title: 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)
Authors: 吕皖丽, 郭玉堂, 罗斌
Abstract: 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.

Paper ID: CCC07-1178
Title: An Adaptive System Identification Algorithm with a General Performance Index Based on Entropy Optimization
Authors: Liu Yan, Ren Xuemei, Wang Zibin, Na Jing
Abstract: This paper presents an entropy minimization algorithm for nonlinear system identification based on the information theory. The Parzen windowing estimator is used to approximate the entropy when the probability density functions of the variances can not be known as a priori or the variances are not realistically expressed with the traditional probability density functions. A general performance index based on the information entropy is discussed in this paper. Minimizing the performance index adopted can make the desired output of the adaptive system being tracked directly by the output of the neural network identifier. Furthermore, this performance index can be easily extended when treating other control problems. The performance of the entropy optimal algorithm is shown by several simulations with backpropagation neural networks.
A Method of Super-resolution Image Restoration Based on Separation

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.

Parameters Identification of Continuous System Based on Hybrid Genetic Algorithm

A new hybrid genetic algorithm is provided by adding up the advantages of the genetic algorithm and gradient algorithm, as uses the results of gradient algorithm improving the populations of genetic algorithm, and selects the best point as the start point of gradient algorithm next time by comparing the best point of genetic algorithm with the last results of gradient algorithm. Applying the method to estimating the parameters of continuous system, the simulation results show it is more quickly than genetic algorithm and owes better anti-noise ability, and improves the defects of genetic algorithm with slower searching ability near a point, and it provides a new method for the parameters estimation of continuous system.

A New Integrated Model and Its Application to Soft-sensing of the Flue Temperature in Coke Oven

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、二元和三元 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 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
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.

Paper ID: CCC07-1293
Title: Recursive Subspace Identification for Closed-loop Systems
Authors: Jiang Yueping, Fang Haitao
Abstract:
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.

Paper ID: CCC07-1363
Title: 一种改进的L树图像压缩算法(An Improvement Image Compression Scheme Based on Lower Tree)
Authors: 张艳, 刘翠, 孙以材, 于明
Abstract:
针对现有图像压缩算法存在的编码过程重复运算、存储量大的问题[1-3], J. Oliver等人利用图像经小波变换后各子带之间系数相关性提出了L树的概念[3], 本文根据L树的概念给出了基于四叉树快速对系数进行编码、重建的图像压缩算法。该算法编解码过程简单、运算量低、速度快，而且具有较高的图像压缩率和重建质量，并在此基础提出了改进方案。

A novel image encoding algorithm is presented based on lower tree [3] to solve the problems such as low speed, huge capacity, repeated calculation in advanced compression codings[1-3]. It is an efficient method of grouping the coefficients, coding them and reconstructing them based on the correlation of the wavelet coefficients in multiresolution. And an improved algorithm is proposed. The experimental result shows that the improved algorithm increases the coding speed, reduces the memory and improves the image recovery quality, so it is an efficient method for image encoding.

Paper ID: CCC07-1405
Title: 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)
Authors: 孙航, 刘荣利, 文成林
Abstract:
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.

Paper ID: CCC07-1415
Title: 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)
Authors: 王炬, 樊绍胜
Abstract:
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，运用阈值法去噪会发生伪吉布斯(Pseudo-Gibbs)现象。在阈值法基础上加以改进的平移不变性小波去噪方法不仅能有效抑制伪吉布斯现象，而且能减少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，该方法对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.

Paper ID: CCC07-1417
Title: 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)
Authors: 顾涓涓, 陶亮
Abstract: 基于 DCT 的实值离散 Gabor 变换（RDGT）是作者先前提出的用于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.

Paper ID: CCC07-1431
Title: 基于 ACA 的子带滤波器组优化算法 (An Algorithm of Optimizing Subband Filter Banks Based on ACA)
Authors: 李晶, 宋朝, 李玲玲, 李娟, 汤小月, 万娟
Abstract: 子带滤波器组在许多领域中得到广泛的应用, 如语音编码, 图像编码, 自适应滤波, 雷达, 噪声消除等。本文提出了一种子带滤波器组系数蚁群优化算法 ACA-QMF。该算法在消除混叠和相位失真的前提下, 通过控制幅度失真, 为参数的变化提供导向, 尽量减小 QMF 组重建误差, 使 QMF 组更接近完全重建的目标。实验结果表明, 优化后 QMF 能够较好消除分带产生的失真。

Subband filter banks has been widely used in many areas, such as speech coding, image coding, adaptive filter, radar, noise elimination etc. A QMF of an ant colony algorithm (ACA-QMF) is proposed which optimizes the coefficient of QMF banks to solve the QMF design problem in this paper. In order to realize the performance of QMF banks approximates perfect reconstruction, the algorithm based on the design free from aliasing and phase distortion could control the change of coefficient of QMF banks and minimize the reconstruction error of QMF banks with minishing amplitude distortion. The Experimental results show that ACA-QMF could better cancel the distortion by subband coding.

Paper ID: CCC07-1450
Title: Periodicity in Calcination Temperature of a Rotary Kiln
Authors: Du Qiliang, Mo Hongqiang, Tian Lianfang, Mao Zongyuan

Abstract:
This paper studies the periodic structure in the time series of the calcination temperature of a Lithopone rotary kiln. Fourier method, which was well known in spectral analysis, indicated prominent period of 142.22 seconds. For this method did not give the reliability of the periodicities found, a curse fitting method was carried out for validation. After that, the reason of the periodicity was clarified based on the measuring mechanism and the inner structure of the kiln. Furthermore, inference that the period was inverse proportional to the rotary speed come out and it was proved by studying another series under a different rotary speed.

Paper ID: CCC07-1479
Title: 基于云理论的支持无输入的语音质量客观评价的建模方法(The Modeling Method for Non-intrusive Objective Speech Quality Measurement Based on Cloud Theory)
Authors: 李晶, 李玲玲, 万娟, 许艮华, 陈芳

Abstract:
语音质量客观评价体系是语音处理中一个重要研究内容, 而基于输入——输出的语音质量客观评价在实际中存在很多不足。本文提出一种基于云理论的支持无输入语音质量客观评价的建模方法。在该模型中给出了规则发生器的构造，并提取特征参量和进行基于主观质量数据库的语音质量测试, 并进行客观系统与主观评价结果的相关度分析。实验结果表明该方法能够有效提高语音质量评价的准确度和降低语音质量评价的复杂度。

Objective speech quality assessment is a important research in speech processing recently, but there are so many disadvantages in assessment based on input-output. A novel modeling method for non-intrusive objective speech quality measurement based on cloud theory is proposed in this paper. The method for rule-maker constructed and feature extracted is proposed. The speech quality for subjective quality speech database is measured. The correlation between subjective system and objective system is analyzed. The Experimental results show that the method is an effective technique to increase nicety and decrease complexity for speech quality assessment.

Paper ID: CCC07-1572
Title: Online Multivariable Identification of a MIMO Distillation Column Using Evolving Takagi-Sugeno Fuzzy Model
Authors: Molazem Sanandaji Borhan, Salahshoor Karim

Abstract:
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
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.

Paper ID: CCC07-1707
Title: Set Membership Parameter Estimation for Linear Systems Subject to Bounded Disturbances
Authors: He Qing
Abstract:
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 nonincreasing. An example has been provided to clarify the algorithm.

Paper ID: CCC07-1731
Title: Robust FIR Filters for Linear Continuous-time State Space Models with Uncertainties
Authors: Quan Zhonghua, Han Soohee, Kwon Wook Hyun
Abstract:
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.

Paper ID: CCC07-0029
Title: A Robust Optimization Model for Multi-objective Operation of Supply Chain under Uncertain Market
Authors: Xu Jiawang, Huang Xiaoyuan
Abstract:
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.

Paper ID: CCC07-0083
Title: 民用机场停机位优化配置计算机仿真(Computer Simulation for Optimizing Assignment of Civil Airport Gate)
Authors: 王力，刘长有
Abstract:
停机位配置指根据航班信息为到港离港航班指定合适的登机口，航班停机位的高效、合理安排是机场地面作业中的一项核心任务。停机位配置问题是一个 MOP（多目标）优化问题，本文在文献 1 给出的民用机场停机位配置多目标数学模型的基础上，根据机场对于不同优化目标不同权值的实际情况，给出三种求解多目标数学模型的具体算法。数值仿真证明了模型和算法的有效性。

Airport gate assignment is to appoint a gate for the arrival or leave flight based on flights in-formation, assigning the airport gate with high efficiency and reason is a key task among the airport ground busyworks. Assigning the airport gate problem is a multi-objective optimization problem, this paper is based on the literature No.1, which gives out a multi-objective mathematic model of airport gate assignment, according as the fact of airport confirming different right for different optimized objective, and gives out there arithmetics for the multi-objective mathematic. Simulation result shows the validity of this model and algorithm.
Title: Study of Compound Optimal Control for Beer Saccharification Temperature
Authors: Shang Jiliang, Yu Wei, Gao Dexin
Abstract: The beer saccharification temperature process has great phase lag, and the technology for brewage needs its control track the set curve fast without overshoot. The normal PID algorithm apparently can’t satisfy these demands. This paper presents a new method called Compound Optimal Control—combined Model Predictive Control (MPC) with Bang-Bang Control. The simulation shows that the method not only has faster tracking speed, higher control accuracy and no overshoot compared with the normal PID control and Dynamic Matrix Control only, but also has stronger suppressing capability of disturbance than PID control. Thus it satisfies the technical demands. And this system can shorten the saccharification time simultaneously.

Title: Decentralized Control of Linear Systems Based on the New Viewpoint of Cooperative Control
Authors: Tang Wenyan, Nian Xiaohong, Cao Li
Abstract: 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.

Title: 区域稳定的有效非线性预测控制(Effective Nonlinear Predictive Control with Regional
Stability)

Authors: 何德峰, 季海波, 陈作贤, 郑涛

Abstract:
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.

Paper ID: CCC07-0335
Title: Optimal Dynamic Pricing Strategies with Two Differentiated Products
Authors: Wei Jie, Tu Fengsheng

Abstract:
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 manufacturer 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.
Paper ID: CCC07-0342
Title: Maximum Principle for Fully Coupled Forward-backward Stochastic Control System with Random Jumps
Authors: Shi Jingtao, Wu Zhen
Abstract:
A maximum principle for one kind of fully coupled forward-backward stochastic control system with random jumps is proved. The control variable is allowed to enter both diffusion and jump coefficients with the control domain is convex.

Paper ID: CCC07-0476
Title: Optimal Robust Control for Uncertain Impulsive Systems
Authors: Liu Bin, Hill David J.
Abstract:
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 impulsive 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.

Paper ID: CCC07-0554
Title: Optimal Security Investment under Tax and Transaction Cost
Authors: Wan Shuping
Abstract:
When a single stock is modeled by switching geometric Brownian motion, optimal security
investment problem with the objective of maximizing the long-run growth rate of after-tax wealth is established. This problem has been transformed into an optimal stopping problem. By solving the generational Stefan problem, the optimal trading strategy is obtained. Numerical example indicates that it is optimal not only to cut short the losses, but also the profits. Tax does not mean bad things for investors and they can get better performance by making use of the tax credit.

Paper ID: CCC07-0557
Title: Optimal Investment Consumption Model with Vasicek Interest Rate
Authors: Dong Jiuying
Abstract:
The optimal investment consumption problem for a single riskless bond, a zero-coupon bond and a risky stock modeled by the Vasicek interest process has been established. The investment objective is maximizing the utility of his consumption and terminal wealth. By the stochastic dynamic programming principle, the HJB equation for the optimal solution is given. In the case of constant relative risk aversion utility, the analytic optimal trading strategies are derived. The results show that the optimal proportion allocated in the stock is a constant fraction, but the optimal proportion in the zero-coupon bond is time-variant. The optimal consumption rate is in a feedback form of the wealth and depends on the stochastic interest rate. A numerical example illustrating the results is presented.

Paper ID: CCC07-0594
Title: 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)
Authors: 路飞, 宋沐民, 田国会, 李晓磊
Abstract:
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.
Paper ID: CCC07-0600
Title: One Kind of Stochastic Nonzero-sum Game Problem and BSDEs
Authors: Wu Zhen, Yu Zhiyong
Abstract:
In this paper, we deal with one kind of stochastic nonzero-sum differential game problem for $N$ players. Using the solutions of the backward stochastic differential equations and Malliavin calculus technique, we give the explicit form of a Nash equilibrium point.

Paper ID: CCC07-0658
Title: 用蚁群算法求解不定期船调度问题(Solving the Tramp Ship Dispatching Problem Using ACA)
Authors: 赵刚, 陈文兵
Abstract:
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.

Paper ID: CCC07-0711
Title: 面向大规模过程系统优化的序列界约束极小化技术(Sequential Bound Constrained Minimization Technique for Large-scale Process System Optimization)
Authors: 李翔, 梁昔明
Abstract:
基于非线性约束的序列界无约束极小化方法, 对大规模过程系统稳定优化的序列界约束极小化方法进行了研究。对工程模型引进松弛变量处理后, 该约束优化方法的罚函数仅包含等式约束的惩罚项, 不包含界约束及不等式约束的惩罚项。通过求解一系列约束极小化问题而非无约束极小化问题获得原问题的解; 算法按 2 层结构实现, 内层结构主要求解约束极小化问题得到下一个迭代点, 外层迭代主要修改乘子向量和罚向量以及检查收敛准则是否满足, 重构下次迭代的界约束子问题, 或在收敛准则满足时终止算法。此外, 还给出了求解约束极小化问题的修改截断 Newton 法, 并就一类规模可变的约束优化问题和一类最优控制问题对所给方法进行了数值试验, 试验结果表明, 本文提出的序列界约束极小化技术适合大规模优化问题求解, 并且是稳定和有效的。

Based on sequential unconstrained programming method, the sequential bound constrained programming algorithms for large-scale process system optimization are studied in this paper. Since mild variables are introduced according to all inequality constraints, the penalty function of our algorithms only contains the penalty terms for equality constraints. A series of bound constrained sub-problems instead of a series of unconstrained sub-problems are solved in these
algorithms. The sequential bound constrained programming algorithms are performed in two stages. The inner stage is the bound constrained minimization of the augmented Lagrange penalty function in which a new set of primal variables is found. The outer stage is performed to update the Lagrange multipliers and penalty parameters, check for convergence and accordingly reinitiate another bound constrained minimization or declare convergence. Furthermore, a modified truncated-Newton algorithm is proposed to solve the bound constrained sub-problems. Finally, numerical experiments are made for two kinds of alterable dimension nonlinear programming problems, which proves the stability and effectiveness of the algorithms for large-scale process system optimization.

Paper ID: CCC07-0712
Title: Research on DO Intelligent Control System in Fermentation
Authors: Zhu Xiaoliu, Jiang Dingguo, Zhang Yulin, Xu Baoquan
Abstract: Dissolved Oxygen (DO) is one of great importance in the process of microbe fermentation. A normal PID is difficult to solve the nonlinear, time-delay characteristics. An intelligent PID controller is designed based on dynamic inertia factor PSO, which can adaptively adjust the parameters of PID and is used in the control of DO. Compared with normal PID controller, the new controller is of small overshoot and quick response, improved stability of the system and increase the yield of products.

Paper ID: CCC07-0788
Title: Fast Modular Multivariable Nonlinear Model Predictive Controller
Authors: Zheng Tao, Wu Gang, Ling Qing, Chen Wei, He Defeng
Abstract: 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.

Paper ID: CCC07-0798
Title: Game Theoretic Energy Balance Routing in Wireless Sensor Networks
Authors: Zeng Ji, Mu Chunlei, Hu Jianbin
Abstract: Based on the problem of uneven energy consumption in wireless sensor networks, a Game Theoretic Energy Balance Routing (GETER) algorithm is proposed. The GETER algorithm selects the best relay node based on the Nash equilibrium strategy, which can balance the energy consumption of the routing nodes and improve the network lifetime.
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.

Paper ID: CCC07-0848
Title: Multi-resolution Morphological Operators for Electrocardiogram Signal Analysis
Authors: Ji Tianyao, Lu Zhen, Wu Q. H.
Abstract:
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.

Paper ID: CCC07-0960
Title: Kernel-based Nonlinear Fit with Total Least Square (TLS) Method
Authors: Hu Guanghua, Fu Guanghui
Abstract:
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.

Paper ID: CCC07-0992
Title: Design of an $H_{\infty}$-Optimal FOPID Controller Using Particle Swarm Optimization
Authors: Zamani Majid, Karimi Ghartemani Masoud, Sadati Nasser
Abstract:
This paper proposes a novel method to design an $H_{\infty}$-optimal Fractional Order PID (FOPID) controller with ability to control the transient,
steady-state response and stability margins characteristics. The method uses particle swarm optimization algorithm and operates based on minimizing a general cost function. Minimization of the cost function is carried out subject to the H infinity-norm; this norm is also included in the cost function to achieve its lower value. The method is applied to a phase-locked-loop motor speed system and an electromagnetic suspension system as two examples to illustrate the design procedure and verify performance of the proposed controller. The results show that the proposed method is capable of improving system responses as compared to the conventional H infinity-optimal controller while still maintains the H infinity-optimality of the solutions.

Paper ID: CCC07-1030
Title: 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)
Authors: 刘载文, 段长明, 许继平
Abstract:
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.

Paper ID: CCC07-1074
Title: Stackelberg Equilibriums of Open-loop Differential Games
Authors: Xu Yashan
Abstract:
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.(cite{Fr}). 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.

Paper ID: CCC07-1102
Title: 制造商分销渠道战略选择的博弈分析(On the Choice of Manufacturer's Distribution
Channel Strategy Based on Game Theory

Authors: 赵礼强, 郭亚军

Abstract:
随着电子商务及网络技术的发展,许多制造企业在保持传统渠道的同时增加电子直销渠道来重新构建其分销渠道。近几年渠道战略选择问题引起企业界和理论界的重视。本文运用消费者效用理论建立了多渠道环境下的需求函数,运用博弈论分析了不同渠道结构下的价格策略和利润情况。结论表明,网上购物成本比较低时,制造商最优渠道战略为混合双渠道;网上购物成本比较高时,制造商最优渠道策略为单一传统渠道,最后通过一个实际算例验证了结论。With the rapid development of E-commerce and network, many manufacturers redesign their distribution channel through adding E-market based on traditional channel. This paper develops the aggregate demand function under dual channel based on consumer utility theory, analyzes the pricing strategy and profit under different channel by using game theory, the result shows when the purchase cost from online is low, manufacturer's optimal channel strategy is dual channel; when the cost is high, the optimal channel strategy is traditional single channel. Finally the conclusion is approved through numerical illustration.

Paper ID: CCC07-1106
Title: Optimal Stopping Time and Pricing of Exotic Option
Authors: Yang Bing
Abstract:
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 problem. 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).

Paper ID: CCC07-1114
Title: Multi-objective Optimization of Reactive Power Dispatch Using a Bacterial Swarming Algorithm
Authors: Lu Zhen, Li Mengshi, Tang Wenjia, Wu Q. H.
Abstract:
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.

Paper ID: CCC07-1121
Title: Optimal Controls for a Class of Impulsive Systems with Hybrid Quadratic Performance
Authors: Zhou Yuan
Abstract:
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.

Paper ID: CCC07-1212
Title: A Hybrid Intelligent Algorithm for Vehicle Pick-up and Delivery Problem with Time Windows
Authors: Liao Li, Wu Yaohua, Hu Hongchun, Xiao Jiwei
Abstract:
In this paper a hybrid intelligent algorithm is presented to solve the pick-up and delivery problem with time windows (PDPTW), which combines cluster algorithm, genetic algorithm and tabu search. At first, the multi-vehicle PDPTW problem is transformed into several single-vehicle PDPTW problems by using clustering algorithm, then initial solution for tabu search is constructed by arranging the best solutions of single-vehicle PDPTW problems which obtained by using genetic algorithm, at last the optimal solution is obtained by performing tabu search. In addition, a gradually increase strategy of the number of cluster from the minimal feasible number is proposed, to guarantee the minimization of fleet. The computational results demonstrate the effectiveness of the proposed method to solve the PDPTW problem.
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)

Abstract:
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.

一种改进的 PSO 算法
(A Modified Particle Swarm Optimization Algorithm)

Abstract:
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.
Authors: 张荣
Abstract:

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 multistage 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.

Paper ID: CCC07-1279
Title: 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 (An Optimization Method Based on Integrated Predictive Models and Expert Reasoning Strategies for Mix Proportions in Lead-zinc Sinter)
Authors: 王春生, 吴敏, 周卫华
Abstract:
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.

Paper ID: CCC07-1312
Title: 基于蚁群算法的证券组合投资模型研究 (On Portfolio Investment Model Using Ant Colony Optimization Algorithm)
Authors: 周建国, 张辉, 田继明
Abstract:
基于 Markowitz 资产组合理论，综合考虑证券投资的风险与收益，建立了证券组合投资的多目标规划模型，并用蚁群算法研究了模型的求解，得出了比用 Lingo 模型求解更好的结果。
Based on Markowitz' theory of asset portfolio, a multiple-goal optimization model of portfolio investment was set up considering both risk and return. Then applying ant colony optimization algorithm to solve the model, we got a better result than that of using Lingo.

Paper ID: CCC07-1400
Title: A Real Case of Routing Design for Less-Than-Truckload Motor Carriers Using Genetic Algorithm
Authors: Zhang Jian, Wu Yaohua, Wang Jingbo
Abstract:
How to minimize costs while maintaining a certain level of service is the main concern for most Less-Than-Truckload motor carriers. Hence it is needed to consolidate flows of small shipments and to determine all routes for a fleet of vehicles. In this paper, we proposed a model to describe the routing problem of a real LTL carrier to minimize the long-haul cost with constraints of service time, capacities of different vehicles and management rules. And this paper solved this problem with genetic algorithm and gave the final results using real data of a company in Shandong province, China.

Paper ID: CCC07-1408
Title: Indefinite Stochastic Linear Quadratic Control in Infinite Time Horizon
Authors: Tang Huaibin, Wu Zhen, Zhang Weihai
Abstract:
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.
Paper ID: CCC07-1410
Title: 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)
Authors: 宗群, 王维佳, 孙志明
Abstract: 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.

Paper ID: CCC07-1502
Title: 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)
Authors: 王雅琳, 黎良伟, 阳春华, 桂卫华
Abstract: 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.
Title: 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)
Authors: 马翠芹，李韬
Abstract:
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.

Title: 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)
Authors: 徐家旺，姜波
Abstract:
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。闭环供应链的运作是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.
Abstract:

300MN 模锻水压机是目前我国，也是亚洲最大的模锻液压机，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.

Abstract:

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?

Paper ID: CCC07-1758
Title: 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)
Authors: 丁丽洁, 唐昊, 周雷
Abstract: 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.

Paper ID: CCC07-1763
Title: 基于微粒群优化算法模型的改进策略的研究(On Modified Strategy Based on the Model
of Particle Swarm Optimization)
Authors: 苗广祥, 牛玉广, 陈向阳, 张海萍
Abstract:
针对基本微粒群优化算法的早熟收敛和后期进化缓慢的不足，对微粒群模型的动态特性进行了分析，探讨了微粒群模型的三个参数 \( c_1 \) 和 \( c_2 \) 对算法收敛性和搜索速度的影响，并提出了动态调整这三个参数设置的策略。改进后的算法使微粒群在不同的进化时期呈现不同搜索性能，从而增加群体的多样性和提高微粒的收敛速度，协调算法的局部收敛和全局收敛之间的平衡，从而使算法既快又准地搜索到全局最优解。最后以典型优化问题的实例仿真验证了本文提出的改进策略的有效性。

Aiming at the disadvantages of premature convergence and slow later evolution in the basic particle swarm optimization algorithm, this paper studies the influence of the three parameter, \( c_1 \) and \( c_2 \) on the convergence and divergence and search speed on the basic of PSO's model, then puts forward the strategy of dynamically adjusting the three parameter setting. Modified algorithm makes particle swarm achieve different search performance at different evolution stage, then increases the diversity of the particle swarm, improves the convergence speed of the particle, and coordinates the equilibrium between local and global convergence. As a result, these modifications make the algorithm very quickly and accurately search global optimal solution. Finally, the modified algorithm is proved effective by the simulation example of the typical optimization problem.

Paper ID: CCC07-0041
Title: 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)
Authors: 陈志盛，李勇刚
Abstract:
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。利用松弛权矩阵方法，提出保证系统随机稳定且满足给定 \( H_{\infty} \) 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(LMIs)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 \( H_{\infty} \) tracking performance are proposed using a slack weighting matrix method. The conditions and the optimial 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.

Paper ID: CCC07-0077
Title: The Application of Robust Multivariable Observer in Tandem Cold Mills
Authors: Chen Liangui
Abstract:
A TCM is a complex multivariable process in which the thickness, hardness and crown of the strip can usually not be measured due to the measure meters out of function and the hostile environment. This paper proposed a novel multivariable observer which is robustly stable for changes to the mill modulus while still providing high observed states accuracy. The performance and stability of the multivariable observer are analyzed and the benefit of the multivariable observer is demonstrated using a simulation and paved the way to the production of an advanced
multivariable controller.

Paper ID: CCC07-0089
Title: Observer-based Robust $H_{\infty}$ Control for Uncertain Discrete-time Systems with Both State and Input Delays
Authors: Bi Weiping, Zhao Xiaoli, Qi Chunling
Abstract:
This paper is concerned with the robustness and $H_{\infty}$ control problem of observer-based control for a class of uncertain linear discrete-time systems with both state and input delays. Under no disturbance input, the asymptotic stabilization for uncertain time-delay systems will be guaranteed. Linear matrix inequality (LMI) optimization approach is used to design the observer-based H1 control. An example illustrates the application of the proposed technique.

Paper ID: CCC07-0158
Title: A Comparison Study of PD Control of Joint Velocity in Robot Arms
Authors: Song Naihui, Ren Zhaohui, Wang Yongfu, Wen Bangchun
Abstract:
The PD controller requires measurements of both joint position and velocity. It is necessary to implement position and velocity sensors at each joint. The joint position measurement can be obtained by means of encoder, which gives very accurate measurement. The joint velocity is usually measured by velocity tachometer, which is expensive and often contaminated by noise. Two possible solution are to implement a velocity observers and numerical difference methods. This paper presents a comparison study of performances and characteristics of high-gain observers and LPP Numerical difference methods.

Paper ID: CCC07-0160
Title: On an Output Feedback Stabilization Problem for a Class of Nonlinear Systems
Authors: Li Zili, Chen Zengqiang, Yuan Zhuzhi
Abstract:
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.

Paper ID: CCC07-0175
Title: 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

Authors: 陈东彦，毕海云

Abstract:
研究一般离散时间代数 Riccati 方程（DTARE）解的估计问题．首先，利用矩阵求恒等式给出 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 eigenvaules 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.

Paper ID: CCC07-0213
Title: Delay-Dependent Dynamical $H^\infty$ Control of Linear State-Delayed Systems
Authors: Wang Dejin
Abstract:
This paper provides a linear matrix inequality (LMI) approach to delay-dependent observer-based stabilizing and H-inf 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 H-inf 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.

Paper ID: CCC07-0267
Title: Delay-dependent Guaranteed Cost Control for Nonlinear Neutral Systems with Mixed Delays
Authors: Chen Yonggang, Bi Weiping
Abstract:
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.

Paper ID: CCC07-0291
Title: Robust Strictly Dissipative Control for Singular Systems with Time-delay and Parameter Uncertainties
Authors: Dong Xinzhuang
Abstract:
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.

Paper ID: CCC07-0315

Title: 数值界不确定关联大系统输出反馈分散鲁棒 $H_{\infty}$ 控制(Decentralized Robust $H_{\infty}$ Output Feedback Control for Value Bounded Uncertain Large-scale Interconnected Systems)
Authors: 谢永芳, 黄灿, 桂卫华, 蒋朝辉, 阳春华
Abstract:
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 $H_{\infty}$ 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引理。基于该有界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 $H_{\infty}$ 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 $H_{\infty}$ 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 liner matrix inequality method. Based on the new bounded real lemma a sufficient condition for the existence of a decentralized robust $H_{\infty}$ 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 $H_\infty$ performance is obtained by a homotopy iterative method. At last a numerical example is given to illustrate the effectiveness of the offered method.

Paper ID: CCC07-0372
Title: 带非线性扰动不确定多时变时滞系统输出反馈 $H_\infty$ 鲁棒控制(Output Feedback $H_\infty$ Robust Control for Uncertain Multiple Time-varying Delays Systems with Nonlinear Perturbations)
Authors: 马新军, 舒布工
Abstract:
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 $H_\infty$ 鲁棒控制. 其中时滞是时变的, 不确定满足泛数有界, 而带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.

Paper ID: CCC07-0390
Title: Delay-dependent Robust $H_\infty$ Control for Uncertain Discrete Singular Time-varying Delay Systems Based on a Finite Sum Inequality
Authors: Wang Huijiao, Xue Anke, Lu Renquan, Chen Yun
Abstract:
The problem of delay-dependent robust $H_\infty$ 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 $H_\infty$ state feedback control law is presented, which guarantees that the resultant closed-loop system is regular, causal and stable with disturbance attenuation level $\gamma$ for all admissible uncertainties. A numerical example is given to demonstrate the applicability of the proposed method.

Paper ID: CCC07-0439
Title: Robust Landing Control and Simulation for Flying Wing UAV
Authors: Wang Rui, Zhou Zhou, Shen Yanhang
Abstract:
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/Hinf robust control method is adopted in this paper. The H2 part is to meet excellent dynamic responds; the Hinf 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.
Time-varying Delay
Authors: Guan Haiwa, Gao Lixin
Abstract:
This paper deals with delay-dependent robust stability and $H_\infty$ control problems for uncertain jump linear systems with interval time-varying delay. Based on the Lyapunov-Krasovskii functional approach, a stability criterion is derived by some linear matrix inequalities (LMIs). Furthermore, corresponding $H_\infty$ control laws are given. Some numerical examples are worked out to show the usefulness of the theoretical results.

Paper ID: CCC07-0579
Title: Robust $H_\infty$ Filter Design for 2DFM Model
Authors: Meng Xiangyu, Gao Huijun, Chen Tongwen
Abstract:
This paper is concerned with the robust $H_\infty$ 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 $H_\infty$ filtering problem, with sufficient conditions for existence of the desired $H_\infty$ 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.

Paper ID: CCC07-0703
Title: Robust Stabilization and $H_\infty$ Control for Uncertain Discrete-time Systems with Time-varying Delays
Authors: Tang Hongji, Han Yanwu, Zhang Xiaomei
Abstract:
The problems of robust stabilization and $H_\infty$ control for uncertain discrete-time systems with time-varying delays are investigated. Attention is focused on the design of a memoryless $H_\infty$ state feedback controller such that the resulting closed-loop system is robustly exponentially stable with a prescribed level for all admissible uncertainties. A new delay-dependent sufficient condition for the existence of robust exponential $H_\infty$ state feedback controllers is provided by
constructing a new Lyapunov functional and introducing some slack matrix variables. The desired $H_{\infty}$ controller can be obtained by solving a set of matrix inequalities. Finally, numerical examples are given to illustrate the effectiveness of the proposed method.

Paper ID: CCC07-0839
Title: 不确定时滞系统的时滞相关非脆弱 $H_{\infty}$ 控制 (Non-fragile Delay-dependent $H_{\infty}$ Control for Uncertain Systems)
Authors: 肖仲平, 吴敏, 张先明
Abstract:
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 $H_{\infty}$ 扰动抑制水平 $\gamma$ 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-infinity 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-infinity disturbance attenuation level via a non-fragile controller, is obtained by using the Lyapunov-Krasovskii stability theory. Then, the design of non-fragile $H_{\infty}$ 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.

Paper ID: CCC07-0844
Title: 基于分离算子的鲁棒可靠跟踪控制器设计 (Separator-based Design of Robust Reliable Tracking Controller)
Authors: 欧阳高翔, 倪茂林
Abstract:
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 on 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.

Paper ID: CCC07-1015
Title: Non-Fragile Mixed LQR/\(H_\infty\) Control Problem for Linear Discrete-time Systems with Controller Uncertainty
Authors: Xu Xiaojie
Abstract:
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.

Paper ID: CCC07-1093
Title: Time Delay Force Control for Vehicle Active Suspension System
Authors: Xuan Dong Ji, Kim Jin Wan, Nan Yang Hai, Kim Young Bae
Abstract:
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.

Paper ID: CCC07-1096
Title: 一类非仿射非线性系统的\(H_\infty\)控制 (\(H_\infty\) Control of a Class of Non-affine Nonlinear System)
Authors: 黄洪艺, 彭侠夫
Abstract:
本文将仿射非线性系统的\(H_\infty\)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\(L_2\)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.

Paper ID: CCC07-1128
Title: 鲁棒保性能控制在投资组合决策中的应用(Application on Robust Guaranteed Cost Control Method in Portfolios)
Authors: 高莹, 周鑫, 邹怿
Abstract:
本文运用鲁棒保性能控制方法，研究了在有限边界之内，考虑交易成本和性能指标的动态投资组合管理问题。由若干约束条件组成一个不确定离散系统，通过变换使投资组合的经济约束转化为一个控制中的不确定离散系统，使得一个复杂问题大大简化，最后应用鲁棒控制的保性能控制方法，运用 Matlab 的 LMI 工具箱求解，给出了所期望的状态反馈控制律的存在条件及解析表达式。

This text applies robust guaranteed cost control method to study a dynamic portfolio management problem over a finite horizon with transaction costs and cost index. Some restrictions make up a indeterminacy discrete system. The economic restrictions in the dynamic portfolio management problem are translated into a indeterminacy discrete system in control, which makes a complicated problem easier. At last we apply robust guaranteed cost control method and make use of LMI toolbox of Matlab to solve this problem, meanwhile we give the existent condition of anticipant state feedback control and analytic expression.

Paper ID: CCC07-1291
Title: 有界扰动系统基于集结的鲁棒预测控制器设计(On Design of Aggregation Based Robust Model Predictive Controller for System with Bounded Disturbances)
Authors: 李德伟, 席裕庚
Abstract:
对于具有有界扰动的有约束线性系统，本文借鉴高效鲁棒预测控制（ERPC）的思想，并采用扰动不变集方法处理有界扰动对系统的影响，提出一种基于集结的鲁棒预测控制器，ABRPC。ABRPC 控制器能够较好地处理扰动对系统的影响，在减小控制器的在线计算量的同时，具有较好的控制性能。文中给出 ABRPC 控制器的可行性和鲁棒稳定性证明，并在文章最后通过一个仿真算例验证了该控制器的有效性。

For the constrained linear system with bounded disturbances, a robust model predictive controller ABRPC is present in this paper. Referring to the efficient robust predictive control (ERPC) and adopting the invariant set of the bounded disturbances to deal with the disturbances, the ABRPC deals with the bounded disturbances reasonably, reduces the on-line computational cost and guarantees its control quality. The feasibility and robustly stability of ABRPC is proved in this paper. Finally, a simulation example is present to verify its validity.

Paper ID: CCC07-1342
Title: Roust $H_\infty$ Filtering for Switched Discrete-time Systems with Time-delays
Authors: Liu Xiaowei
Abstract:
This paper mainly designs $H_\infty$ filters for switched discrete-time systems with uncertainties and
time-delays under arbitrary switching sequences. According to Lyapunov theory, a sufficient
condition guaranteeing the error systems of the filters to be asymptotically stable is developed
without uncertainties. Then, by utilizing a lemma and the Schur complement formula, an existing
condition of the robust H∞ filters for the switched systems is given. Finally, simulation results
illustrate the feasibility and advantage of the robust $H_\infty$ filters.

Paper ID: CCC07-1423
Title: Quantized Dynamic Output Feedback $H_\infty$ Controller Design
Authors: Che Weiwei, Yang Guanghong
Abstract:
This paper studies the quantized dynamic output feedback $H_\infty$ 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 $H_\infty$ performance bound. An example is presented to
illustrate the effectiveness of the control strategy.

Paper ID: CCC07-1425
Title: 变时滞线性系统时滞相关的$H_\infty$控制(Delay-dependent $H_\infty$ Control for Linear Systems
with Time-varying Delayed State)
Authors: 张志钢, 张承慧, 崔鹏
Abstract:
利用线性矩阵不等式(LMI)的方法，研究了状态具有变时滞项线性系统的时滞相关的$H_\infty$控制。分别讨论了无记忆时滞相关的$H_\infty$状态反馈控制与基于状态观测器的无记忆时滞相关的
$H_\infty$输出反馈控制的分析与综合问题。文中给出了线性系统反馈设计的充分条件的两种形
式：$H_\infty$状态反馈控制和$H_\infty$动态输出反馈控制。这两类控制器都可由求解线性矩阵不等式
得到，最后给出应用实例，计算结果表明该方法的有效性。

Using the method of linear matrix inequalities (LMI), $H_\infty$ controller is designed for linear
system with time-varying delayed state. Both memoryless $H_\infty$ state feedback control and
observer-based $H_{\infty}$ output feedback control are discussed for system analysis and synthesis.

Sufficient conditions for feedback controller design are given by using two forms: the first is pure $H$-infinity state feedback controller, and the second is $H$-infinity dynamic output feedback controller. Both forms are delay-dependent. Two illustrative examples are given to show the applicability of the proposed approach.

Paper ID: CCC07-1439
Title: Improvement of Robust Positive Realness for a Class of Uncertain Systems
Authors: Li Jing, Zeng Jianping

Abstract:
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.

Paper ID: CCC07-1440
Title: 保证成本控制的动态系统的延迟和不确定系统
Authors: 王军庆, 王天成

Abstract:
针对同时含有离散时滞和分布时滞的不确定线性动力系统，通过运用参数依赖的Lyapunov函数和分解时滞项系数矩阵的方法，研究其保证成本控制问题，给出了基于二次矩阵不等式（QMI）的无记忆状态反馈保证成本控制器的设计方法，所得结果不仅保证闭环系统是指数稳定的，而且性能指标具有给定的上界。最后数值算例验证了本文方法的有效性。

The problem of guaranteed cost control for dynamic system with hybrid delays and uncertainty is considered in this paper. Sufficient condition for solving the problem is obtained by using parameter-dependent Lyapunov Function and decomposing the coefficient matrix of the delay vector. The guaranteed cost controller can be obtained by solving the quadratic matrix inequality, which makes closed-loop system exponential stable, as well as guarantying the cost is bounded in a limitation. Finally, the numerical example shows the validity.

Paper ID: CCC07-1512
Title: 一类时滞不确定系统基于观测器的鲁棒镇定方法
Authors: 张涛, 崔艳秋

Abstract:
研究了具有区间内未知固定状态时滞的不确定系统基于观测器的鲁棒镇定问题，得到了该不确定系统存在状态观测器和基于观测器的鲁棒控制器的充分条件，然后利用求解两个线性矩阵不等式
The observer-based robust stabilization of uncertain system with unknown constant state delay in an interval is studied. A sufficient condition is given for the existence of the state observer and observer-based robust controllers for such uncertain system. The design method of the state observer and observer-based robust controller is presented by solving two linear matrix inequalities (LMIs). Because the designed observer is the observer with delay, the conservation is reduced in the conclusion. At last, an illustrative numerical example is presented, which shows the effectiveness of the proposed method.

Paper ID: CCC07-1596
Title: 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)
Authors: 杨书生, 钟宜生
Abstract: 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, 并对其进行了仿真验证。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.

Paper ID: CCC07-1771
Title: 离散区间 2-D 系统的二次镇定(Quadratic Stabilization of Discrete Interval 2-D Systems)
Authors: 刘征宇, 韩江洪, 张利, 郭祺君
Abstract:
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.

Paper ID: CCC07-1781
Title: Robust Stabilization and Disturbance Attenuation of a Class of MIMO Nonlinear System with Multi-operation Points
Authors: Zhong Yisheng
Abstract:
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.

Paper ID: CCC07-1798
Title: $H_{\infty}$ Analysis Method for the Small Signal Stability of Power System
Authors: Mei Shengwei, Che Wenyan
Abstract:
This work is concerned with the small signal stability problem in multi-machine systems. By means of $H_{\infty}$ theory, firstly the math model with disturbances is constructed; and secondly, the excitation control law for each generator is designed based on solving Riccati Equation. Finally, simulations performed on 4-machine system shows that the proposed $H_{\infty}$ method has more advantages over LQR method in both damping ratio and $H_{\infty}$ norm of the corresponding
closed-loop system and so can enhance the small signal stability of power system greatly.

Paper ID: CCC07-0075
Title: 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)
Authors: 许建强, 陈树中
Abstract: 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 subsystem 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.

Paper ID: CCC07-0115
Title: 基于自适应评价设计的一种控制算法(A Control Algorithm Base on Adaptive Critic Designs)
Authors: 林小峰, 叶伟宝, 宋春宁, 宋绍剑
Abstract: 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.

Paper ID: CCC07-0120
Title: 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)
Authors: 孟斌, 吴宏鑫
Abstract: 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
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.

Paper ID: CCC07-0170

Title: 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)

Authors: 徐爱东, 李传庆, 陈艳军, 刘广生, 韩莉

Abstract:
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得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、鲁棒性和对高阶大惯性系统响应较慢，克服干扰能力有限。文献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-turn 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.
Paper ID: CCC07-0192
Title: Adaptive Constrained Predictive PID Controller via Particle Swarm Optimization
Authors: Song Ying, Chen Zengqiang, Yuan Zhuzhi
Abstract:
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.

Paper ID: CCC07-0255
Title: A Kind of Multi-rate Predictive Control for Time-delay Systems
Authors: Liu Xiaohua
Abstract:
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.

Paper ID: CCC07-0373
Title: 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 )
Authors: 曹荣敏, 侯忠生, 黄健
Abstract:
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.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. Conjugated 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.

Paper ID: CCC07-0419
Title: A Model Reference Adaptive Controller Design for Discrete Hammerstein Systems
Authors: Shen Qingbo, Ding Yuanming
Abstract:
A model reference adaptive control scheme is presented for a class of discrete time nonlinear system described by a Hammerstein model. For the Hammerstein model, we present a controller structure of the exact model matching (EMM) and give the control strategy of model reference adaptive control system. Finally, the effectiveness of the proposed scheme is illustrated through numerical simulations.

Paper ID: CCC07-0446
Title: 无模型自适应控制方法在永磁直线电机控制中的应用(Model-free Adaptive Control Used in Permanent Magnet Linear Motor)
Authors: 金尚泰，侯忠生，王卫红
Abstract:
本文将基于紧格式线性化的无模型自适应控制算法应用到永磁直线电机的速度控制中,控制器的设计仅需系统的输入输出数据,并能够实现参数自适应控制和结构自适应控制。仿真结果验证了无模型自适应算法的有效性。
In this paper, the model-free adaptive control algorithm is applied to permanent magnet linear motor speed control based on the dynamic linearization of tight format of a class of SISO nonlinear system. The design of controller is based on I/O data of the system and can realize the parameter adaptive control and structure adaptive control. The simulation results show the effectiveness of the algorithm.

Paper ID: CCC07-0449
Title: 改进的带无模型外环补偿的自适应控制系统(Developed Adaptive Control System Design with a Model-free External Loop As a Compensator)
Authors: 蔡满军，刘明坤，田广军，刘建军
Abstract:
自适应控制系统在处理带有未建模动态系统的控制问题时控制效果不好甚至失稳。为此提出了一种带无模型外环补偿的自适应控制系统设计，它是在传统的自适应控制系统的外面，又加上一个无模型控制的外环，用来补偿由于参数时变及未建模动态所引起的系统跟踪误差，该控制系统设计具有简单的系统结构。本论文对该方法进行了改进，增加了控制功能组合部分，使得该方法的控制精度进一步提高，仿真验证了该方法的有效性。
Adaptive control system in dealing with the controlled plant with some unmodeled dynamics has its bad performance and deficiencies. To overcome this proposing a the adaptive control system
with a Model-Free external loop as a compensator has been proposed. It consists of two feedback loops, one is the traditional adaptive feedback loop, called inner loop. The other is called model-free adaptive control (MFAC) based external loop, which is used to serve as a compensator for system tracking error caused by time-varying parameters and model mismatch and unmodeled dynamics. The method has very simple configuration. This paper have developed the method, added an control function combination, so that the method has improved the control precision. Simulation results have demonstrated the efficiency of the developed method.

Paper ID: CCC07-0504
Title: 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)
Authors: 张天平, 李红春, 王芹

Abstract:
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.

Paper ID: CCC07-0519
Title: 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)
Authors: 洪昭斌, 陈力

Abstract:
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所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
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.

Paper ID: CCC07-0686
Title: 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)
Authors: 孙云平, 李俊民, 张果
Abstract:
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.

Paper ID: CCC07-0694
Title: Adaptive Control of Flexible Satellite
Authors: Arif Thawar
Abstract:
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.
Title: Iterative Learning Control for Time-delay Systems with Initial Rectifying Action
Authors: Xia ju po, He xiong xiong, Sun ming xuan
Abstract:
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.

Title: Design of ASVG Controller Based on Variable Structure Neural Network Fuzzy Control
Authors: Hong zhen nan, Sheng yi fa, Li zhu lin, Yang wu jiao
Abstract:
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.

Title: Neural Network and Adaptive Inversion for Re-entry Vehicle Control
Authors: Li Kefeng, Ren Zhang, Zhang Qingzhen, Liu Chengrui
Abstract:
This paper firstly analyses the kinetics model of re-entry vehicle, then presents a control method using neural network and adaptive inversion to overcome the flaws existing in other conventional control methods such as proportional-derivative(PD) and recently have extended to a special case of proportional-integral(PI) desired dynamics using implicit model-following. This new controller can adapt to nonlinear and strong couple of the plant, and the controller is not sensitive to the
variety of flight condition and other uncertainties. Simulation results for a re-entry flight model are presented to illustrate the good performance of the controller.

Paper ID: CCC07-0944
Title: Discrete-time Adaptive Iterative Learning From Different Tracking Tasks with Variable Initial Conditions
Authors: Chi Ronghu, Hou Zhongsheng, Sui Shulin
Abstract:
A new discrete-time adaptive iterative learning control (AILC) approach is developed to deal with systems in presence of time-varying parametric uncertainties. By using the analogy between the discrete time axis and the iterative learning axis, the new adaptive ILC can incorporate a Projection algorithm, hence the learning gain can be tuned iteratively along the learning axis and pointwisely along the time axis. The major advantage of the new AILC is that it can relax the identical conditions on the initial state and reference trajectory, in the sequel achieves an almost perfect tracking performance.

Paper ID: CCC07-1003
Title: 一类非线性系统的周期学习控制(Periodic Learning Control for a Class of Nonlinear Systems)
Authors: 陈陆安, 孙明轩, 何熊熊
Abstract:
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 boundness of all the signal in the closed loop is guaranteed.

Paper ID: CCC07-1019
Title: An Adaptive Tracking Method for Non-holonomic Wheeled Mobile Robots
Authors: Yue Liyong, Xie Wei
Abstract:
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.

Paper ID: CCC07-1123
Title: 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)
Authors: 陈彭年, 秦化淑
Abstract:
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.

Paper ID: CCC07-1196
Title: Adaptive Control of Rotation Speed of Ship Exhaust Gas Turbo-Generator
Authors: Xu Xiaoyan, He Min
Abstract:
Based on the operation principle of marine exhaust gas turbo-generation system, the simplified mathematical models generation system is established corresponding to the interaction of
demanded active power and shaft rotation speed of generator. Then, an adaptive control method is
designed to substitute for the proportional-integral (PI) control method of rotation speed regulation
of the turbo-generator. According to the control algorithm, the control system makes
self-organizing through modification of its weighted values, and the weighted values are
determined through correlative search. Additionally, a smoothness factor is applied during the
modification of the weighted values, which makes the procedure of the weighted value
modification more smoothly. The experimental results show that, when the rotation speed
regulation process of the exhaust gas turbo-generator is concerned, its dynamic property under
adaptive control is better than that under PI control.

Paper ID: CCC07-1324
Title: 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)
Authors: 方勇纯
Abstract:
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,它由对于扫描管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.

Paper ID: CCC07-1368
Title: 基于迭代学习的伺服系统自适应摩擦补偿研究(Adaptive Friction Compensation of
Servo System Based on Iterative Learning)
Authors: 杨雁, 王云宽, 龚立, 宋英华
Abstract:
摩擦环节是影响伺服系统性能的主要因素之一，针对具有重复运动特性的参数时变伺服系统，提出了一种基于迭代学习的自适应摩擦补偿方法，即在自适应摩擦补偿基础上，通过重复动作间的迭代学习来提高摩擦力模型参数的估计精度，从而达到提高伺服系统性能目的。利用混合能量函数方法，还证明了学习周期内任意时间的跟踪误差在迭代域上渐进收敛的结论。

An adaptive friction compensation approach based on iterative learning is developed in this note to address a class of nonlinear servo systems with repeatable actions and time variant friction model uncertainties, which are iteration independent. By using the composite energy function which provides the system information along time and iterative horizons, and through a mathematically rigorous analysis, the algorithm is proved to be stable convergence along the iterative learning horizon, and the tracking error is asymptotic convergence as the iteration number increased. The simulation illustrations are given to show the approach can achieve high-accuracy trajectory control and it is feasible to practical applications.

Paper ID: CCC07-1454
Title: Higher-order Adaptive Iterative Control for Uncertain Robot Manipulators
Authors: Quan Quan, Wang Xinhua, Cai Kaiyuan
Abstract:
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 convergence 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.

Paper ID: CCC07-1468
Title: Output-feedback MRAC for Continuous State Delay Systems: the Relative Degree Two Case
Authors: Kamali Marzieh, Askari Javad
Abstract:
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 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.

Paper ID: CCC07-1620
Title: 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)
Authors: 于双和, 赵永生
Abstract:
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.

Paper ID: CCC07-0102

Title: 高超声速飞行器再入段滑模跟踪控制设计(Design of Sliding Mode Tracking Control for Hypersonic Reentry Vehicles)
Authors: 杨俊春, 胡军, 吕孝乐
Abstract:
针对高超声速飞行器存在模型不确定性和外部干扰的情况,本文设计了基于等价控制方法的积分滑模控制器,实现了对再入制导指令角的鲁棒解耦跟踪。这里并不要求不确定性和平干扰具有常数界,只要其界为状态变量或可测外部变量的已知函数即可。在不确定性和干扰情况下,所设计的积分滑动面能够保证跟踪误差的有界性,而滑模控制器则保证系统快速趋近滑动面,且在有限时间内到达它。本文最后以一再入飞行器为例,对标称轨道制导指令角的跟踪进行了仿真。仿真结果验证了本文设计的滑模控制器具有鲁棒解耦跟踪性能。

An integral sliding mode controller is designed via equivalent approach under model uncertainties and external disturbances to provide robust, de-coupled tracking of the guided angle command for hypersonic reentry vehicles. All uncertainties and disturbances are not required to be constants. They may be bounded by some known functions of states and external measurable variables. In the presence of uncertainties and disturbances, the designed integral sliding surface provides the bounded tracking error and the sliding mode controller ensures that the system approaches the sliding surface with high speed and reaches it in a finite time. Finally, the tracking of the guided angle command for a nominal trajectory of a reentry vehicle is simulated as an example. Simulation results demonstrate that the designed controller has robust de-coupled tracking performance.

Paper ID: CCC07-0195

Title: VSC Based on CMAC Neural Network for a Class of MIMO Nonlinear System
Authors: Wu Guangbin
Abstract:
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.

Paper ID: CCC07-0284
Title: 十字梁系统的自适应滑模控制研究(On Adaptive Sliding-Mode Control for Cross Beam System)
Authors: 赵红超, 张爽川, 王亭, 何明星
Abstract:
对十字梁系统的三通道非线性模型进行了分析, 为了克服通道间耦合项的影响, 对非线性模型进行了处理, 使其包括线性项和非线性耦合项两部分。在此基础上, 采用自适应滑模控制方法设计三通道的控制系统。该方法利用自适应算法对非线性耦合项进行补偿, 并利用滑模控制保证系统的跟踪误差收敛于零。仿真结果表明, 所设计的自适应滑模控制系统具有很好的控制效果。

The three-channel nonlinear model of cross beam system is analyzed in the paper. In order to overcome the influence of coupled terms among three channels, the nonlinear model is disposed to include linear section and nonlinear coupled section. Based on that, an adaptive sliding-mode control method is applied to design the control systems of three channels. It uses an adaptive algorithm to compensate the nonlinear coupled terms, and it uses the sliding-mode control method to guarantee the convergence to zero of the system track error. Simulation results show that the designed adaptive sliding-mode control system possesses very good control effect.

Paper ID: CCC07-0310
Title: 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)
Authors: 武玉强, 马新, 宗广灯
Abstract:
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.

Paper ID: CCC07-0313
Title: Decoupling Control of the Bearingless Induction Motor Based on Differential Geometry Variable-structure Method
Authors:董磊, 刘贤兴, 孙宇新
Abstract: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.

Paper ID: CCC07-0462
Title: Design of a VSC Controller of Reduced Inputs for Satellite Formation Flying
Authors: Wang Zhaokui, Zhang Yulin
Abstract: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.

Paper ID: CCC07-0909
Title: Continuous Finite Time Control for Stewart Platform with Terminal Sliding Mode
Authors: Zhao Dongya, Li Shaoyuan, Gao Feng
Abstract: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
A Novel Observer-based Output Feedback Sliding Mode Control for Uncertain Discrete-time Systems

Li Juntao, Jia Yingmin, Du Junping, Yu Fashan

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.

The Pitch Channel Slide Control System Design for Supersonic Cruise Missile

Chen Jie, Pan Changpeng, Gu Wenjing

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.

A Kind of Robust Variable Structure Control Scheme Based on Support Vector Machine

Zhang Yibao, Ren Jia

This paper proposes a kind of support vector machine and global robust variable structure control algorithm. In the variable structure趋近律与平移滑平面后，得到了基于平移滑平面的变结构控制算法。然后根据扰动的上下界得到了趋近律参数的取值范围与变结构准滑动模态的宽度，并提出了通过适当选择滑平面参数以减小准滑动模态的宽度的方法。最后引入支持向量机以实现基于线性黑箱系统输入输出数据的控制算法，从而实现了系统辨识与控制算法的结合。仿真结果证明该算法简单易行，并且具有较强的鲁棒性。
A VSC (Variable Structure Control) scheme based on SVM (Support Vector Machine) and SSS (Shift Switching Surface) is developed. Based on SSS and VSC reaching law, a control scheme for tracking control system is proposed, and an additional control is introduced to reduce effect of disturbance. Then SVM is introduced to realize VSC for black-box system. The scheme is simple, and the robustness is proven in simulation.

Paper ID: CCC07-1232
Title: Variable Structure Control for Interval Systems
Authors: Wang Cuihong, Hao Guang, Huang Tianmin
Abstract:
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.

Paper ID: CCC07-1317
Title: Design of Fuzzy Rule Based Novel Sliding Mode Controller for Buck Converter
Authors: Geng Jianhua, Zhang Changfan, Wang Xibo, Luo Cheng
Abstract:
This paper presents a fuzzy sliding mode controller for the Buck converter by a novel method, the novel method considers system and designs the controller on the three-dimensional space, and thinks over the dynamic information of all elements in the buck circuit adequately. At the same time, the method adopts the exponent tendency arithmetic to descend chatter, and employs fuzzy theory to improve performance of the controller, the system can arrive the stability state further more quickly. Lastly this controller is applied on the Buck converter by the simulation experiments, and the result is excellent.

Paper ID: CCC07-1334
Title: Mid-frequency Disturbance Rejection of HDD Systems
Authors: Guo Yuqian, Wang Youyi, Xie Lihua
Abstract:
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.
Title: 3D Variable Structure Guidance Law Based on Adaptive Model-following Control with Impact Angular Constraints
Authors: Sun Weimeng, Zheng Zhiqiang
Abstract:
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.

Title: 用于无功静补系统的鲁棒切换函数变结构控制
(A Variable Structure Robust Control Method in SVC Application for Performance Improvement)
Authors: 茅靖峰, 孙玉坤, 吴国庆, 刘羡飞
Abstract:
针对电力系统无功静补系统面临的非线性、多目标控制问题,应用滑模变结构控制理论、鲁棒控制理论和直接反馈线性化技术,设计了能同时改善电力系统功角稳定与装设点电压动态性能的静止无功补偿器（SVC）非线性变结构鲁棒控制器。控制器考虑了含 SVC 的单机—无穷大系统（SMIB）模型可能的不确定性项,以其标称系统对应的代数 Riccati 方程的解来构造滑动模态超平面,进而给出变结构鲁棒控制算法。设计的控制规律简答,鲁棒性强且易于工程实践。数字仿真结果验证了变结构鲁棒控制设计方法的正确性和有效性。

For solving power system nonlinear and multi-objective control problems, a variable structure robust control design was presented for a static VAR compensator (SVC). The controller for the nonlinear system was designed using variable structure control theory, robust control theory and direct feedback linearization technique. Firstly, the nonlinear model of a single-machine infinite-bus system including SVC with uncertainties was analyzed. Then based on the method for constructing sliding mode hyperplane with the solution of the algebraic Riccati equation of normal system, a variable structure robust control algorithm was carried out. The proposed controller can improve power angle stability of power system and ensure local voltage quality. The control law has simple structure, strong robustness, and easy to realize. Finally, the simulation results verify the validity of the proposed approach.
An Adaptive Sliding Mode Compensation for Friction and Force Ripple in PMSM AC Servo System

Authors: Zhang Wenjing

Abstract:
Dynamic friction and force ripple are the most predominant factors that affect the positioning accuracy of permanent magnet synchronous motor servo system, and it is desirable to compensate them in finite time with a continuous control law. In this paper, based on LuGre dynamic friction model, an adaptive sliding mode controller is proposed to compensate the nonlinear effect of friction and force ripple. The compensation scheme consists of a PD component and an adaptive sliding mode component for estimating the unknown system parameters. Using Lyapunov stability theorem, asymptotic stability analysis and position tracking performance are guaranteed. Experimental results well verify the feasibility and the effectiveness of the proposed scheme for high-precision motion trajectory tracking.

Robust Decentralized Sliding Mode Control for Large Scale Uncertain Systems

Authors: Mnasri Chaouki, Gasmi Moncef

Abstract:
To design a decentralized sliding mode control for uncertain interconnected systems, two approaches are presented in this paper. The first one exploits the use of the common sliding mode strategy of design to simplify the structure of the controller and to give useful results after the reaching phase, while the second takes advantage of a particular sliding surface to give good results starting from any initial conditions. The implementation of the proposed decentralized sliding mode controllers, through a two coupled inverted pendulums model, shows their validity.

Exponential Stability of Delayed High-order Hopfield-type Neural Networks with Diffusion

Authors: Lou Xuyang, Cui Baotong

Abstract:
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.
Title: On the Optimum Method of Feedforward Multi-Layer Neural Network
Authors: Hu Ying, Huang Jin
Abstract:
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.

Paper ID: CCC07-0261

Title: Design for BBT Missile Controller Based on the RBF Neural Networks
Authors: Huang Shengjie, Zhao Zhuwei, Luo Qi
Abstract:
In this paper, adaptive RBF neural networks are present for nonlinear BBT missile controller. Considering the unknown smooth function vectors and the pneumatic parameter disorder, we introduce RBF neural networks into simulating unknown nonlinear vectors. It overcomes some limitations of robust control. In addition, a systematic backstepping design method has been used to guarantee semiglobally uniformly ultimately bounded of closed loop signals, and the output of system can converge to a small neighborhood of the actual trajectory. Finally, simulation result is presented to demonstrate the validity of the approach.

Paper ID: CCC07-0326

Title: Image Target Recognition Using Pulse Coupled Neural Networks Time Matrix
Authors: Liu Qing, Ma Yide, Zhang Shaogang, He Wansheng
Abstract:
A novel method for image target recognition based on the Pulse Coupled Neural Networks (PCNN) time matrix is presented in this paper. We describe the PCNN and put forward the concept of PCNN time matrix. The time matrix contains useful information related to spatial information of the image that is under processing. According to some physical concepts, a kind of new invariable feature of image histogram vector, histogram vector center, is defined, which is used in image target recognition. The results of computer simulations are that histogram vector center of PCNN time matrix has the ability of anti-geometric distortions (translation, rotation and scaling, TRS), and its extraction method is simple. Moreover, little parameters are extracted, and the presented target recognition approach is more efficient which compared with the traditional method.

Paper ID: CCC07-0398

Title: New Exponential Stability Criterion for Delayed Cellular Neural Networks
Authors: Liu Xinge, Ou Xiaobo, Tang Meilan
Abstract:
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.

Paper ID: CCC07-0410
Title: Standard Neural Network Model for the Feedback Stabilization of Intelligent Systems
Authors: Liu Meiqin, Zhang Senlin, Yan Gangfeng
Abstract: 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.

Paper ID: CCC07-0430
Title: 一种挖掘认知图的新方法(A New Methodology of Mining Cognitive Maps)
Authors: 陈庄, Ali R. Montazemi
Abstract: 认知图(Cognitive Map, CM)是一种新的智能方法，与专家系统、神经元网络等传统智能技术相比，它具有独特的优势，如易于表示结构化知识，易于进行运算推理的数字矩阵(而不是基于规则的推理)等。但是，要充分展示 CM 的这些优势，首先必须获得正确的 CM 图。传统的获取 CM 图的方法（如问卷法、头脑风暴法、样本学习法等）主要借助专家经验，因其过分强调主观因素而忽视客观数据资源，容易导致信息丢失现象。为此，该文提出了一种基于客观数据资源来挖掘 CM 图的新方法，它主要由数据库初始化技术、权重系数
Cognitive Map (CM) is a new intelligent method. Compared either experts system and neural networks, it has several desirable advantages such as: it is relative easy to use for representing structured knowledge, and the inference can be computed by numeric matrix operation instead of explicit IF/THEN rules. However, in order to exhibit these advantages about CM, the first step is that the corrected CMs must be obtained. Traditional approaches for obtaining the CMs, including questionnaire method, brainstorming method and sample learning method, mainly rely on experience of domain experts. Because these methods put much emphasis on the subjective factors, neglect the objective data resources, they always lose some information. Therefore, this paper proposes a new methodology of mining the CMs based on data resource, which mainly includes database preprocessing technology, optimization algorithm for weight coefficients and simplification strategy of CMs. The experimental research based on a finance database is done and the results show that: the new method can mine all possible relationship among all nodes to form the CMs, and can also simplify it according to the significant degree of relationships; the CMs mined by the new method has more information than the CMs obtained by traditional approaches.

Paper ID: CCC07-0630
Title: 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)
Authors: 徐国保, 尹怡欣, 殷路, 郝彦爽, 周美娟
Abstract:
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.

Paper ID: CCC07-0635
Title: 自由漂浮空间机械臂系统关节轨迹跟踪的自适应神经网络控制(Adaptive Neural Network Control of Free-Floating Space Manipulator System in Joint Space)
Authors: 郭益深, 陈力
Abstract:
In this paper, the adaptive neural network control of space manipulator system is discussed. Firstly, the dynamic equations of free-floating space manipulator system are derived through the Lagrangian formulation. Based on the above results, space manipulator system is modeled through the neural network technique. And then an adaptive neural network control scheme of space manipulator system with unknown parameters to track desired trajectories in joint space is developed. The proposed control scheme need neither linearly parameterize the dynamic equations of system, nor know any actual inertial parameters. In addition, it does not require the time-consuming training process offline and saves the time of neural network training. Lastly, a simulation study of a planar free-floating space manipulator system is presented. The simulation results show that the proposed control scheme is feasible and effective.

Paper ID: CCC07-0667
Title: 基于模糊 CMAC 的水下灵巧手手指轨迹控制(Finger Tracking Control of Underwater Dextorous Hand Based on Fuzzy CMAC)
Authors: 王华, 黄筱调, 何晋
Abstract:
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 deduce. 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.

Paper ID: CCC07-0753
Title: Parameters Optimization of GPC Based on Swarm Algorithm
Authors: Zhang Ping, Wang Youhua, Nie Xinpeng, Lv Dianli
Abstract:
In this paper, the zeros of plant are decomposed into non-minimum phase zeros and minimum
phase zeros; a new predictive equation is built. Combining generalized predictive control function with PID structure, and then optimizing the parameters of PID cost function based on swarm algorithm, thereby a new predictive algorithm is gained on the basis of introducing a restraining overshoot predictive method and model error amendment. Simulation results show this algorithm improves the controlling performance greatly, increases instantaneous respond.

Paper ID: CCC07-0812
Title: Chaos in a Simple Hopfield Neural Network Satisfying Dale's Rule
Authors: Cao Hai, Li Qingdu
Abstract:
This paper shows that chaos can take place in a simple three dimensional Hopfield neural network with its connection matrix satisfying Dale's rule. In addition, a rigorous computer-assisted verification of chaoticity is given by virtue of topological horseshoe theory.

Paper ID: CCC07-0934
Title: A Multi-dimension Predictor Based on ANN and Its Application
Authors: Wang Tianzhen, Tang Tianhao
Abstract:
This paper presents a multi-dimension predictive model PDRNN based on the diagonal recurrent neural networks with a parallel learning algorithm. This model can be used to predict not only values, but also some points in the multi-dimension space. And also its applications in multi-dimension prediction will be discussed in the paper. Some analysis results show the significant improvement to multi parameters simultaneous prediction using the PDRNN algorithm.

Paper ID: CCC07-0936
Title: NN-ANARX Structure for Control of Nonlinear SISO and MIMO Systems: Neural Networks Based Approach
Authors: Petlenkov Eduard, Belikov Juri
Abstract:
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.

Paper ID: CCC07-0937
Title: 基于 BP 神经网络图像的指纹细化算法(The Algorithm of Thinning Fingerprint with BP Neural Network)
 Authors: 叶茂, 闵春平, 李传光
Abstract:
为了快速的进行细化，并有利于采用BP神经网络的强大分类功能对指纹图象进行分类，提出并实现BP神经网络对指纹图象进行细化，从而在不增加细化模板的情况下，达到细化的所满足的要求。
In order to fast thinning, considered with Application of BP Neural Network Classifier, the algorithm that thinning fingerprint with BP neural network is provided. This algorithm on the thinning fingerprint not only saves template but also meets the need of thinning fingerprint.

Paper ID: CCC07-0997
Title: Wavelet Neural Network Disturbance Observer-based Adaptive Robust Tracking Control for Servo System
Authors: Wang Hongyan, Wang Qinglin, Qiao Jihong, Xia Yuhui
Abstract:
This paper presents an adaptive robust control approach of the nonlinear systems using a wavelet neural network disturbance observer (WNNDOB). The proposed WNNDOB 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.

Paper ID: CCC07-1025
Title: A Novel Bionic Neural Network Control Method for Vivid Animation of Virtual Animal's Locomotion
Authors: Zhang Daibing
Abstract:
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 excitatory 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.

Paper ID: CCC07-1026
Title: New Results for Globally Asymptotic Stability and Instability of Recurrent Neural Networks
Authors: Zhang Yutian, Luo Qi
Abstract:
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.

Paper ID: CCC07-1090
Title: 基于 OIF-Elman 网络的燃气日负荷预测(Date Gas Load Forecasting with OIF-Elman Network)
Authors: 苏刚, 王玲玲, 徐永生, 王秀丽
Abstract: 燃气日负荷的预测对燃气生产计划及合理调度起着重要的指导作用。为提高燃气负荷预测的精度,通过分析燃气日负荷的变化规律和影响因素,建立了合理的燃气日负荷预测模型,采用具有输出-输入反馈机制的改进 Elman（OIF-Elman）网络对燃气日负荷进行预测。与传统的 Elman 网络比较, OIF-Elman 网络不仅计人了层节点的反馈,而且考虑输出层节点的反馈,以便从有限的训练样本中获得更多的信息。预测结果表明,在样本点较少时,无论在训练速度上,还是在预测精度上, OIF-Elman 网络明显优于 Elman 网络。OIF-Elman 网络提高了网络的泛化能力,既降低了对训练样本个数的需求,又能提高预测精度,在燃气负荷预测中得到成功的应用。

Date gas load forecasting plays a significant role in making plans and dispatching of gas producing. In order to improve the forecasting accuracy, in accordance with the influence factors and characteristics of date gas load, a model has been established to forecasting date gas load with OIF (output-input feedback) Elman network. Compared with conventional Elman network, OIF-Elman network takes into account not only the hidden nodes feedback but also the output feedback so as to obtain more information from limited sampling spots. The emulation illustrates that OIF-Elman network is better than Elman network not only in training speed but also in accuracy when the sampling spots are less. OIF-Elman network improves the generalization. It also improves the forecasting accuracy with less sampling spots. Therefore it can be used to forecast the date gas load.

Paper ID: CCC07-1160
Title: 具有变时滞 Cohen-Grossberg 神经网络的指数稳定性准则(Exponential Stability Criterion for Cohen-Grossberg Neural Networks with Time-varying Delay)
Authors: 李涛, 费树岷
Abstract: 本文讨论了具有变时滞 Cohen-Grossberg 神经网络的指数稳定性问题。通过选取合适的 Lyapunov-Krasovskii 泛函,引入自由权矩阵和系统的等价描述变换,得到了一个关于其指数稳定的时滞相关充分性条件。该充分条件以 LMI 的形式给出,能够借助 Matlab 工具箱 LMI
In this paper, the global exponential stability is investigated for the Cohen-Grossberg neural networks with time-varying delay. By using the appropriate Lyapunov-Krasovskii functional and equivalent descriptor form of the considered system, an LMI-based delay-dependent sufficient condition is obtained to guarantee the exponential stability of the addressed neural networks, which can be checked readily by resorting to the Matlab LMI toolbox. A numerical example is given to show the effectiveness and less conservatism of the obtained methods.

Paper ID: CCC07-1265
Title: Novel Stability Analysis of High-order Cohen-Grossberg Neural Networks with Time-varying Delays
Authors: Ji Yan, Cui Baotong
Abstract:
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.

Paper ID: CCC07-1339
Title: 最小覆盖算法(The Least Covering Algorithm)
Authors: 赵妹, 张燕平, 张铃, 徐峰
Abstract:
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来选择概念背景知识，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文本上，我们无法“无中生有”，换句话说，当我们只有小量样本时，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。
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.

Paper ID: CCC07-1369
Title: 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)
Authors: 杜延春, 李贻斌, 王桂月
Abstract:
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.

Paper ID: CCC07-1392
Title: 不可约迭代函数系统的商空间理论(Quotient Space Theory About an Irreducible Iterated Function System)
Authors: 张铃, 张燕平, 方宏彬, 张沆
Abstract:
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 \( \{X, wi, pij, i, j=1, 2, ..., n\} \), then exists a corresponding chain of quotient space \( \{W_k=(X_k, u_k, F_k), k=1, 2, ...\} \) and a martingale \( \{(u_k, F_k), k=1, 2, ...\} \) 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) Pk is a support set of uk, 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.

Paper ID: CCC07-1519
Title: Supervisory Control of Chaotic Systems Using Online GA Tuning Neural Networks
Authors: Che Yanqiu, Wang Jiang, Zhou Sisi

Abstract:
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.

Paper ID: CCC07-1526
Title: $H_\infty$ Control for Chaotic System with Cooperative Weights Neural Network
Authors: Sun Li, Wang Jiang, You Hao, Deng Bin

Abstract:
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 level by adequately selecting the weight factor; the changes of weights are consistent by on-line 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.
Title: Estimation of Stator Resistance and Temperature Measurement in Induction Motor Using Wavelet Network
Authors: Huang Weili, Huang Weijian, Liu Lin
Abstract:
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.

Title: Power Quality Disturbances Detection and Classification Using Complex Wavelet Transformation and Artificial Neural Network
Authors: Liu Hua, Wang Yuguo, Zhao Wei
Abstract:
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.

Title: Adaptive NN Control of a Class of Nonlinear Systems with Unknown Control Direction
Authors: Zhao Zhuwei, Huang Shengjie, Luo Qi
Abstract:
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.

Paper ID: CCC07-1642
Title: 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)
Authors: 吴涛, 陈黎伟, 毛军军, 张铃
Abstract:
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 neutral 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.

Paper ID: CCC07-1644
Title: 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)
Authors: 毛军军, 张铃, 郑婷婷, 吴涛
Abstract:
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 \( \{X, Wi, Si, i=1,2,...,n\} \), a hierarchical structure \( \{X_k, k=1,2,...\} \) can be proved, and the distance is induced on the quotient chain \( \{X_k, k=1,2,...\} \). (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 \( \{(X_k, W_k, P_k), k=1,2,...\} \) is constructed. (4) Lay \( X_k \) into primary space, \( P_k \) are proved that converge to \( X \) with Hausdorff distance. (5) a sufficient and necessary condition which performed from a function iterative system to fractal graph is proposed.

Paper ID: CCC07-1739
Title: Tuning of the Structure and Parameters of Wavelet Neural Network Using Improved Chaotic PSO
Authors: Yu Guangbin, Li Guixian, Bai Yanwei, Jin Xiangyang
Abstract:
This paper presents the tuning of the structure and parameters of a wavelet neural network (WNN) using an improved chaotic particle swarm optimization (ICPSO), the ICPSO approach is a method of combining the improved particle swarm optimization (IPSO), which has a powerful global exploration capability, with the chaotic strategy, which can exploit the local optima. By introduced a new strategy to the ICPSO, it will also be shown that the ICPSO performs better than the traditional PSO and GA based on some benchmark test functions. A WNN with switches introduce to links is proposed. By tuning the structure and improving the connection weights of WNN simultaneously, a partially connected WNN can be obtained. By doing this, it eliminates some ill effects introduced by redundant in features of WNN. An application example on Iris forecasting is given to show the merits of the ICPSO and the improved WNN.

Paper ID: CCC07-1740
Title: Inverse System Control of Nonlinear Systems Using LS-SVM
Authors: Lv Guofang, Song Jinya, Liang Hua, Sun Changyin
Abstract:
This paper firstly provides a short introduction to least square support vector machine (LS-SVM), then provides sequential minimal optimization (SMO) based pruning algorithms for LS-SVM. After a simple discussion of inverse-model identification, a LS-SVM based direct-model identification method is developed by using LS-SVM's excellent ability of function approximation. The most important and difficult step in inverse control
methods is the modeling of the inverse nonlinear dynamic system. Both SVM and LS-SVM can solve this problem. Simulation results demonstrate LS-SVM method is better than SVM in accuracy, static state performance as well as computer cost.

Paper ID: CCC07-1785
Title: 基于参数优化与 GRNN 逼近的非线性 PID 控制 (A Non-linear PID Controller Approach Based on Variables Optimized and GRNN)
Authors: 柴毅，凌睿
Abstract: 根据 PID 控制器各控制参数与偏差之间的非线性映射关系，设计非线性 PID 控制器。运用遗传算法分段优化各离散偏差点的控制参数，并采用 GRNN 神经网络逼近各控制参数构造出基于偏差的连续最优参数曲线。仿真结果表明所提出的控制算法具有良好的快速性和稳定性。

According to the non-linear mapping relations between PID controller each control variable and error, design non-linear PID controller. Optimizing controlled variables by using the genetic algorithm partition in each separated errors, and using the GRNN neural network to approach each controlled variable and structure their optimized continuous variable curves based on the errors. The simulation result indicated proposed the control algorithm has the good rapidity and the stability.

Paper ID: CCC07-0005
Title: Application of Fuzzy Controller in the Speed Control of Permanent Magnet Linear Motors
Authors: Zhu Linsen, Tang Yangping, Zhang Dailin
Abstract: In this paper, a fuzzy controller is applied in the speed control of permanent magnet linear motors to promote their speed control performances. At the same time, the detailed design of the fuzzy controller is given. Fuzzy controllers can achieve high dynamic performance, but cannot achieve high static performance since fuzzy controllers have no integral part, especially when permanent magnet linear motors are influenced by strong force disturbances. The paper designs a disturbance observer to compensate the force disturbances based on the mathematical model of permanent magnet linear motors. So the influence of the force disturbance is eliminated, and the speed control effect of permanent magnet linear motors is increased.

Simulation results show the fuzzy controller with the compensation of disturbance observer has a higher performance than the traditional PI. The experiment results also verify its higher dynamic and static performances in the speed control of permanent magnet linear motors.
Title: Adaptive Fuzzy Control for SISO Nonlinear Time-delay Systems

Authors: Qu Zifang, Du Zhenbin, Liu Zhaowei

Abstract:
针对单输入单输出非线性时延系统，提出了一种自适应模糊跟踪控制方案。该方案有机综合了自适应控制和控制。文中构建了一种自适应时延模糊逻辑系统来逼近未知时延函数；设计了补偿器来消除模糊逼近误差和外部扰动，根据跟踪误差给出了参数调节规律，构造了包含时延的李亚普诺夫函数，从而证明了误差闭环系统满足期望的跟踪性能。仿真结果表明了该方案的可行性。

This paper presents an adaptive fuzzy tracking control scheme for SISO nonlinear time-delay systems. The scheme organically synthesizes adaptive control and control. A kind of adaptive time-delay fuzzy logic systems is constructed and used to approximate the unknown time-delay functions. A compensator is designed to eliminate fuzzy approximation errors and external disturbances. The adjusting laws for parameters are derived by the tracking error. The Lyapunov function with time delays is constructed, and then it is proved that the error closed loop system satisfies the anticipant tracking performance. The simulation results demonstrate that the control scheme is feasible.

Paper ID: CCC07-0092

Title: Combining Forecasts of Personal Credit Scoring Based on RBF Neural Network

Authors: Chen Yufang, Jiang Minghui

Abstract:
With the idea of combining forecasts, this paper presents a new approach by combining multi-linear regression and logistic with RBF network, and applies it in the area of personal credit scoring. The results indicate that the new technique is more accurate than either of the individual technique, especially in avoiding recognizing the bad applicants as good ones.

Paper ID: CCC07-0099

Title: Energy-to-peak Filtering for Fuzzy Stochastic Neutral Systems with Time-delays: LMI Approach

Authors: Chen Zhisheng, Li Yonggang

Abstract:
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 $L_2-L_\infty$ 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 $L_2$-$L_\infty$ 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.

Paper ID: CCC07-0186
Title: 基于 T-S 模型不确定非线性系统的鲁棒非脆弱 $H_\infty$ 控制 (Non-Fragile $H_\infty$ Robust Control of Uncertain Nonlinear Systems Based on T-S Model)
Authors: 岳菊梅, 李俊民, 闫永义
Abstract: 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 $H_\infty$ 稳定和控制器的设计问题。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 $H_\infty$ 模糊控制器,使闭环系统对允许的不确定参数具有 $H_\infty$ 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-inf 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 $H_\infty$ fuzzy controller is designed based on piecewise Lyapunov function theory, PDC and Linear Matrix Inequation method, which ensure the asymptotically stability and the $H_\infty$ 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.

Paper ID: CCC07-0232
Title: 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)
Authors: 唐耀庚, 高嵩, 欧阳惠斌, 李兰君
Abstract: 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.

Paper ID: CCC07-0324
Title: A Fuzzy-PID Control System of PTFE Sintering Furnace Based on Lonworks
Authors: Gong Chenglong, Feng Yuan, Wang Jingzhuo, Song Yongxian
Abstract:
This note introduces an industrial control system which adopts fuzzy-PID and Lonworks. According to the character of a class of time-delay and great inertia first-order system, we chose a combined-control strategy that On-off control or Fuzzy-control or PID control strategy were selected automatically, so accurate control to the four PTFE (Polytetrafluoroethylene) molding furnace sintering process such as sintering temperature, sintering time, cooling speed etc were achieved. App effect shows, temperature control precision is 0.5%, initial tracking error, maximum exceed error and final error are 2.5, 2.0 and 2.0 Celsius respectively. It proves that the combined-control system is better than the singularity structural such as PID or Fuzzy in fleetness and robustness and steady-state precision.

Paper ID: CCC07-0331
Title: 一种改进的基于 MRAS 的速度辨识方法(An Improved Speed Identification Method Based on MRAS)
Authors: 黄志武, 阳同光, 桂卫华, 单勇腾, 年晓红
Abstract:
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。本文提出了一种改进的 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.

Paper ID: CCC07-0337
Title: Fuzzy Control of Underwater Robots Based on Data Mining
Authors: Liang Xiao, Sun Yushan, Guo Bingjie, Wang Bo
Abstract:
Aiming at high overshoot and steady-state error in fuzzy controller of underwater robots, a new method based on data mining technique was presented. Apply Boolean association rule data mining to mine the polling list of fuzzy control from the database of manual operation record, and simulation and pool experiments were carried out on ship detection underwater robot to verify the feasibility and superiority. The results show that the controller has lower overshoot and good robustness to external disturbances, and the polling list of fuzzy control can be constructed automatically by Boolean association rule data mining, which improves the accuracy and the
precision of motion control for underwater robots.

Paper ID: CCC07-0475
Title: 基于模糊策略的水下机械手轨迹控制(Tracking Control Based on Fuzzy Strategy for Underwater Manipulator)
Authors: 何晋, 王杰, 王华
Abstract: 针对一种复杂的控制系统,普通的模糊控制器不能形成很好的控制效果。将专家知识应用到模糊控制器上,构成一种综合集成的智能专家模糊控制器。然后采用一种直接对隶属度函数参数进行编码的矩阵式个体编码遗传算法,对模糊控制器中隶属函数进行寻优,大大提高了系统的控制效果,同时由于专家知识的引入改善了系统对环境和机构参数变化的适应性。The good control performance can not be gotten for a kind of complicated control system only using simple fuzzy controller. A integrated intelligent expert fuzzy controller is composed by introducing expert know ledge in to the fuzzy controller. Then, fuzzy membership function can be optimized automatically according to the genetic algorithm (GA) encoded by matrix individual for direct ion to the parameters of membership function. The control performance is largely improved. It enhanced adaptability for environment and parameter movement by introducing expert know ledge into the system.

Paper ID: CCC07-0486
Title: A Self-optimal Fuzzy Logic Controller Based on Association Rules Mining to Ball Mill Pulverizing System
Authors: Cao Hui, Si Gangquan, Zhang Yanbin, Ma Xikui
Abstract: 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.

Paper ID: CCC07-0507
Title: Robust Fuzzy Control of Nonlinear Delay Systems Subject to Impulsive Disturbance of Input
Authors: Jiang Haibo, Yu Jianjiang, Zhou Caigen
Abstract: The problem of robust fuzzy control for a class of nonlinear delay systems subject to impulsive disturbance of input is investigated by employing Lyapunov functions. The nonlinear delay system
is represented by the well-known T-S fuzzy model. The so-called parallel distributed
compensation (PDC) idea is employed to design the state feedback controller. Sufficient
conditions for global exponential stability of the closed-loop system are derived in terms of linear
matrix inequalities (LMIs), which can be easily solved by LMI method. Simulation results show
the effectiveness of the proposed controller design methodology.

Paper ID: CCC07-0515
Title: 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)
Authors: 肖运启，徐大平，吕跃刚
Abstract:
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 filed-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.

Paper ID: CCC07-0522
Title: 漂浮基空间机械臂姿态、关节协调运动的模糊变结构滑模控制(Fuzzy Variable Structure
Sliding-mode Control for Space Manipulator to Track Desired Trajectory in Joint Space)
Authors: 梁捷，陈力
Abstract:
本文利用多刚体系统动力学方法对载体姿态受控、位置不受控制的空间机械臂系统运动学、
动力学进行了分析。利用拉格朗日方法并结合系统动量守恒关系，建立了空间机械臂系统的
非线性动力学模型。以此为基础，对空间机械臂姿态、关节协调运动的控制问题作了研究。
考虑到空间机械臂系统结构的复杂性及其某些参数的变动性，根据具有较强鲁棒性的滑模变
结构控制理论，设计了空间机械臂姿态、关节协调运动的滑模变结构控制方案；为了克服滑
模变结构控制器抖振的缺点，我们附加设计了一个模糊控制器，根据系统的输出来动态调节
滑模变结构控制器等速趋近率的系数，从而既确保了系统的快速响应而又消除了原有的抖
振。系统数值仿真，证明了该模糊滑模变结构控制器良好的控制效果。
Abstract: In this paper, the kinematics and dynamics of free-floating space manipulator systems
are analyzed. By use the method of multibody dynamics, the dynamics equations of spare
manipulator are established. Based on the result, the control problem for space manipulator to
track the desired trajectory in joint workspace is discussed. Because of the high structure
complexity and the parameter uncertainty of space manipulator systems, the scheme of variable structure sliding-mode control with better robustness to uncertainty and disturbance is proposed. Fuzzy controllers are designed at the aim of chattering reduction and rapid response. The fuzzy controllers can tune the sliding control law parameters automatically according to the relationship between system state and switching manifold. The effect of the controller is testified by computer simulation.

Paper ID: CCC07-0578
Title: Robust Adaptive Fuzzy Output Tracking Control of Uncertain Robot System Using Backstepping Design
Authors: Qiao Jihong, Dai Yaping, Liu Jinkun, Wang Hongyan
Abstract:
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.

Paper ID: CCC07-0582
Title: 基于二型模糊预测的路口群落多级模糊控制系统 (Multilayer Fuzzy Control of Intersections Community Based Traffic Forecast of Type-2 Fuzzy Logic)
Authors: 张伟斌, 刘文江
Abstract:
改善城市交通网络中拥挤区域的交通状况是智能交通系统的热点。该文提出了“路口群落”的概念，从系统的角度来分析拥挤区域在城市交通网络中的系统行为和控制方式，并应用二型模糊逻辑对路口群落的流量进行预测，得到了以防止“路口群落”堵塞为前提的车辆平均延误最小的优化模型及其多级模糊控制算法 (T2F-MACFC)。计算机仿真表明，T2F-MACFC算法相对于目前实际应用的“绿波” (Green Wave)自适应控制方法，可以减少交通拥挤地区50%的堵塞情况发生，而二型模糊预测的引入使得车辆平均速度提高15%。
increase of vehicle mean speed.

Paper ID: CCC07-0590
Title: Fuzzy Reliability Analysis of Disk Array Systems
Authors: Jiang Minghua, Zhou Jingli, Hu Ming
Abstract:
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 introduce 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.

Paper ID: CCC07-0626
Title: 基于模糊控制的IUIa特性智能充电机(A Automatic Charger with IUIa Characteristic Based on Fuzzy Control)
Authors: 高飞燕, 李兰君, 阳武娇
Abstract:
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 IUIa 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 IUIa characteristic according with the standard DIN41772 of Germany.

Paper ID: CCC07-0634
Title: Stability Analysis and State Feedback $H_{\infty}$ Controller Designs for Discrete-time T-S Fuzzy Systems
Authors: Chang Xiaoheng, Jing Yuanwei, Gao Xiyong, Liu Xiaoping
Abstract:
The problems of stability conditions and state feedback H1 controller designs for discrete-time T-S fuzzy systems are studied. A new stability conditions are obtained derived in previous papers, and a sufficient LMI conditions which guarantee the existence of the state feedback Hcontroller for discrete-time T-S fuzzy systems is proposed. Finally the effectiveness of the proposed approach is shown through a numerical example.

Paper ID: CCC07-0682
Title: Improved Performance of Permanent Magnet Synchronous Motor by Using Particle Swarm Optimization Techniques
Authors: Wahsh Said
Abstract:
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.

Paper ID: CCC07-0683
Title: 基于模糊推理的入侵检测系统(Intrusion Detection Based on Fuzzy Reasoning)
Authors: 喻飞, 沈岳, 廖桂平, 张林峰, 徐成
Abstract:
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.

Paper ID: CCC07-0713
Title: 一类参数不确定模糊脉冲系统的鲁棒模糊控制(Robust Fuzzy Control for a Class of Fuzzy Impulsive Systems with Parametric Uncertainties)
Authors: 周彩根, 姜海波, 王琪, 于建江
Abstract:
基于 T-S 模糊模型,讨论了一类不确定非线性模糊脉冲系统的鲁棒模糊控制问题。在系统含参数不确定和脉冲矩阵未知的情况下,采用线性矩阵不等式(LMI)方法提出一种模糊控制设计方案,结合并行分布补偿(PDC)的基本思想设计状态反馈控制器,利用 Lyapunov 方法证明闭环系统以全局指数稳定。在 LMI 方法下,鲁棒控制器的设计问题转化为线性矩阵不等式问题(LMIP)。仿真结果表明所提出的控制器设计方案的有效性。

This paper discusses the problem of robust fuzzy control for a class of nonlinear uncertain fuzzy impulsive systems based on T-S fuzzy model. In presence of parametric uncertainties and unknown impulsive matrices, a scheme of robust fuzzy control via linear matrix inequality (LMI) technique is proposed. The concept of parallel distributed compensation (PDC) is employed to design the state feedback controller. By Lyapunov method, the resulting closed-loop system is
shown to be globally exponential stable. By LMI technique, the problem of designing the robust fuzzy controller is translated into linear matrix inequality problem (LMIP). Simulation shows the effectiveness of the proposed controller design methodology.

Paper ID: CCC07-0738
Title: 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)
Authors: 李鑫滨，窦春霞，年晓红
Abstract:
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 subject 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.

Paper ID: CCC07-0751
Title: Control of Proton Exchange Membrane Fuel Cell Based on Fuzzy Logic
Authors: Zhan Yuedong, Zhu Jianguo, Guo Youguang, Jin Jianxun
Abstract:
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.

Paper ID: CCC07-0801
Title: The Research and Application of Immune Feedback Control in the Load Control System of Tube Mill
Authors: Yuan Guili, Liu Jizhen, Tan Wen, Liu Xiangjie
Abstract:
Aiming at the tube mill burthen controlled object with the characteristics of large delay, large inertia, nonlinear and time-variant, we design a tube mill burthen control system basing at fuzzy immune PID control. The system combines the cascade control with the fuzzy immune PID control, and adopts P control in the inner loop and fuzzy immune PID control in the outer loop, taking fully advantage of the cascade control, fuzzy control, immune feedback control and PID
control, which makes the system have not only better track ability but also stronger robust and anti-disturbance. In order to show the superior of the control strategy, simultaneously the paper carries out cascade PID control simulation, and the result manifests that the control effect has better regulation-quality than cascade PID control, in some sense equaling with the internal model control and Smith predictive control.

Paper ID: CCC07-0807
Title: 带有自适应模糊监督控制器的一类非线性系统模糊控制 (Fuzzy Control for a Class of Nonlinear System with Adaptive Fuzzy Supervisory Controller)
Authors: 师五喜
Abstract:
在系统中未知非线性函数有界但界函数未知的情况下, 对一类非线性系统提出了带有自适应模糊监督控制器的模糊控制方法, 此方法用模糊逻辑系统逼近未知界函数, 用此模糊逻辑系统来设计监督控制器, 并对监督控制器中的未知参数进行自适应调整, 文中证明了该方法可以保证闭环系统状态有界。仿真结果验证了此方法的有效性。
When the nonlinear functions in the system are bounded but the bound functions are unknown, a fuzzy control equipped with adaptive fuzzy supervisory controller for a class of nonlinear system is presented. In this method, a fuzzy logic system is used to approximate unknown bound function, the supervisory controller is designed by the fuzzy logic system, and the unknown parameters in fuzzy logic system are adjusted adaptively. It is proved that this method can guarantee the bounded of the state of closed-system. Simulation results indicate the effectiveness of this method.

Paper ID: CCC07-0826
Title: On Position-occupying Optimization Based on Entropy Weight
Authors: Jia Yue, Song Baowei, Zhao Xiangtao, Liang Qingwei
Abstract:
This thesis analyzes relative intensity of all kinds of factors that affect the accomplishment of combat mission in combat programs by Fuzzy AHP method. It establish fuzzy estimation matrix by compare with all kinds of factors. It figures out entropy weight by calculating fuzzy interval according to elements of cut set and which commander's contentment optimism degree to fuzzy estimation matrix. Then decision-maker determines priority of combat programs to be elected. Then it gives an example to calculate and give a total optimization decision-making order to all kinds of combat programs. This judgment way takes on guidance meaning to combat programs optimization.

Paper ID: CCC07-0841
Title: 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)
Authors: 王俊玲, 舒喆醒, 陈亮, 王忠信
Abstract:
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
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.
与积分环节相结合;内环为电流环,采用 PI 调节器. 最后通过仿真验证了算法的有效性.

Taking BUCK Three-Level DC/DC inverter for example, the fuzzy controller of Three-Level DC/DC inverter is designed. The proposed controller is implemented with two control loops. The outer loop is voltage loop with fuzzy controller and pure integral, generates the command inductor current. The inner loop is current loop with PI controller. The simulation results verify the effectiveness of the algorithm.

Paper ID: CCC07-0870
Title: 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)
Authors: 盛义发, 喻寿益, 洪镇南, 高金生
Abstract:
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了简化。仿真试验结果表明, 通过开关频率优化和模糊控制, 不但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; 转距能快速、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 are introduced to simplify fuzzy control rules. 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.

Paper ID: CCC07-0947
Title: 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)
Authors: 解迎刚, 王志良, 张琴
Abstract:
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.
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.

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.
A fuzzy predictive control system of steam dryness for steam-injection boiler is presented in this paper, which is based on the investigation of current control systems and the analysis about the characteristics and influencing factors for steam Dryness. In this control system, a two dimension fuzzy controller is employed to steady steam pressure, and error and error change of steam pressure are used as the input variables of this fuzzy controller. A fuzzy predictive controller based on T-S fuzzy model is employed to obtain the control variable of fuel-dryness closed loop. And this control variable is multiplied by the feed forward control variable to form the feed forward-feedback control of dryness fraction. The simulation results show that the presented fuzzy predictive control system has good control performance and simple algorithm for easy realization.

Paper ID: CCC07-1117
Title: Using Fuzzy Neural Network in Real Estate Prices Prediction
Authors: Zhang Xiaoli
Abstract:
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.

Paper ID: CCC07-1136
Title: 二自由度交流磁轴承参数自整定模糊PID控制器研究(On Fuzzy PID Controller with Parameters Self-tuning in 2 Degrees of Freedom AC Magnetic Bearings)
Authors: 王雷, 朱熀秋, 陈艳
Abstract:
在介绍二自由度交流磁轴承工作原理基础上,阐述了悬浮力产生机理,建立了悬浮力数学模型. 设计了交流磁轴承参数自整定模糊 PID 控制器,给出了模糊控制器的模糊规则表,并在 MATLAB7.0/ SIMULINK 环境下构建了系统的仿真模型, 进行了动态仿真, 通过与常规 PID 控制性能相比较, 得出这种变参数模糊 PID 控制器不仅能够提高交流磁轴承的动态性能, 而且具有很强的适用性和鲁棒性.
Based on introducing working principle of 2 degrees of freedom AC-HMB, the principle of
producing suspension force is expounded and the mathematics models of suspension forces are set up. The fuzzy PID controller with parameters self-tuning for 2 DOF AC-HMB system is designed, and the fuzzy control rule is present. Within MATLAB7.0/SIMULINK environment, the system simulation model is constructed and dynamic simulation had been completed. Comparing with normal PID controller performance, the results have shown that this parameters self-tuning PID controller not only can improve the system dynamic performances, but also has good self-adjustability and robustness.

Paper ID: CCC07-1143
Title: 三角模糊数多属性决策的一种新方法(A New Method for Triangular Fuzzy Number Multiple Attribute Decision Making)
Authors: 覃菊莹，孟凡永，曾雪兰
Abstract:
本文在新给出的三角模糊数距离公式的基础上，提出了一种三角模糊数多属性决策的排序方法。针对三角模糊数多属性群组决策，给出了一种新的群组决策的集结方法及决策方法。最后通过算例来说明该方法的有效性和实用性。

On the basis of the new distance formula for triangular fuzzy numbers given by the paper, a priority method for triangular fuzzy numbers multiple attribute decision making is given. A new assembly method and decision method are given for triangular fuzzy numbers multiple attribute group decision-making. Finally, a numerical example is given to show its effectiveness and practicability.

Paper ID: CCC07-1182
Title: Active Suspension System Based on LMS Adaptive Fuzzy Algorithm
Authors: Sun Jianmin, Yang Qingmei
Abstract:
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.

Paper ID: CCC07-1266
Title: Delay-dependent LMI Conditions for Stability and Stabilization of T-S Fuzzy Systems with Time-delay
Authors: Wang Renming, Pan Juntao
Abstract:
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
Paper ID: CCC07-1313
Title: 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)
Authors: 雷琪, 吴敏
Abstract: 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.

Paper ID: CCC07-1407
Title: 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)
Authors: 蒋蔚, 印平, 曹丽婷
Abstract: 集中供热系统二次侧供水温度控制属于大惯性、大迟延系统。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 55 oC ~ 75 oC, 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.

Paper ID: CCC07-1413
Title: 语言型模糊偏好信息群决策的一种优化算法(An Optimal Algorithm of Group Decision Making Based on Linguistic Fuzzy Preference Information)
Authors: 曾雪兰, 李正义
Abstract:
模糊决策系统中，对于用语言偏好关系表示偏好信息的群决策问题，通过转换函数，构造偏差函数，利用最优化思想，建立最优化模型，给出了一种基于语言偏好信息的群决策优化算法，称为“最小方差法”。该方法具有计算简单易操作的特点，最后通过一个算例说明该算法的有效性与实用性。
The problem of group decision making toward expressing preference relation in linguistic labels in fuzzy decision system, constructs deviation function by transform function, make use of the idea of optimization, builds optimal model, an optimal algorithm of group decision making based on linguistic preference information is proposed, called "least variance method". Calculate simply and manipulate easily are features of this method, and finally, an example is given to show the efficiency and practicability of this method.

Paper ID: CCC07-1437
Title: 焦炉温度的预测模糊控制研究(Temperature Predictive Fuzzy Control of Coke Oven)
Authors: 李公法, 孔建益, 蒋国璋, 杨金堂, 熊禾根, 侯宇
Abstract:
在分析焦炉生产工艺特点的基础上，建立了焦炉加热的智能控制系统模型，提出了将预测控制与模糊控制相结合的预测模糊控制算法。预测控制负责提高控制精度，模糊控制负责为实时控制提供预测模型未收敛时的控制量及模型收敛后的修正前控制量。采用该算法对具有大惯性、纯滞后等特性的焦炉温度进行控制，取得了较好的控制效果。实际应用表明该算法具有良好的控制性能和实用价值。
On the basis of analyzing production characteristics of coke oven, heating intelligent control model of coke oven was built. Then predictive fuzzy control algorithm was proposed combining predictive control with fuzzy control. In the algorithm, predictive control was responsible for control accuracy and fuzzy control was to provide control variables when predictive model was not convergent as well as uncorrected control variables when the model had converged. A good temperature control of coke oven with characteristics of large inertia and time delay was obtained by application of the algorithm. The practical running indicates that the algorithm has good control performance and great practical value.

Paper ID: CCC07-1552
Title: Feature Extraction Method in Fault Diagnosis Based on Wavelet Fuzzy Network for Power System Rotating Machinery
Authors: Kang Shanlin, Pang Peilin, Fan Feng, Ding Guangbin
Abstract:
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.

Paper ID: CCC07-1623
Title: Parameter Identification of T-S Fuzzy Models Based on Particle Swarm Optimization Algorithms
Authors: 丁园, 高晓智, 黄显林, 尹航
Abstract:
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.

Paper ID: CCC07-1660
Title: T-S Fuzzy Modeling and Application Based on Satisfactory Optimization
Authors: 刘剑锋, 桂卫华, 黄志武
Abstract:
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，并用向后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
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 rectified 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 identity speed of the T-S model are improved. Applying to locomotive brake control unit, the result shows the effectiveness of the proposed method.

Paper ID: CCC07-1769
Title: 基于模糊 PID 控制的电子束焊机稳定电源设计(Design of EBW Stabilized High-Voltage Source Based on Fuzzy PID Control)
Authors: 何少佳，莫金海，韦寿祺，黄道
Abstract:
介绍了一种基于模糊 PID 控制的电子束焊机高压稳定电源电路系统。系统电路由升压变压器、PWM-BOOST 电路和限流控制电路组成。PWM-BOOST 电路升压比可达 1:5.5 以上，因此变压器的输出电压大为降低，其结构大为简化。由于该系统为强非线性和工作于大信号状态，无法建立精确数学模型，因而用常规的 PID 控制方法很难获得满意的效果，因此本文提出一种模糊 PID 控制方法，该方法根据电路系统特性，设计了一种 PID 参数的模糊调整规则。为了更有效地分析系统的性能，考虑到 SABER 擅长开关电路分析，而 MATLAB 擅长控制系统的仿真，因此本文采用了 MATLAB-SABER 混合仿真方法并建立了相关的仿真模型。仿真结果表明，这种模糊 PID 控制器不仅控制精度高，而且具有良好的适应能力，即使在供电电源大幅波动的情况下仍然获得良好的控制效果。

A novel PWM-BOOST type EBW (electron beam welder) stabilized high-voltage source circuit system is introduced. This system consists of setting-up transformer, PWM-BOOST converter and a current limiter. PWM-BOOST converter can step up the voltage with the ratio higher than 1:5.5; as a result, the transformer's output voltage is decreased and its structure can be simplified. Due to the strongly non-linearity and big signal working condition of the circuit system, conventional PID controller is very difficult to reach a satisfactory performance; therefore a fuzzy PID controller is developed to handle these difficulties. This fuzzy PID can automatically adjust the parameters according specific rules of the circuit's characteristics. Considering that SABER is much more specialized and powerful in switched-circuit analysis whereas MATLAB is very powerful in control system design, a MATLAB-SABER co-simulation method is effectively used to design the fuzzy PID controller by elaborately establishing the SABER and MATLAB models and fuzzy algorithm. The simulation results show that this fuzzy PID controller has much higher control precision, better dynamic and static behaviors, favorable self-adaptive capability as well as easier realization hence is quite adequate in practical applications.

Paper ID: CCC07-1776
Title: 一般模糊系统作为函数逼近器的设计方法(Design Methods of General Fuzzy Systems As Function Approximators)
Authors: 高谦，王秀红，魏新江
Abstract:
分别根据被逼近函数的三种不同情况：1. 函数解析式已知；2. 函数解析式未知，但对任给的输入，都可以确定相应的输出；3. 仅知道有限数量的输入输出数据对。给出一般模糊系统作为函数逼近器的设计方法。文中最后举例说明如何设计一个一般模糊系统以所要求的精度逼近给定的函数。

In this paper, design methods of general fuzzy systems as function approximators are given respectively by the following three different conditions of functions to be approximated: 1. The formulas of the functions are known; 2. The formulas of the functions are unknown, but for any input of the functions, we can get the corresponding output; 3. We only know limit pairs of input-output data of the functions. Finally, an example is given to show how to design a general fuzzy system to approximate a given function by a required accuracy.
Aiming at emotion deficiency in present E-Learning system, speech emotion recognition system is proposed in the paper. A corpus of emotional speech from various subjects, speaking different languages is collected for developing and testing the feasibility of the system. The potential prosodic features are first identified and extracted from the speech data. Then we introduce a systematic feature selection approach which involves the application of Sequential Forward Selection (SFS) with a General Regression Neural Network (GRNN) in conjunction with a consistency-based selection method. The selected features are employed as the input to a Modular Neural Network (MNN) to realize the classification of emotions. Our simulation experiment results show that the proposed system gives high recognition performance.

Paper ID: CCC07-0221
Title: Image Segmentation Based on the Mean-Shift in the HSV Space
Authors: Li Siqiang, Liu Wei
Abstract:
The 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.

Paper ID: CCC07-0222
Title: 基于灰色绝对关联度和 LOG 算子的图像边缘检测算法研究(On Image Edge Detection Based on Grey Absolute Degree of Incidence and LOG Operator)
Authors: 李俊峰, 杨瑷萍, 戴文战, 潘海鹏
Abstract:
把灰色绝对关联度和 LOG 算子相结合, 提出了一种新的图像边缘检测算法。该算法以 LOG 算子作为参考序列, 以图像任一象素点及周围 8 个像素点的灰度值作为比较序列, 进而对其分别进行处理并求其灰色绝对关联度, 根据灰色绝对关联度来检测图像边缘。仿真试验表明, 该方法对图像边缘的检测精度比较高, 抗噪能力强, 其高了边缘检测的效果。
In this paper, based on grey absolute degree of incidence and LOG operator, a new method of edge detection is put forward. First, LOG operator and grey degree values of nine nearby pixel are acted as referenced sequence and comparative sequence respectively. Moreover, they are processed and the grey absolute degree of incidence between them is calculated, and the edges of a image are detected based on the grey absolute degree of incidence. At last, the simulation is done and the results show that this method has a high precision in image detection, a better antimoise ability and improving image detection effect.

Paper ID: CCC07-0247
Title: 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)
Authors: 叶青, 朱亮红, 朱素红, 李学
Abstract:
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.

Paper ID: CCC07-0249
Title: 基于多重分形特征的金属断口图像识别(Multifractal Spectrum and Their Applications in Metal Fracture Surface Images Identification)
Authors: 翁桂荣, 秦树伟
Abstract: 基于多重分形谱的物理意义, 探讨多重分形对金属失效典型形貌断口图像的处理, 从中提取金属失效断口的尺寸分布特征谱来进行分类。利用多重分形谱具有标度不变性来描述断口图像的尺寸分布, 对韧性拉伸断口、河流花样、韧性沿晶及裂纹扩展等典型形貌的金属失效断口图像进行处理, 并进行特征提取及分类。实验表明, 利用多重分形谱对典型形貌的失效断口图像分类是可行的, 并且有较好的效果。

Based on the physical sense of multifractal spectrum, classification of the typical morphology of the metal fracture surface by obtaining the images character based on the multifractal spectrum will be described. The methods have unchangeable characteristic of the multifractal spectrum. Then the images can be classified by using artificial neural network. 20 images of ductile fracture, stream design fracture, intergranular cracking fracture and crack propagation are used as a study samples and 20 images are used as a test samples. The data of the experiment explains the feasibility of the method.

Paper ID: CCC07-0329
Title: A Line Detection Algorithm Based on Error Propagation
Authors: Gao Xiaoqing, Peng Tao
Abstract: 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.

Paper ID: CCC07-0385
Title: 基于数学形态学的白细胞分割及提取(Leukocytes Image Segmentation and Extraction Based on Mathematical Morphology)
Authors: 沙盛中，翁桂荣，秦树伟
Abstract: 基于数学形态学的原理,实现对白细胞图像的分割提取,将白细胞的区域从背景中分割出来,完成单个白细胞与其他细胞分割及提取,以便提取该细胞的各种特征,同时提取细胞核及细胞浆,从而完成白细胞的自动检出。实验结果表明,利用数学形态学对白细胞图像进行分割是有效的、可行的。

Leukocytes image segmentation and extraction based on mathematical morphology. Its aim is to segment and extract the leukocytes, nucleus, cytoplasm and background, even in the case of closely clustered cells. This procedure gets a more accurate borderline of the interesting areas. The experiment shows that this processing method is effective and feasible.

Paper ID: CCC07-0409
Title: 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)
Authors: 王守强，朱大铭，史士英
Abstract: 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.

Paper ID: CCC07-0429
Title: Generalized Fuzzy Enhancement Based Recognizing Method for Planar Objects
Authors: Wang Zaifu
Abstract:
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.

Paper ID: CCC07-0433
Title: A Novel Kernel PCA Support Vector Machine Algorithm with Feature Transition Function
Authors: Wang Lianhong, Zhang Guoyun, Zhang Jing
Abstract:
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.

Paper ID: CCC07-0444
Title: A Novel Proximal Support Vector Machine and Its Application in Radar Target Recognition
Authors: Tao Xiaoyan, Xia Jingbo, Zhang Rui
Abstract:
The samples are assumed to distribute normally in the solution of the standard proximal support vector machine (PSVM). But in many application problems, the data set for each class is generally unbalanced, where a poor performance can be gotten by PSVM. For this, a novel PSVM is presented, namely the modified PSVM (MPSVM). By adding a new diagonal matrix in the primal optimization problem, the new algorithm assigns the different penalty coefficients to the positive and negative samples respectively. Therefore the samples in different classes can make different contributions to the learning of the decision surface. Based on the sufficient experimental results on the UCI datasets, MPSVM is also applied to the measured radar range profile images and the results illustrate the effectiveness of the proposed method.

Paper ID: CCC07-0463
Title: 一种唇读嘴唇的实时检测方法(A Real Time Lip Detection Method in Lipreading)
Authors: 何俊，张华
Abstract:
摘 要: 针对图像序列中唇读嘴唇实时检测跟踪问题，提出了一种利用肤色、唇色色度聚类特性，以及 R/G 特性差异检测嘴唇的新方法。首先在 HSV 颜色模型中采用基于阈值的分类方法分割出肤色区域，自适应根据个体在唇色和肤色在色度上的聚类特性检测出嘴唇，经
R/G 滤波器滤波后得到可靠的嘴唇区域。在服务机器人上进行的唇读人机交互实验表明该方法计算量小、实时性好、正确检出率高，完全能满足实际唇读人机交互中的检测和跟踪要求。To solve the problem of detecting and tracking lip in lipreading, a new real time lip detection method based on the discrepancy of skin and lip on chrominance and R/G was proposed. First, find out skin area based on threshold value in HSV color model, then look for the lip area based on the individual chrominance property of skin and lip adaptively. Filtered with R/G filter Lip was located. Experiments on service robot demonstrate that the method is effective, fast and fit for detecting and tracking lip in real time lipreading application.

Paper ID: CCC07-0657
Title: 基于边界设计高斯型传递函数(Gaussian Transfer Function Based on Boundary)
Authors: 赵颖, 周芳芳, 樊晓平
Abstract: 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，决定了绘制的效果，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.

Paper ID: CCC07-0701
Title: 融合分水岭算法和蚁群聚类的图像分割(Image Segmentation Method by Combining Watersheds and Ant Colony Clustering)
Authors: 杨卫莉, 郭雷, 赵天云, 肖谷初
Abstract: 针对传统分水岭分割算法对噪声敏感和易于产生过分割问题，提出一种新的基于分水岭和蚁群智能聚类的图像分割方法 CWAC(Combining Watersheds and Ant Colony clustering). CWAC 方法首先用分水岭变换对图像做初分割，然后用蚁群方法在区域之间进行聚类合并，获得最终的分割结果。CWAC 不但成功地解决了分水岭存在的过分割问题，还大大提高了蚁群聚类算法的搜索时间；本文利用分水岭变换后的灰度信息和空间信息，定义了一种新的引导函数，可更准确有效引导蚁群聚类。实验结果表明 CWAC 可以快速准确地分割出目标，是一种有效的图像分割方法。Aimed at resolving the problems of sensitivity to noise and over-segmentation existing in traditional watershed algorithm, we presents a new image segmentation method -Combining
Watersheds and Ant Colony Clustering (CWAC). Firstly, the image is initially segmented using the watershed algorithm. Then, ant colony clustering algorithm is used to merge different regions of homogeneity to gain the final result of segmentation. We use intensity and spatial information from watershed transform to define a new visibility which can get more accuracy and efficient clustering ant colony. Experiments show that CWAC algorithm can successfully solve over-segmentation problem and at the same time it can reduce the computational times of ant colony clustering. So CWAC can segment objective quickly and accurately and it is practicable method for the image segmentation.

Paper ID: CCC07-0725  
Title: 基于二次弯折函数的频率弯折方法(Quadratic Function Based Frequency Warping Method)  
Authors: 王洪海，刘刚，郭军  
Abstract: 在分析传统的频率弯折函数不足的基础上提出了一种新的二次弯折函数,其表达式的系数由频率对齐的起点和终点以及拐点来确定，拐点通过格型搜索算法或变步长的搜索算法确定。将这种新的频率弯折方法应用于自动语言辨识研究中，对比实验表明，二次弯折函数的效果优于常规的线性弯折函数和分段线性弯折函数。A new quadratic warping function is proposed with the intention to compensate for the disadvantages with traditional frequency warping functions. The quadratic curve is determined by frequency starting/ending point as well as the inflexion point which can be determined through grid search or variable step search. Application of this new frequency warping method in ALID reveals that the new quadratic warping function outperforms linear function and piecewise linear function in decreasing recognition error rate.

Paper ID: CCC07-0894  
Title: A CDMA Signal Receiver Based on LS-SVM  
Authors: Fan Xiaogang, Li Lei, Chen Xiao  
Abstract: This paper discusses an adaptive kernel nonlinear learning algorithm which is based on LS-SVM for Code Division Multiple Access (CDMA) system. LS-SVM uses mean squared error criterion. An advantage of it is that the algorithm can be implemented adaptively on-line. The LS-SVM detectors have advantages in that they have moderate complexity, can be implemented adaptively, and require only training sequence data from the desired user

Paper ID: CCC07-1002  
Title: An Efficient Flexible Semantic Distance Function  
Authors: Yang Sen, Liang Min, Guo Jiankui, Ruan Beijun, Zhu Yangyong  
Abstract: Quantifying similarity between two objects plays an important role in clustering and classification,
The quality of the similarity scores can be improved by considering the semantic information related with the features of objects. In this paper, we propose a semantic distance function, X-Dist, which not only utilize the semantic information to measure the difference between two objects and a solution of the transportation problem in linear optimization, but also is a metric which can make searching efficiently. The experimental results show that this distance function can be as well as the previously proposed similarity measures in nearest neighbor searching, discriminative power and computing speed.

Paper ID: CCC07-1022
Title: 基于图像引力和优化贪婪算法的新型 Snake 模型(An Improved Snake Model Based on Image Gravitation and Optimized Greedy Algorithm)
Authors: 李国友
Abstract: 提出了一种改进的主动轮廓线模型(Snake 模型), 分别改进了模型的能量构造函数和数值迭代方法。在模型的外力项中, 增加了图像引力, 解决了 Snake 模型对初始轮廓线位置和形状的限制; 在模型的内力项中, 增加了面积项, 较好地处理了图像中的凹陷部分; 在能量函数最小化实现中, 对贪婪算法进行了优化, 使蛇点能快速地收敛到图像的边缘附近, 提高了收敛速度, 另外, 通过蛇点的自适应增加或减少提高了检测的准确性。从而克服了参数主动轮廓线模型对初始曲线敏感、不能收敛到物体的凹陷的边缘和计算量大等问题。实例研究表明了该模型的合理性、有效性和计算的快速性。

A improved active contour model is presented in this paper. function of energy and method of numerical value overlap are improved. The problem of the active contour model's sensitivity to its initial position and the poor convergence to boundary concavities which exists in the traditional Snake for curve evolution are solved because Image gravitation term and area term are added in the new model; Snake points rapidly converge near image edge and increased or decreased self-adapted by optimal greedy algorithm. So, The active contour model's sensitivity to its initial position, the poor convergence to boundary concavities which exists in the traditional Snake and sensitivity to noise are solved, and the computational complexity decrease. Experimental results show the new model is efficient and precise.

Paper ID: CCC07-1036
Title: 双向 Boosting 模糊聚类集成(A Fuzzy Clustering Ensemble Based on Dual Boosting)
Authors: 翟素兰, 罗斌, 郭玉堂
Abstract: 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 $k$ 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。最终的聚类结果是通过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.

Paper ID: CCC07-1039
Title: 一种基于黎曼度量的训练样本类不平衡 SVM 分类方法研究 (An Imbalanced Training Data SVM Classification Problem Based on Riemannian Metric)
Authors: 周绮凤, 林成德, 罗林开, 彭洪

Abstract:
本文提出一种基于黎曼度量的训练样本类不平衡问题的分类方法。通过对由高斯径向基核函数确定的优化超平面和支持向量进行分析，利用保角影射，基于黎曼度量对原有的核函数进行修改，由修改后的核重新训练支持向量机进行分类，从而解决传统支持向量机的“有偏性”。实验结果表明，这种方法能在保证整体准确率较高的前提下，有效提高样本数较少类别的分类准确率。

A method based on Riemannian metric to the classification problem with imbalanced training data was proposed. The idea is based on the analysis of the optimizing hyper-plane and support vectors induced by an RBF kernel. We use the conformal transformation and Riemannian metric to modify this RBF kernel, and reconstruct a new SVM with the modified kernel. The later SVM is shown to be superior to the traditional SVM classifier. Experimental results show that this method can improve the accuracy of the class with less training data under a high total accuracy.

Paper ID: CCC07-1069
Title: An Improved General Particle Swarm Optimization Algorithm for Fast Infrared Image Segmentation
Authors: Ni Chao, Li Qi, Xia Liangzheng

Abstract:
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.

Paper ID: CCC07-1097
Title: 一种优化的 ICA 表情特征提取方法 (A Method of Expression Feature Extraction Using Optimized ICA)
Authors: 周书仁, 梁昔明, 朱灿
Abstract:

A combined method of expression feature extraction with particle swarm optimization (PSO) and independent component analysis (ICA) is proposed. The basic ICA algorithm is used to derive the independent base vector from the expression images. To decrease the computing complexity, the dimension of the expression image is reduced, and then PSO algorithm is applied to process expression data set to get the best optimal solution set. Finally, Hidden Markov Model is used to validate the correctness and validity of the algorithm. The experiments in the expression database show faster way of expression features extraction based on correct rate of expression recognition.

Paper ID: CCC07-1168
Title: The Path Planning of Virtual Endoscopy Based on Image Segmentation
Authors: Gao Xiangjun, Tian Lianfang, Wang Lifei, Mao Zongyuan

Abstract:
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.

Paper ID: CCC07-1245
Title: 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)
Authors: 刘志斌, 金连文

Abstract:
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 的大类别字和汉字分类方法。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, 识别人率分别大幅降低了 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.

Paper ID: CCC07-1246
Title: 基于 AdaBoost 的手写体汉字相似字符识别(Handwritten Chinese Similar Characters Recognition Based on AdaBoost)
Authors: 张彬, 金连文
Abstract:
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,针对于手写汉字识别中类似类数大,相似字识别率低的问题,我们提出了一种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,自适应提升方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.

Paper ID: CCC07-1345
Title: 基于小波包和神经网络的虹膜图像分类方法(Classifying Method of Iris Image Based on Wavelet Packet and Neural Network)
Authors: 吕前行, 周治平, 纪志成
Abstract:
通过小波包变换和神经网络相互结合进行虹膜识别,构造了基于神经网络的虹膜分类结构。首先通过小波包分解细处理提取虹膜纹理特征信息,构造特征向量;然后采用构造型 RBF 神经网络基分类器,把神经网络的特征分类问题转化为包含问题。详细论述了小波包和神经网络相结合进行模式识别的方法,这种基于多分类器联合的方法不仅能够有效的减少训练时间和降低学习复杂性,而且增加了系统的准确性和鲁棒性,同时又克服了隐层节点难选择的问题和优化了网络结构。

By combining wavelet packet with neural network in human iris recognition, an neural network ensemble was constructed to iris classification. Iris image texture features are acquired by using wavelet packet decomposition, then through the new constructive RBF neuron networks, the training for texture classification problem of neural networks is transformed into the "including" problem of a points. A combination method of wavelet packet and neural network in pattern recognition is given. The method of pattern recognition based on combining multiple classifiers not only can reduce the long training time and learning complexity of traditional neural networks, but also can improve veracity and robustness ability in pattern recognition. At the same time, the problem of harding to determine the number of hidden node is resolved in neural network, and the optimization of the neural network is also considered.
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手工工作。本文求得了仿射变换参数的具体表达式，并对汉字和部件图象进行了预处理。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 preprecessings 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.

Paper ID: CCC07-1412
Title: 基于 DSP 和 ZigBee 无线智能语音控制系统设计(Design of Wireless Intelligent Speech Control System Based on DSP and ZigBee)
Authors: 边红昌, 程德福, 祁玉林, 张坤
Abstract:
介绍了以 DSP 为语音控制模块与以 PIC 单片机和无线传输芯片 CC2420 为核心构成的 ZigBee 无线传输模块建立的无线智能语音控制系统。给出了系统硬件总体结构及各模块的具体设计方案，语音识别算法和系统软件的实现方法。针对 DSP 对语音识别算法进行优化，且对 ZigBee 协议栈进行优化简简，最终实现了独立运行、识别率高及操作方便的家庭智能语音控制系统。

Introduce a Wireless Intelligent Speech Control System based on DSP as Speech Control Model and PIC Microcontroller & wireless transmit chip CC2420 as the ZigBee Wireless Transmit Model. Hardware design, Speech Recognition Algorithm and Program design are given in this paper. Especially Speech Recognition Algorithm is optimized toward DSP and ZigBee Protocol Stack is reduced. Independent, high recognition rate and convenient operation family intelligent speech control system is realized in our system.

Paper ID: CCC07-1428
Title: Novel Hybrid Clustering Algorithm Incorporating Artificial Immunity into Fuzzy Kernel Clustering for Pattern Recognition
Authors: Jiang Quansheng, Jia Minping
Abstract:
The application of artificial immunity and fuzzy kernel clustering in data classification is studied, and a new hybrid clustering algorithm incorporating artificial immunity into fuzzy kernel clustering for pattern recognition is proposed in this paper. The algorithm, by combining kernel-based fuzzy clustering with artificial immune evolution algorithm, which learns from the mechanism of immunocyte clone, memory and affinity maturation in natural immune system,
operates on antibody with clone, hyper-mutation and restraint in each generation. The algorithm can quickly obtain global optima, and perfectly solve the flaws of the fuzzy c-means and kernel clustering algorithm, which are sensitive to initialization and easy to involve local optima. Our experiments on IRIS data as well as compressor fault data demonstrate the feasibility and effectiveness of the new algorithm.

Paper ID: CCC07-1484
Title: 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)
Authors: 卿湘运, 王行愚
Abstract:
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跳跃马尔可夫链蒙特卡罗(RJMCMC)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.

Paper ID: CCC07-1583
Title: First Study on Laser Bone Ablation System at the Skull Base for Micro Surgery Based on Vision Navigation
Authors: Lu Shaofang
Abstract:
As the anatomic structures, for example bone thickness, are different and the destruction of the membrane lining the inner ear can lead to a damage of organ functions, for example deafness or vertigo, the protection of soft tissue structures behind the ablated bone in skull base surgery is mandatory. Consequently, a safer and more accurate Cochlear Implantation technology need to be developed urgently. For the detection of the boundary between soft tissue and bone the laser bone ablation system which was based on the combination of laser, robotics, coaxial monitoring and vision navigation was developed for a micro surgery at the skull base. Through this the laser is guided across the ablation area by vision navigation technologies. In this paper our laser bone ablation system and the first results of the boundary detection are described.

Paper ID: CCC07-1613
Title: 一种新的基于层次和 K-means 方法的聚类算法(A Novel Clustering Algorithm Based on Hierarchical and K-means Clustering)
Authors: 李文超, 周勇, 夏士雄
Abstract:

Although the apriority and randomicity to initiate clustering centers of K-means have been solved by traditional hierarchical k-means clustering algorithm, the algorithm is difficult to be applied widespread popularly owing to its high computational complexity. So a novel clustering algorithm based on hierarchical and K-means clustering, which has good computational complexity, is proposed in this paper. Firstly, the concept of silhouette coefficient is introduced and the optimal clustering number \(K_{opt}\) included in data set of unknown class information is decided. Then the distribution of data set is gotten through hierarchical clustering and clustering center is decided. Finally, the clustering is completed through K-means clustering. The efficiencies of the algorithm is validated through the test of IRIS testing data set.

Paper ID: CCC07-1616
Title: 利用特征点定位嘴巴(Mouth Detection Based on Interest Point)
Authors: 汪力, 叶桦, 夏良正

Abstract:

PCA 方法已经被成功用于检测人脸，它在嘴巴和眼睛的检测中也有用到，但是由于嘴巴比眼睛的姿态更多，在嘴巴的检测中，效果不是很好，而嘴巴特征点却不容易受到嘴巴姿态改变和光照变化的影响。本论文选择了应用较广泛的 Harris Corner 方法用于特征点的检测，并结合了 PCA 概率模型，使嘴巴的定位比较准确，并具有一定的抗干扰性。

PCA had been used on detection of face successfully before. Although PCA had also been used on detection of mouth and eye, it has low detection rate on mouth detection. Because mouth has more pose than eye and PCA can be affected by illumination easily. Interest point has been a popular way on object detection because of its stable property. This paper use Harris corner interest point on mouth detection with PCA probability model. The experiment result shows that the correct rate and the accuracy of mouth position have all been enhanced.

Paper ID: CCC07-1634
Title: 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 )
Authors: 顾巧论, 高铁杠, 陈增强

Abstract:

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.

**Paper ID:** CCC07-1677  
**Title:** 基于特征不变量的目标识别定位方法研究 (On Invariant-based Object's Locating Method)  
**Authors:** 季铮, 张剑清, 詹总谦  
**Abstract:** 提出利用目标的局部特征不变量, 在复杂背景下对目标进行识别和定位的层次方法。具体针对方形标记牌, 首先对其局部特征进行构造和提取, 找出其初始位置, 并针对其特定模式, 利用模板影像和精确直线提取, 定出其中心位置, 实现其在复杂背景下的全自动识别和定位。It is presented that one hierarchical method based on invariant feature for object recognition and location in complex background. For rectangle mark, local features are constructed and extracted firstly. Approximate location can be detected by aggregating local features. The precise location can be measured by template matching and extract structure lines. So it is realized that marks are located in complex background automatically.

**Paper ID:** CCC07-1700  
**Title:** 一种指针式高精度仪表读数自动识别新方法 (A New Method of Automatic Reading of High-precision Pointer Meter)  
**Authors:** 张艳玲  
**Abstract:** 提出一种新的指针式高精度仪表读数自动识别方法。即对采集到的仪表位图图像进行灰度化等预处理, 阈值投影法定义表盘区域、点角度法定义指针、弧形投影最大吻合法定义反射镜、弧形投影定位刻度, 最后识别指针读数。A new method of automatic reading of high-precision pointer meter is introduced. In this method, first, the color image was transformed to gray image; secondly, the area of dial plate was segmented by threshold value and projection; thirdly, the pointer needle was located using dot-goniometry; then the graduation and reflector were located by arc projection; finally, the pointer needle value is recognized automatically.

**Paper ID:** CCC07-1718  
**Title:** 大肠癌组织自体荧光光谱数据处理新方法研究 (A New Data Processing Approach Research to Auto-fluorescence Spectrogram for Colorectal Carcinoma)  
**Authors:** 樊晓平, 廖志芳, 陈宇宙, Liao Zhining, 瞿志华  
**Abstract:** 数据分类是数据挖掘技术在医疗数据分析中的一个重要应用, 本文在分析了医疗数据特点后, 提出了利用计数最近邻算法对大肠早癌光谱数据进行分类的思想, 同时在分析该算法性能的基础上, 提出了基于检索树的计数最近邻算法对大肠早癌自体荧光光谱数据进行分
Data classification is an important data mining role in biomedicine. This paper proposes a method to analyze Colorectal Carcinoma Auto-Fluorescence Spectrogram data based on Counting KNN Algorithm after analyzing the characteristics of biomedicine data. Though Counting KNN Algorithm for classification is simple and effective, it does not deal with biomedicine data well. After analyzing the algorithm performance, a novel Counting KNN algorithm by index tree is presented. The new method improves the efficiency by using a tree structure index with the same accuracy. Experiments show that this method outperforms the distance-based voting kNN for accuracy, and ckNN for efficiency.

Paper ID: CCC07-0052
Title: 执行器失效不确定时滞系统的指数稳定鲁棒 $H_{\infty}$ 可靠控制 (Robust $H_{\infty}$ Reliable Control with Exponential Stabilization for Uncertain Delay Systems Against Actuator Failure)
Authors: 滕青芳, 范多旺
Abstract:
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 $H_{\infty}$ 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 $H_{\infty}$ 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 $H_{\infty}$ 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 $H_{\infty}$ 范数的干扰抑制能力。

The problem of robust $H_{\infty}$ 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 $H_{\infty}$ 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 $H_{\infty}$ norm bounds despite any outages within a prespecified subset of actuators.

Paper ID: CCC07-0073
Title: Development of Intelligent Monitor-system Based on Agent
Authors: Xu Dahua
Abstract:
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.

Paper ID: CCC07-0085
Title: 微型仿昆扑翼飞行器控制 I: 操控机制 (Control of Insect-like Flapping Wing Micro Air Vehicles I: Control Mechanic)
Authors: 胡明朗, 魏瑞轩, 周炜, 崔晓峰
Abstract: 针对微型仿昆扑翼飞行器的双自由度翅膀所带来的设计和控制上的难度,在分析振翅运动参数对扑翼气动力影响的基础上,设计了一个可行的操控机制,仅仅对转动角一个自由度的控制就实现对气动力和气动力矩 6 个控制输入的独立控制,保证了仿昆扑翼飞行器的能控性。这种操控机制有效降低了仿昆扑翼飞行器设计和控制的难度。

In allusion to the design and control difficult of insect-like flapping wing micro air vehicle (FMAV) for its’ two degrees of freedom wings, a feasible control mechanic is brought forward based on the analysis of wing kinematics parameters’ influence on aerodynamics forces. This mechanic demand a single active degree of freedom (attack angle) for control the six independent degrees of freedom in aerodynamics forces and torques, then ensure the controllability of FMAV, which simplify the mechanical design and control difficult of insect-like FMAV.

Paper ID: CCC07-0086
Title: 微型仿昆扑翼飞行器控制 II: 控制量 (Control of Insect-like Flapping Wing Micro Air Vehicles II: Control Parameter)
Authors: 胡明朗, 魏瑞轩, 董志兴, 崔晓峰
Abstract: 仿昆扑翼飞行器是一种欠驱动系统,其控制问题具有相当的难度,基于输入参数化方法提出了一种控制方法,即通过控制振翅运动参数,在扑翼飞行器动力学系统中引入更多数目的独立控制参数直至将其转化为完全可控系统,从而解决仿昆扑翼飞行器的控制问题。结果的有效性将通过对模型的可控性分析得到证明。

As an under-actuated system, the control of insect-like flapping wing micro air vehicle (FMAV) is rather difficult; a control strategy is brought forward based on input parameterization, this strategy can possess a larger number of independent virtual control inputs of dynamics system by choice wing kinematics as control inputs and turn the dynamics system into a fully controllable one, then solve the control problem of FMAV. This result is validated through analyze of insect-like MAVs’ controllability.

Paper ID: CCC07-0162
Title: Control System Design for Radiator Thermal Characteristics Experiment System
Authors: Wang Jiangjiang, Zhang Chunfa, Jing Youyin, An Dawei
Abstract:
This paper introduces the designed control system for a water-cooled radiator thermal characteristics experiment system and the hardware of control system. The control strategies of hot-water temperature in heating system and the air temperature in cooling system are analyzed. The control system for heating system combines fuzzy control with feedforward control and cascade control to satisfy the different testing work conditions and higher stability requirements. The cascade control system for cooling system is presented. On basis of traditional cascade control system, the setpoint response controller is designed in terms of the robust control H2 optimal performance specification. Finally, some test experiments are included to show the validity of the designed control system.

Paper ID: CCC07-0374
Title: 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)
Authors: 陈勇, 桂卫华, 阳春华, 王随平, 谢永芳
Abstract:
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.

Paper ID: CCC07-0377
Title: 新型执行机构的航天器鲁棒自适应姿态跟踪控制(Spacecraft Adaptive Robust Attitude Tracking Control with New Actuator)
Authors: 刘军, 韩潮
Abstract:
研究以变速控制力矩陀螺群（VSCMGs）为执行机构的航天器姿态跟踪问题。采用四元数描述姿态, 现时姿态与期望姿态之间的方向余弦矩阵来描述姿态误差。考虑执行机构模型参数不确定和有外干扰的情况, 姿态误差动力学方程为多输入多输出的非线性系统。基于Lyapunov理论设计了鲁棒自适应控制器, 运用光滑投影算法避免了估计参数陷入奇异。仿真结果表明, 设计的鲁棒自适应控制律明显地缩小了姿态跟踪误差, 很好地解决了外部环境干扰和执行机构由于安装误差或机械磨损造成的轴承方向未对准的问题。
This paper deals with the attitude tracking of spacecraft with single-gimbal Variable-Speed Control Moment Gyrosopes (VSCMGs) as actuator. The quaternion is used to describe the attitude, the attitude error is expressed by rotation matrix from desired attitude to current one. Considering actuator model parameter uncertainties and external disturbances, the spacecraft
equations of motion are fully nonlinear and can be represented as a Multi-Input-Multi-Output (MIMO) system. The adaptive robust controller is derived based on Lyapunov theorem, a smooth projection algorithm is then applied to keep the parameter estimates from singularity. Simulation results show that the proposed law attenuates the attitude error obviously, successfully deals with external disturbances and unknown misalignment of the axis directions of the actuators due to installation error or wearing out of the mechanical parts.

Paper ID: CCC07-0487
Title: DSP Control Method of Single-phase Inverters for UPS Applications
Authors: Gao Kecun
Abstract:
The paper presents a new deadbeat controller with repetitive integral action suitable to uninterruptible power supply (UPS). Its aim is to achieve a deadbeat dynamic response for the controlled variables (output voltage and inverter current). As a result of the repetitive action, the controller also can reduce the steady-state error and distortions caused by unknown periodic disturbances usually resulted from the input source and output load. Moreover, its design is extremely simple and requires only a reasonably accurate knowledge of the output filter parameters. The validity of the proposed strategy is implemented on a DSP controller (TMS320LF2407) and tested on a 3.75KVA inverter.

Paper ID: CCC07-0498
Title: Application of Reduction Modifying in Hot Strip Continuous-Rolling Process Controlling
Authors: Wang Xiaolin, Yue Zongmin
Abstract:
Strip thickness is an important factor of strip quality. The experienced physical model is not suit for solving the problem of strip thickness fluctuation which resulted from data abnormality in product process. A new method of modifying reduction is presented to solve the problem. This method controls strip thickness by combining scene real-time metrical data with experienced physical model, modifying reduction and keeping balance of stands. With the method, the eligible ratio of finished product is advanced and the influence of data abnormality is eliminated. The new method is of great significance to guarantee the fault tolerance of control system and stability of production and product quality.

Paper ID: CCC07-0547
Title: 基于 MATLAB 的汽车防抱制动系统控制算法仿真研究(The Simulation Research of Control Arithmetic for Automobile ABS Based on MATLAB)
Authors: 杨英
Abstract:
本文提出一种新的开发汽车防抱死制动系统的控制算法。首先建立汽车单轮模型和制动器模型；在 MATLAB 软件环境下，建立汽车防抱死系统各个子模块，即滑移率计算模块，车轮受力模块，路面输入模块和整车模块，再将各个子模块连接起来构成防抱死系统的整车仿真模型。通过调整制动力矩使滑移到率达到最佳，分别采用开关控制、PID 控制策
略和模糊控制策略，建立防抱死系统的控制仿真模块，选择合适的控制参数和模糊控制规则，
对汽车 ABS 控制系统进行仿真，并对其稳定性和制动距离、制动时间进行分析、比较，目
的在于开发出稳定的制动防抱死系统，更好的提高车辆的制动性能。

A new method to develop automobile's anti-lock braking system is presented under MATLAB
software condition. First, a single wheel automobile model and an arrester model are established.
Then, several sub modules of anti-lock braking system (ABS) are established, that is slippage rate
calculating module, wheel supporting force module, road surface input module and full
automobile module. Finally, the ABS simulation model is obtained by connecting above modules
according to the braking rule. The best slipping rate is achieved by adjusting the brake moment.
Using switch control, PID control and Fuzzy control at the whole module, the simulation results
show that PID control can achieve the best control result in the way of braking distance, braking
time and control stability. This method can help the designer to shorten ABS product development
period and guarantee the superior performance.

Paper ID: CCC07-0565
Title: R&D on Laser Scanning Manufacturing Control System
Authors: Zhao Fangfang, Sun Huilai, Lin Shuzhong, Qi Xiangyang
Abstract:
The paper presented the actions and data communication among the components of LSM. There
was nonlinearity mapping in LSM. And it brings about nonlinearity errors of manufacturing
geometry model. The control system was founded based on analysis of LSM technological
speciality. The control system concerns the distance of the two swaying mirrors, the distance
between the swaying mirror and convex lens, the mirror swaying angle, the lens focal length, the
lens central height, the lens convex radius and the medium refractive index. It improved the
precision and reduced the errors in LSM system. Modularization design ideology was adopted in
the control system of LSM system. It made the complexity of software predigested, program
structure perspicuity and easily comprehended, link-port simply.

Paper ID: CCC07-0632
Title: Design of Tiltrotor Flight Control System Using Optical Control
Authors: Fan Yonghua, Yang Jun
Abstract:
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. Fist 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 covers 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.
Title: A Design Method of Sliding Mode Controller Based on Disturbance Observer

Abstract:

In this paper, a design method of sliding controller with the disturbance observer is proposed for the existence of disturbance and parameter perturbation in electromechanical servo system, switch function, gain and control function are given. At the same time, stability analysis is made by means of the Lypunov function. The sliding controller designed by the method has a lower switch gain, so chattering of sliding mode is reduced greatly. Moreover, the disturbance is compensated quickly. Simulations verified that the proposed control method has the better dynamic performance and the robust capability, and also that it has a decided advantage over the conventional sliding control in the suppression of chattering.

Title: Reliable Tracking Control for a Class of Uncertain Systems

Abstract:

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.

Title: The Applications of Model PID or IMC-PID Advanced Process Control to Refinery and Petrochemical Plants

Abstract:

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.

Paper ID: CCC07-0774
Title: Override and Model Predictive Control of Particle Size and Feed Rate in Grinding Process
Authors: Chen Xisong, Zhai Junyong, Li Qi, Fei Shumin
Abstract:
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.

Paper ID: CCC07-0805
Title: 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)
Authors: 阮久宏, 李贻斌
Abstract:
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.

Paper ID: CCC07-0877
Title: 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

Authors: 余瑶, 钟宜生

Abstract:
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摆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称作控制和鲁棒补偿器组成。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.

Paper ID: CCC07-0935

Title: 随机扰动下的动态矩阵控制系统性能监控、调节与诊断
Performance Monitoring, Tuning and Diagnosis of DMC under Stochastic Disturbance

Authors: 李刚, 王庆林, 黄彪

Abstract:
对随机扰动下动态矩阵控制系统的性能监控、调节与诊断方法进行了研究。首先针对动态矩阵控制定义了一种性能基准曲线并给出了其在线估计方法。之后对所估计得到的基准曲线的性质进行了讨论, 并利用其设计了一个完整的性能监控、调节和诊断流程。最后通过仿真验证了该流程的有效性。

This study focuses on the performance monitoring, diagnosis and tuning of DMC systems with stochastic disturbance. A DMC performance benchmark curve is defined and estimated from the routine process data. The characters of the benchmark curve are discussed and based on which a procedure for monitoring, diagnosis and tuning of DMC is designed. The utility of this procedure is confirmed by simulations.

Paper ID: CCC07-0983

Title: 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

Authors: 彩梅, 余岳, 孙尧, 桂卫华

Abstract:
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。该调制策略的简化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.

Paper ID: CCC07-1079
Title: Improvement of Vehicle Handling and Stability by Integrated Control of Four Wheel Steering and Direct Yaw Moment
Authors: Wu Jianyong, Tang Houjun, Li Shaoyuan, Fang Wan
Abstract:
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 framework 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.

Paper ID: CCC07-1080
Title: 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)
Authors: 王彬, 张云生, 熊新, 王帅
Abstract:
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.

Paper ID: CCC07-1118
Title: 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)
Authors: 卢子广, 谭峙
Abstract:
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.

Paper ID: CCC07-1193
Title: Concurrent Design of Flexible Manipulator System
Authors: Xiao Zhiquan
Abstract:
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.

Paper ID: CCC07-1278
Title: 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)
Authors: 向婕, 吴敏
Abstract:
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地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.

Paper ID: CCC07-1378
Title: 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)
Authors: 杨凌宇, 钟友武, 申功璋
Abstract:
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.

Paper ID: CCC07-1380
Title: Robust Self-tuning IMC for Opto-electronic Tracking Time-delay System
Authors: Xu Bo, Ji Wei, Pan Wei, Qian Yanping
Abstract:
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.

Paper ID: CCC07-1564
Title: 无轴承同步磁阻电动机反馈解耦控制(Feedback Decoupling Control of Bearingless Synchronous Reluctance Motor)
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.

Title: On MEMS Design Automation
Authors: Zhao Xin, Sun Guangyi, Ren Liang, Lu Guizhang
Abstract:
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.

Paper ID: CCC07-0441
Title: Multi-object Negotiation Mechanism of Manufacturing Enterprise Supply Chain Based on Multi-Agent
Authors: Yang Changhui
Abstract:
It is initiative to apply multi-agent technology to the supply chain management (SCM) of manufacturing enterprise, as in the multi-agent-based supply chain system of manufacturing enterprise, purchase agent should negotiate with the supply agent for price, quality, delivery time and supply quota etc. A model for multi-object negotiation of multi-agent system is presented. The negotiation strategy between purchasing agent and multiple supply agents are also proposed. The model can be used to optimize the SCM of manufacturing enterprise. Manufacturing enterprise and strategic partnerships may share profit and achieve joint gains based on this model.

Paper ID: CCC07-0525
Title: 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)
Authors: 张启程, 孙广毅, 赵新, 王俊伟, 金纯, 卢桂章
Abstract:
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.

Paper ID: CCC07-0526
Title: 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)
Authors: 景绍洪, 孟庆金, 袁铸钢

Abstract:

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.

Paper ID: CCC07-0553
Title: 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-Informatization System)
Authors: 王志坚，蔡自兴
Abstract:

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-Informatization System was investigated. The problems to model different system layers by Petri net in AMR Enterprise-Informatization 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-Informatization System, this helps to overcome above problems.

Paper ID: CCC07-0779
Title: CIM 应用的扩散模型分析(Diffusion Model Analysis on the CIM Application)
Authors: 薛朝改，高溦，曹海旺
Abstract:

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 应用的实施情况及发展趋势，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.

Paper ID: CCC07-0991
Title: 基于内分泌激素调节机制的自适应免疫算法的 flow shop 调度问题 (An Adaptive Immune Algorithm Based on Regulation Laws of Hormone in the Endocrine System for Scheduling Problems of Flow Shop)
Authors: 王祎, 顾幸生, 徐震浩
Abstract:
针对间歇生产过程中存在的无限中间储罐的 flow shop 调度问题，建立了相应的数学模型；并基于内分泌激素调节规律，提出了一种新颖的解决此类问题的自适应内分泌免疫调度算法。仿真实例表明，该算法的收敛速度和搜索精度均优于改进的免疫算法，证明了该算法的有效性和优越性。

A new model which describes the flow shop scheduling problems with unlimited intermediate storage in the batch plant is constructed. A novel adaptive endocrine & immune algorithm (EIA) is first proposed based on the regulation laws of hormone in the endocrine system. The simulation results show the convergence rate and search precision of EIA are better than those of the improved immune algorithm, thus verifying the validity and excellence of EIA approach.

Paper ID: CCC07-1084
Title: 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)
Authors: 陈静杰, 陈玖圣, 张晓瑜
Abstract:
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 establish by data envelopment analysis (DEA). The hierarchy structure model is implemented based on .NET, the simulation credibility of this method is proved validity.

Paper ID: CCC07-1292
Title: 预测调度算法在单机问题中的应用(The Application of Predictive Scheduling Algorithms for Single Machine Problem)
Authors: 张颖, 巢志骏, 席裕庚
Abstract:
本文针对经典单机调度问题，根据预测控制的思想，提出一种单步预测调度算法。文中对该单步预测调度算法进行了性能分析，在理论上证明了预测调度算法的竞争比下界仍然是 2，和在线算法的下界相同，即在极端情况下预测调度和在线调度算法的性能保证是相同的。但对于一般的情况，由于考虑了未来的变化情况，单步预测调度算法的调度结果是优于在线调度算法的。文章最后通过仿真比较验证了本文中的结果。

In this paper, we apply the predictive control theory into a classic scheduling problem and propose
one single-step predictive scheduling algorithm. The performance of it is analyzed thoroughly and the lower bound of it is proved to be 2, which is the same as that of online algorithm. That is, in worst cases even the single-step predictive scheduling cannot perform better than online scheduling. However, with regarding to the more general instances, single-step scheduling outperforms online scheduling because it takes more future changes into consideration. This result is testified by the simulation.

Paper ID: CCC07-0286
Title: Position Accuracy Improvement of PMLSM System Using Artificial Immune Algorithm
Authors: Liu Yang, Tan Boxue, Cao Kecai
Abstract:
This paper suggests that the artificial immune algorithms can be used effectively on tuning of a PID control structures for PMLSM system. The controller's attribute behavior mechanism in PMLSM and the artificial immune system have certain similarities since both systems deal with various attribute inputs (antigens: input and noise) and output through interactions among multiple attribute modules (lymphocytes and/or antibodies: control function). Simulation results reveal that artificial immune algorithm are effective use to search for optimal control against disturbance.

Paper ID: CCC07-0288
Title: A Linear Motor Position Control Based on the Artificial Immune Clustering Methodology
Authors: Liu Yang, Liu Ying
Abstract:
In this paper, a novel algorithm, the artificial immune clustering methodology (AICM), is developed to control the position of the permanent magnet linear synchronous motor (PMLSM) intelligently. The advantage of the AICM, perfect learning and adaptability, as well as efficient pattern recognition, enhances the data process ability of PMLSM, which results in the improved position-precision and robustness. The experimental results are given out and the validity of this method is verified.

Paper ID: CCC07-0311
Title: 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)
Authors: 刘贤兴, 乔薇, 周旭, 胡育文
Abstract:
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.

Paper ID: CCC07-0451
Title: 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)
Authors: 刘宜, 丛爽
Abstract: 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.

Paper ID: CCC07-0954
Title: 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)
Authors: 朱[number]秋, 李烽, 潘伟, 孙晓东
Abstract: 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.

Paper ID: CCC07-1029
Title: 巨型水压机液压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)
Authors: 周育才，刘少军，刘忠伟，邓奕，黄明辉
Abstract:
本文以3万吨模锻水压机动梁位置保持系统为例，针对模段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.

Paper ID: CCC07-1078
Title: A Direct Torque Controlled Permanent Magnetic Synchronous Motor System Based on the New Rotor Position Estimation
Authors: Chen Yongjun, Huang Shenghua, Wan Shanming, Wu Fang
Abstract:
The low speed and high torque permanent magnetic synchronous motor (PMSM) is increasingly playing an important role in electric propulsion system due to its many advantages over competing technologies. The Direct Torque Control (DTC) technique for PMSM is receiving increasing attention due to the important advantages the low dependence on motor parameters when compared with other motor control techniques. But for successful operation of PMSM, rotor position and speed information is required. Thus, there has been an intense interest in the development of a so-called position sensorless drive. In this paper, a Adaptive Estimation approach is developed which enable sensorless operation of the PMSM. Implementation issues for the sensorless PMSM electric drive are discussed, and experimental results are presented in order to demonstrate the effectiveness of the proposed techniques to the sensorless PMSM.

Paper ID: CCC07-1169
Title: 多电平直流环节逆变器宽调制度均衡控制策略研究(On Balance Control Strategy with a Wide Range of Modulation Indexes for Multilevel DC-link Inverter)
Authors: 陈金平，贺昱曜，茹锋，林继鹏，吴婷婷
Abstract:
针对多电平直流环节逆变器存在各个DC-DC变换单元输出功率及其功率器件开关负荷不均衡问题，利用阶梯波调制中控制角可灵活调整的特点，提出了一种易于实现的功率均衡控制策略。该策略在1/2个相电压输出周期内通过调整各单元的控制角来补偿由阶梯波调制时控制角的影响所造成的功率不相等，从而可在调制度不同的情况下快速实现输出功率均衡，并使各单元功率器件开关次数相等、器件负荷一致。经实验分析表明该策略可快速实现各变换单元输出功率和功率器件负荷的均衡，且提高了逆变器输出电压波形的质量。

To solve the problem that the output power and switch burthen of each DC-DC converter cell in
the Multilevel DC-link (MLDCL) inverter are imbalance, a new power balance control strategy is proposed in this paper. By adjusting the control angles of each cell in 1/2 output cycle of phase voltage to overcome the adverse effects of the control angles in conventional staircase modulation, it can balance the output power of each cell with a wide range of modulation indexes. Meanwhile the switch numbers and switch burden of each power devices in the cells also achieve balance. Further more, the new strategy is simulated and confirmed with different modulation indexes, and the simulation results show that it can also improve the waveform performance of phase voltage.

Paper ID: CCC07-1170
Title: 永磁同步电机控制系统仿真建模研究(Simulation Modeling Research of Permanent Magnet Synchronous Motor Control System)
Authors: 孙子文, 杨国超, 纪志成
Abstract: 基于永磁同步电机的数学模型, 提出了一种新型的仿真建模方法。系统采用双闭环控制方法: 速度环用比例积分控制, 电流环用 PWM 控制。对仿真过程中不同载波频率下 IGBT 桥路上的功率损耗进行了详细的比较分析。仿真结果证明了建模方法的正确性, 同时该模型也适用于验证其它控制算法、控制策略的合理性, 为实际电机控制系统的设计调试提供了新思路。

Based on the mathematical model of Permanent Magnet Synchronous Motor (PMSM), a novel method of modeling PMSM control system has been proposed. The control system adopts the double loops method. In the system, a PI controller is adopted in the speed loop and a PWM current controller is adopted in the current loop. After that, the simulink results of the power losses in IGBTs in different carry frequencies are compared. The simulink results show the validity of the modeling method. This novel method offers a new thoughtway for designing and debugging actual motors.

Paper ID: CCC07-1179
Title: 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)
Authors: 修杰, 夏长亮
Abstract: 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、鲁棒性好、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.

Paper ID: CCC07-1184
Title: An Adaptive Localization Method for Autonomous Digging Robot
Authors: Sun Yi, Lu Haijun
Abstract:
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.

Paper ID: CCC07-1217
Title: An Application of Fuzzy Logic Controller for Switched Reluctance Motor Drive
Authors: Xiu Jie, Xia Changliang
Abstract:
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 demonstrate that the proposed FLC presents a better performance than the conventional PID controller.

Paper ID: CCC07-1250
Title: 基于 ARM 的机器人运动控制系统(A Robot Motion Control System Based on ARM)
Authors: 田景文，高美娟，李瑾，李凯
Abstract:
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
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.

Paper ID: CCC07-1354
Title: Wave Variable Sliding Mode Control Design for Bilateral Tele-Operation Systems Using Haptic Interfaces
Authors: Dong Ling Fang, Khorasani Khashayar
Abstract:
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.

Paper ID: CCC07-1355
Title: Group Motion Control of Multi-agent Systems Based on Complex Network
Authors: Wu Zhengping, Guan Zhihong, Li Tao
Abstract:
Multi-Agent Systems (MAS) are, nowadays, an important research area within Robotics and Artificial Intelligence and a growing number of systems have been recently presented in the literature. Motivated by recent advances in synchronization theory of complex dynamical network, this paper develops a general methods of controller design for formation reaching and group motion controlling of the MAS. A novel motion model of MAS is presented at first. Based on this model, the design method of decentralized controller for each agent is investigated. The stability properties of the system is also analyzed in detail. In this control scheme the topology of the control interconnections is fixed and invariant. The control policy ensures that all agents eventually move in group formation with desired group motion dynamics while at same time avoid collisions. In the end, the validity of this scheme is supported by computer simulation.
Title: 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)

Authors: 刘志刚, 李世华

Abstract:

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.

Title: 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)

Authors: 李诺, 王江, 张荣华

Abstract:

To solve the electromagnetic torque ripple caused by uncertain nonlinear factors 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.
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%.
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 考虑动态纵向边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.

Paper ID: CCC07-0143
Title: 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)
Authors: 绳涛, 王建, 蔡文澜, 马宏绪
Abstract:
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行进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.

Paper ID: CCC07-0174
Title: Cooperative Control for Target Search, Classification and Attack for AUAVs (Attack Uninhabited Air Vehicles)
Authors: Shen Yanhang, Zhou Zhou
Abstract:
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.

Paper ID: CCC07-0181
Title: 基于导航评价函数的非完整轮式移动机器人路径规划(Path Planner of Nonholonomic Wheeled Mobile Robots Based on Navigation Evaluation Function)
Authors: 郑效光，庄严，王伟
Abstract:
本文研究了已知环境中非完整轮式移动机器人路径规划问题, 提出一种基于优化思想的路径规划算法. 本算法充分考虑机器人与目标点的距离和角度、机器人速度以及障碍物这三种因素的影响, 建立了规划问题的导航评价函数, 将路径规划问题转化为离散优化问题. 在机器人当前状态下, 借鉴动态窗思想, 确定了输入量的搜索范围, 并进一步利用遗传算法求解机器人最优避障输入量. 本文考虑了目标点与障碍物的关系, 对已知环境下静态障碍物、动态障碍物、动态目标跟踪三种情况分别进行了仿真实验, 结果验证了该算法的有效性.

This paper studies the method of path planning for nonholonomic wheeled mobile robots in the known environments. The path planner based on optimization is proposed. This planner takes full account of the distance and angle between the robot and the target, velocity and obstacles to the navigation evaluation function, and then formulates the path planning problem in the discrete optimization problem. On the current state of robot, the range of input is determined by dynamic window, then the avoidance obstacles optimization input is solved by genetic algorithm. In this paper, the relationship of the target and obstacles is also accounted. Numerical simulations were performed to illustrate the effectiveness of the proposed planner in static, moving obstacles and dynamic object tracking, respectively.

Paper ID: CCC07-0212
Title: 基于贝叶斯理论的移动机器人相对定位(Relative Localization of Mobile Robots Based on Bayesian Theory)
Authors: 陈余庆，胡英，马孜
Abstract:
本文研究了多移动机器人在未知环境下的相对定位方法问题. 在满足马尔可夫假设条件下, 首先通过贝叶斯推理方法分析了机器人之间的定位更新规则, 形而基于非完整机器人的里程计位姿估计模型, 分别提出了机器人的状态及其协方差估计方程和相对观测方程, 并基于分布式扩展卡尔曼滤波实现方法, 对机器人之间的相对位姿和协方差估计值实现更新与校正. 该方法提高了机器人群体的协作定位能力, 实际机器人相对位置实验验证了本文方法的有效性.

This paper investigates the relative localization problem of multiple mobile robots under the unknown circumstance. The localizing rules between robots are analyzed based on bayesian assumption. Then the estimating equations of the robot's the states and covariances are deduced from the odometry's model of noholonomic robots, also the relative observation equations between robots are constructed. So the estimated values of the states and covariances can be updated by the rules of distributed extended kalman filter. Experiment results have demonstrated the validity of the proposed approach for a group of robots.
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 radial 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.

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.

Paper ID: CCC07-0316
Title: Constraints Analysis in the Motion Control Process of Parallel Robots
Authors: Guo Sheng, Fang Yuefa, Huai Chuangfeng
Abstract:
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.

Paper ID: CCC07-0624
Title: 基于 SPF 模型的闭链机构自适应控制(Adaptive Control of Closed Kinematics Chains Based on Singularity Perturbed Formulation)
Authors: 吴爱玲，王中华，周志强
Abstract:
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。本文考虑机器人转动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.
Title: 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)
Authors: 阮久宏, 荣学文, 吴三友
Abstract:
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.

Title: 多传感道路检测及目标跟踪的新型融合方法(Multi-sensor Based Lane Detection and Object Tracking Method)
Authors: 陈莹, 吴定会
Abstract:
针对道路上车辆运动与车道形状、位置的关系, 提出了一种新型的多传感道路检测与目标跟踪方法。毫米波雷达虽具有精确的纵向测距功能, 却不能识别车辆的横向位置、道路状况, 弯道或换道时容易丢失目标。利用图像传感器摄取的道路图像, 选取道路形状模型, 利用道路图像的灰度特征, 结合优化算法改变模板参数, 实现对车道的跟踪。利用车道曲率与车辆转向角之间的关系, 并采用基于 UKF(Uscented Kalman Filter)的非线性估计算法和最小方差融合准则, 获得车辆状态的融合估计。仿真实验验证了该方法能大大提高路面车辆的姿态跟踪精度。

Considering the relation between the movement of vehicles and the lane parameter, a novel fusion method of lane detection and object tracking is proposed. Though millimeter radar can accurately provide longitude range and velocity information of vehicle ahead, it can not recognize lateral position and road state, which makes it easy to loss targets when vehicle ahead turns or changes its lane. To solve this problem, lane information achieved from image is integrated with radar-filtered information. With the selected road shape model and the intensity feature of lane image, an optimization algorithm was established to maximize likelihood function evaluating how well the image gradient data on an assumed lane marking supports a given set of template parameters. Lane curve parameter can be transformed into vehicle front wheel orientation, and finally the fusion estimation of vehicle state can be achieved by UKF (Uscented Kalman Filter) estimator and least-squares based data fusion algorithm. Simulation results validate the proposed method can improve vehicle’s pose tracking accuracy significantly.

Title: 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)
Abstract:
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.

Authors: 苏剑波

Abstract:
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)

Authors: 王红霞, 田国会, 李晓磊, 卜范骞

Abstract:
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环境信息计算他们的可信度,经D-S证据理论方法融合后用于选择最优地标指示的路径;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,该方法既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.

Authors: 刘万里, 曲兴华, 闫勇刚

Abstract:
开发了一种能够在地面和墙壁上运动的小型轮腿复合式爬壁机器人。该机器人机构融合轮式机

This paper develops a miniature wheel-legged climbing robot which can move on the ground and climb on the wall surfaces. The robot system combines the merits of wheeled mechanism, legged
mechanism and vacuum-sorbs mechanism, and possesses many advantages, such as less weight, small volume, simplicity structure and quickly response. The robot can change the moving modes according different conditions of terrain; it moves on the ground with high speed and remote distance using wheeled system, and climbs flexibly on the smooth wall surfaces using four impendent-swing-legs and vacuum-sorbs system. The control system based on DSP technology is adopted to ensure the robot to be with low power consuming, good reliability and high real-time characters. The Theoretical analysis and experiment results show that the climbing robot has high mobility, good environment adaptability and climbing wall surface ability.

Paper ID: CCC07-0859
Title: 寻迹竞速机器人的设计与实现(Design and Application for Cruising and Contesting Robot)
Authors: 王明顺, 沈谋全
Abstract:
针对第一届全国大学生智能车邀请赛的特定需求,设计出了一个寻迹竞速机器人。通过优选系统电源、采用虚拟编码器测速、图像传感器路径识别方案及实时的 N-2 数据压缩存储与处理和便于优化控制的切换控制策略等方法,使我们的寻迹竞速机器人在有全国高等学校 112 支代表队参加的第一届全国大学生智能车邀请赛中取得了决赛第十名的好成绩。

Paper ID: CCC07-0933
Title: 医用微型机器人动力学建模和螺旋槽参数优化研究(Kinetic Modeling and Spiral Groove Optimization of Medical Micro-Robot)
Authors: 梁亮, 彭辉, 甘敏
Abstract:
针对人体内腔粘液为非牛顿流体的特点,推导了非牛顿流体的变形雷诺方程,建立了医用微型机器人在人体内腔中运动的动力学模型。采用有限差分法分析了医用微型机器人螺旋槽参数对机器人动压粘液膜承载量、轴向摩擦牵引力和周向摩擦阻力的影响,从而获得了一组相对最优的螺旋槽参数。

A modified Reynolds equation is derived from the property of human body's lumen that is non-Newton fluid. A motion model is built for the spiral-grooved medical micro-robot working inside the lumen of human body. Based on the finite difference method, the relationship between the spiral-grooved parameters and kinetic properties such as the load capacity of hydrodynamic pressure, the axial thrust force and the circumferential resisting force is analyzed theoretically. Consequently, the optimal parameters of the spiral grooved medical micro-robot are obtained.

Paper ID: CCC07-0980
Title: 一种新型直线驱动器的数学模型及控制策略(The Mathematical Model of A Novel Linear Actuator and Its Control Strategy)
Authors: 张庆新，张红梅，王凤翔
Abstract:
磁控形状记忆合金（Magnetically Controlled Shape Memory Alloy 简称 MSMA）是一种新型功能材料，具有形变量大和机电能量转换效率高等特点。本文首先阐述了一种新型 MSMA 直线驱动器的工作原理，进行了磁路特性的分析和励磁绕组的设计，在此基础上建立了系统的简化动力学模型，给出的仿真曲线，提出了一种新的控制策略，制作了 MSMA 直线驱动器的样机，实验结果表明模型的正确性和实用性。

The magnetically controlled Shape Memory alloy (MSMA) is a new type of functional materials, which has large strain and high efficiency of electromechanical energy conversion. In this paper, the work principle of the MSMA linear actuator is introduced, and based on the analysis and design on magnetic circuit and winding, the dynamic model of MSMA actuator and the simulating curves are given. After the control system is designed, the MSMA actuator prototype is proposed. The experimental results verify the model's validity and practicability of MSMA in intelligent system.

Paper ID: CCC07-1009
Title: Gait Design and Balance Control for the Biped Robot Based on Reaction Null-space Method
Authors: Huai Chuangfeng, Fang Yuefa, Guo Sheng
Abstract:
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.

Paper ID: CCC07-1073
Title: 靶定位并联机器人控制研究(On Target Positioning Parallel Robot Control)
Authors: 孙立宁，刘彦武，曲东升，李长峰
Abstract:
设计并制造了一种精密定位并联机器人，可实现对实验靶的 6 自由度全方位微米级定位。论述了系统定位工作原理，设计了高集成度的并联机器人控制系统，将所有控制模块集成于控制计算机内。在对该并联机器人位姿控制算法研究的基础上，推导了靶定位数学模型。研究了一种基于视觉的靶定位闭环控制方法，这种方法在坐标系关系不完全确定的情况下，通过对 6 自由度并联机器人各自由度循环调整实现了对靶的多自由度精密定位。实验表明该机器人系统实现了对实验靶的 6 自由度自动闭环定位。
Designed and manufactured a type of precision parallel robot for positioning, and realized 6 DOF spacial precision target positioning in micro meter scale. Principle of the system is dissertated, and
a high integrated and accurate control system for parallel robot is designed. All the control
modules are integrated in the computer. Based on the research of the parallel robot's positioning
control arithmetic, the model of target positioning is deduced. A method based on vision for target
positioning closed-loop control is studied. In the method, 6 DOF precision target positioning is
realized by the loop adjustment of each DOF of the parallel robot on the condition of the relation
between coordinate systems is not known completely. Experiments proved this robot system
realized 6 DOF auto closed-loop target positioning.

Paper ID: CCC07-1099
Title: A Study of Autonomous Parking for a 4-Wheel Driven Mobile Robot
Authors: Zang Joung Ill, Xuan Dong Ji, Kim Jin Wan, Kim Young Bae
Abstract:
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.

Paper ID: CCC07-1216
Title: A Novel Path Planning Method Based on Certainty Grids Map for Mobile Robot
Authors: Li Jigong, Feng Yiwei, Zhu Chaoqun
Abstract:
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.

Paper ID: CCC07-1222
Title: 一种新型排水管道检测机器人研究(On a New Detecting Robot in Sewer Pipe)
Authors: 杨清梅, 孙建民
Abstract:
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
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 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.

Paper ID: CCC07-1237
Title: 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)
Authors: 杨毅，付梦印，孙常胜，王美玲，赵诚
Abstract:
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，跑车仿真试验验证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 constrains 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.

Paper ID: CCC07-1290
Title: Research on the Efficiency of Robot Fish
Authors: Yu Jinghu
Abstract:
Fish swimming have the characteristic of the high efficiency, low noise and high flexibility. And
more researchers draw attention to Robot fish and obtain considerable achievement. This paper
focused on the Efficiency of the robot fish. Through the analysis of the robot fish's dynamical
model, the relationship between the speed of Robot fish and the fish body parameter which
concluded the frequency, body's wave number and amplitude of foil can be obtained.

Paper ID: CCC07-1333
Title: 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)
Authors: 雷兆明, 孙鹤旭, 刘作军, 林涛, 杨鹏
Abstract:
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.

Paper ID: CCC07-1351
Title: 手眼视觉系统的自标定技术(Self-Calibration Technique Based on Hand-Eye Vision
Systems)
Authors: 王海霞, 王春艳, 卢晓
Abstract:
深入研究了手眼视觉系统的标定方法, 提出一种灵活、有效的手眼系统自标定方法。该方法
在定位过程中没必要将摄像机内部参数和旋转矩阵分开, 可将其看作一个“黑箱”直接获得,
不需要分别确定每部分中的每个参数, 这样既降低了计算量又减少了误差。在标定过程中,
不需要已知参考物, 只需摄像机对空间数点取像, 分别在末端做 4 次或 4 次以上的纯平移运
动及 2 次或 2 次以上带旋转的任意运动过程中取像 (其中, 运动次数是根据是否满足给定的
判断准则来决定的), 实现了系统的自标定方法。此外, 该方法对摄像机的安装及运动方向
没有任何约束, 是一种非常灵活的自标定方法。
A flexible valid self-calibration technique for robotics hand-eye systems is proposed. It is not
necessary to disjoin the camera intrinsic parameter matrix and the orientation matrix, so they can be obtained as a 'black-box', where every parameter of every part needn't be computed, thus the computation cost and the error are both depressed. In the process of calibration, the known reference objection isn't needed, and it only requires the camera to observe images from couple arbitrary reference points at four (or more) pure translational motions and two (or more) random motions with revolving, respectively, thus the proposed self-calibration of hand-eye systems is implemented, where the motion times is decided according to the given criterion. Furthermore, there is no restriction to the installation and the motion direction of the camera, so the proposed technique is easy to use and flexible.

Paper ID: CCC07-1420
Title: 并发定位与建图的多目标免疫进化算法 (Multi-objective Immune Evolutionary Algorithms for SLAM)
Authors: 李枚毅
Abstract:
由于运用进化算法求解移动机器人并发定位与建图问题时, 需要处理多目标, 因此将该问题作为多目标优化问题进行处理。为了有效地提高基于多目标进化算法的移动机器人并发定位与建图方法的效率, 提出了结合免疫机制的局部搜索方法。为此, 构造了称之为关键点栅格吸引操作的局部搜索方法, 它运用了所针对问题的领域知识。通过移动机器人物理实验验证了所构造算法的计算代价比其他基于进化算法的单目标优化方法少, 获取的地图准确性更高。

The simultaneous localization and mapping problem with evolutionary algorithms is translated to a multi-objective immune optimization problem since it inherently possesses of multi-objective characters, and in order to efficiently solve the simultaneous localization and mapping problem, a local searcher with immunity is constructed. The local searcher employs domain knowledge of the problem, which is named as a key point grid pulling that is developed in the paper. The experiment results of a real mobile robot indicate that the computational expensiveness of designed algorithms is less than other evolutionary algorithms of single-objection and multi-objective optimization problem without immunity for simultaneous localization and mapping and accuracy of obtained maps are higher.

Paper ID: CCC07-1544
Title: Loop-closing by Using SIFT Features for Mobile Robots
Authors: Zhao Fengda, Kong Lingfu, Li Xianshan
Abstract:
To resolve the problem of accumulative error in the real-time loop-closing of SLAM, SIFT features are used to match the visual appearance in the environment. The visually salient regions are selected from an image using Scale Saliency algorithm. Then, the SIFT features extracted from the salient regions in current image are used to match to the possible candidate features. The experiment results show the method is feasible.

Paper ID: CCC07-1640
Title: ICF 精密并联机器人系统的研制 (Development of Precision Parallel Robot in ICF
In the research of ICF accurate orientation of the sensor is one key factor to guarantee target exactly. So one 6-DOF parallel robot is developed, in which Hooke articulated structure is adopted to suit the heavy-load and requirement of orientation precision. For further enhancing the orientation and repetition precision of the robot, speed of the integrated linear motor is programmed in reason with closed-loop controlling strategy. In the mean while, inverse kinematics model of the parallel robot is set up and network communication based on sever and client is developed to realize remote control of the robot. The results of experiment show that the repeated orientation-precision of the robot proposed is of 1μm, which can fulfill the accurate adjustment on the pose of robot.

Paper ID: CCC07-1790
Title: The Control of Search and Rescue Robots with the General Suppression Control Framework
Authors: Lau Henry
Abstract:
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.

Paper ID: CCC07-0345
Title: MIMO 网络化控制系统的分析和建模(Analysis and Modeling of MIMO Networked Control Systems)
Authors: 武翠琴, 李艾华, 张振仁
Abstract:
Considering the MIMO networked control systems, Influences of the controller's driven style on the network induced delay is discussed. The discrete time model is derived which the sensor nodes is time-driven, the controller node and the actuator nodes are event-driven. A stochastic optimal controller is designed to satisfy the given discrete performance index, which can also make the networked control systems exponentially mean square stable. A simulation experiment illustrates the effectiveness of the presented theory.

**Abstract:**

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 satisfies 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.

**Abstract:**

The multi-agent cooperation is an important task in a distributed control system. Its key part is how to generate coalition group of agents. The ant algorithm is used often to solve this problem in
MAS control system. But it has some deficiencies, such as partial optimization, slow constringency and low precision. With the respective virtues of genetic algorithm and ant algorithm, a new ant algorithm was presented in this work. It included two phase. In the first phase, it produced the information elements through genetic algorithm, and obtained optimization coalition through ant algorithm in the second phase. The simulation experiments were done and the results show that both the optimizing performance and time performance of new ant algorithm are improved enormously. The new algorithm not only quickens the constringency process and advances the precision of calculation result, but also avoids partial optimization problem.

Paper ID: CCC07-0583
Title: 群机器人网格分布控制研究 (On Grid Distribution Control of Swarm Robots)
Authors: 熊举峰, 谭冠政
Abstract:
群机器人学是多机器人系统的一个重要研究方向, 其主要特点是系统包含大量个体。如何控制不受数量限制的群机器人系统, 是一个极具挑战性的问题。网格分布是指大量机器人按照一定的要求均匀分布在某一区域中。本文基于人工物理原理分析了群机器人网格分布控制原理和方法，并制定了详细的系统性能评价指标（稳定时间、碰撞次数、覆盖率、连接数、簇数、分布密度等参数），还提出了采用曲线拟合法构建虚拟力模型。通过在无障碍物和有障碍物环境中的网格分布和移动仿真，显示出该方法可以鲁棒、有效的完成网格分布。指出了今后的研究方向。

Swarm robotics is one of the important research directions of multi-robot systems, whose major feature is that the system includes many robots. How to control swarm-robot system is a challenging problem. Grid distribution means that a lot of robots distribute averagely in an area when they are demanded. We analyses a principle and method that based on artificial physics, we also put forward some performance judgment parameters (such as stabilization time, collision times, overlay rate, connection number, cluster number, distributing density and so on); Meanwhile, we extend the virtual force model to use curve-fitting method. The result of the experiment shows that this method can accomplish the grid distributing control robustly and efficiently in a complicated environment. At last, the directions of further research are proposed.

Paper ID: CCC07-0800
Title: Water Level Control of Boiler Drum Using One IEC61131-3-Based DCS
Authors: Yang Qiliang, Xing Jianchun, Wang Ping
Abstract:
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.
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 (GDCS), 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 GDCS, establishes a fault-tolerance mechanism model by Stochastic Petri Nets (SPN) for local areas scheduler, describes the complete independent subtask dispatching and allocating policies, and proposes a dynamic scheduling train of thought of non complete independent subtask.
Paper ID: CCC07-1095
Title: Output Feedback of Model-based Networked Control Systems with Multi-rate Input Sampling
Authors: Wang Zhiwen, Guo Ge, Hong Yi, Luo Dongsong
Abstract:
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.

Paper ID: CCC07-1284
Title: DCS内嵌式先进控制与优化软件的开发与应用(Development of DCS-Embedded Advanced Control and Optimization Software)
Authors: 弓岱伟, 孙德敏
Abstract:
为更广泛的在工业领域应用先进控制与优化, 开发了一套针对大型 DCS 的内嵌式先进控制与优化软件, 软件在数据的处理 (包括与 DCS 数据交互、数据 Cache 和预处理等)、完善的配置文件支持 (定义标准的配置文件, 并使主程序和所有算法模块参数可配置)、模块化设计 (定义标准模块模板, 使算法模块化, 并实现多线程并行处理)、完整的日志系统等方面有着先进的设计, 先进设计提供了很高的通用性和可移植性, 可广泛应用于工业控制领域。软件系统已完成并投入实际项目应用, 获得了非常好的应用效果。

A DCS-embedded advanced control and optimization software system was developed for industrial area. The software features advanced technics mainly including fast & stable data communication with DCS, data caching and preprocessing, common module templates for algorithm and logic modules, configuration file support for highly configurable main program and modules, advanced logging support, threaded modules management with parallel processing. The software system was proved to be highly stable and portable, and suitable for varies industrial area. The software's application also archived excellent results.

Paper ID: CCC07-1365
Title: 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)
Authors: 陈杨杨, 田玉平
Abstract:
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.

Paper ID: CCC07-1434
Title: A Distributed Real-time Control System of Aluminum Electromagnetic Rapid Roll-casting
Authors: 田照耀, 廖力清, 刘建良
Abstract:
本文介绍了多传感器信息融合技术、网络化和实时操作系统为一体的铝电磁场快速铸轧过程分布式实时控制系统，分析了系统的分布式网络化结构、硬件设计方案及实时操作系统软件结构，最后对铸轧板带的质量进行了分析。结果表明：系统稳定可靠，铸轧板带晶粒细化效果明显，力学性能显著改善。

This paper introduced a kind of distributed real-time control system for aluminum electromagnetic rapid roll-casting, which integrated Multi-sensor Information Fusion Techniques, networked and Real-time Operation System. The design of the distributed network, structure of hardware and real-time operating system were analysed, furthermore analysed the strips. Result showed that: the system had good stability and reliability, electromagnetic field caused pronounced changes in aluminum roll-casting strip's structure, and had significant effects on mechanical properties of finished sheets and plates thereof.

Paper ID: CCC07-1453
Title: Optimal Scheduling Algorithm for Messages in Networked Control Systems Based on Token-Bus
Authors: 刘怀, 黄建新, 曹弋
Abstract:
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 presented in this paper are effective.

Paper ID: CCC07-1701
Title: Design of History Database for Networked Control Systems
Authors: Zhu Youzhi, Peng Peng, Zheng Geng
Abstract:
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.

Paper ID: CCC07-0177
Title: 基于增益失调因子的H-infinity滤波鲁棒机理研究(On the Robustness Mechanism of H-infinity Filter Based on Gain Maladjustment Gene)
Authors: 李金梁, 郝顺义, 吴高龙

H-infinity filtering achieves satisfying robustness at the cost of some estimation precision, while its filtering precision is not assured at the same time, and even always be divergent. The illegibility of the algorithm structure makes the study only a qualitative analysis. Based on a Krein space state-space model, a suit of generalized H-infinity robust filtering algorithm and some important concepts, such as “generalized filtering gain” and “gain maladjustment gene”, etc, were founded. Problems about H-infinity filtering robustness were discussed and some correlated
conclusions, such as “suboptimal H-infinity robust filtering precision upper limit”, “H-infinity filter robustness mechanism” and “H-infinity filter divergence reasons” and so on were proposed. Then, an analysis of filtering strategy effect led to the norm condition of optimal H-infinity filtering disturbances attenuation gene. The last but not the least, H-infinity robust filtering algorithm was decomposed in two taches: Kalman filtering and making robustness, and a suit of “structuring decomposed algorithm” was established, which is based on gain maladjustment gene and clearly opens out the essence of H-infinity robust filtering.

Paper ID: CCC07-0207
Title: 自校正分量解耦信息融合 Kalman 平滑器 (Self-tuning Decoupled Component Information Fusion Kalman Smoother)
Authors: 高媛, 张鹏, 贾文静, 邓自立
Abstract: 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.

Paper ID: CCC07-0227
Title: 一种自适应模糊的局部区域图像增强算法 (An Adaptive Fuzzy Image Enhancement Algorithm for Local Regions)
Authors: 闫茂德, 伯绍波, 李雪, 贺昱曜
Abstract: 针对模糊图像增强算法存在运算速度慢、图像部分信息丢失等缺点, 提出一种具有封闭性和移植性好的模糊增强变换算子。该变换算子结合梯度算子将图像的增强处理集中于局部区域, 并引入最大类间方差法自动地选取最佳阈值参数, 实现了一种基于自适应模糊的局部区域图像增强算法。该算法在沥青路面裂缝图像检测系统中的应用表明, 其增强效果明显优于现有的模糊图像增强算法, 且提高了运算速度, 具有一定的实用性和推广性。

In order to deal with the drawbacks of low speed and losing image information in fuzzy image enhancement algorithms, a novel fuzzy enhancement operator with close-character and transplantable-character is proposed in this paper. The approached operator employs the gradient operator to make the image enhancement processing focus on the interested regions, and the OTSU operator to automatically select the best threshold value, which can realize a novel adaptive fuzzy image enhancement algorithm for local regions. Through the experiments of the asphalt
pavement crack image detection system, the experimental results indicate that the novel algorithm can not only obtain better processing effects and higher processing speed than now-available fuzzy image enhancement algorithms, but also possess the property of high practicability and generality.

Paper ID: CCC07-0236
Title: 基于信息熵的改进TFIDF特征选择算法(An Improved TFIDF Feature Selection Algorithm Based on Information Entropy)
Authors: 周炎涛, 唐剑波, 王家琴
Abstract: 文本特征的选择对文本分类的精确性有着非常重要的影响。本文针对传统的TFIDF没有考虑到特征词条在各个类之间的分布的不足，对TFIDF特征选择算法进行了深入的分析，并结合信息熵的概念提出了一种新的TFIDF特征选择算法。实验结果表明，改进后的算法可以有效地提高文本分类的精确度。
The quality of text feature selection affects the accuracy of text categorization greatly. Due to the deficiency of traditional TFIDF without considering the distribution of feature words among classes, the paper analyzed the TFIDF feature selection algorithm, and proposed a new TFIDF feature selection method with concept of information entropy. Experimental results show the method is valid in improving the accuracy of text categorization.

Paper ID: CCC07-0282
Title: Inner Mechanism-Based Real Time Data Fusion of the Multisensors of Magnetic Bearings
Authors: Ku Shaoping, Hu Yefa
Abstract: On the basis of introducing the basic principle of magnetic bearings, the data model of the multisensors of magnetic bearings is established. The data are considered to obey normal distribution. Variance analysis method is proposed in the data fusion. The condition is derived to determine whether or not the sensors are wrong. It is pointed out that an industrial computer or two embedded single microprocessors can realize the real time control and data process. When two microprocessors are used one is used to control the rotor keeping at the balance place, and the other's task is to finish data fusion. The system will provide fault prompt when there exists fault according to the result of data fusion. In order to positioning the fault inner mechanism should be considered in fault analysis. Inner mechanism is mainly decided by the position arrangement of the sensors and vibration of the rotor. Some relative experimental results are given.

Paper ID: CCC07-0304
Title: 战术任务规划决策支持技术研究(On Decision Making Support Technology for Tactical Mission Planning)
Authors: 任敏, 胡红娟, 沈林成
Abstract: 美国“战斧IV”巡航导弹可以用于打击地面战术目标和移动目标，扩展了战术打击能力。针对具备类似作战能力的导弹，本文对武器控制系统的战术任务规划决策支持技术进行了研究，建立了基于Petri网的巡航导弹战术任务决策支持模型，提出了多目标攻击决策评价算法，并在此基础上完成了战术任务规划原形系统设计与实现。
The Tomahawk Block IV Cruise Missile of American can be used for striking tactical targets and moving targets, greatly enlarged its tactical striking ability. Aiming at these missiles of having similar capabilities, decision making support technology of the weapon control system is researched in this paper, the tactical mission decision support model based on Petri nets for cruise missile is founded, The decision algorithm of multi-targets attacking based on entropy modulus and fuzzy mathematic is presented, and Tactical mission planning decision making prototype system is designed and realized in this thesis.

Paper ID: CCC07-0305
Title: Signal Analysing of Failure Monitoring System for Gear Chain
Authors: Zheng Lijun, Yu Lixin
Abstract:
A real-time mechanical fault monitoring system for gear transmission chain was studied and realized, which utilizing the initial phase, the phase difference and the amount of phase modulation of the finite length modulated signal. The signal is demodulated and the phase-modulated signal is retrieved in remote control mode. Furthermore, some key techniques such as data communicating, data monitoring and anti-jamming methods are designed.

Paper ID: CCC07-0354
Title: A Bayesian Framework for Target Tracking in Sensor Networks
Authors: Cheng Yuanguo, Li Guohui
Abstract:
The work described in this paper presents a framework to track a moving target in sensor networks. The framework employs a method based on Bayesian classification to calculate the detection probabilities and proposes a tracking algorithm by defining the moving scope of a target, where the sensors have the higher values of detection probabilities. Experiment results show this scheme is effective.

Paper ID: CCC07-0460
Title: 车用氧传感器性能参数检测系统开发(Development of Measurement System Applied to Detecting the Parameters of Oxygen Sensor)
Authors: 冯国胜，王海花，李军，薛淑发
Abstract:
为开发车用氧传感器性能参数检测系统，基于DSP56F807数字信号处理器，构建了系统硬件平台，采用C语言和LabVIEW语言编写了数据采集程序、SCI串口数据发送程序和LabVIEW与DSP接口程序，提出了氧传感器电压信号、内阻及过渡时间检测方法。试验结果证明该系统能可靠地对氧传感器参数进行检测和分析。

In order to develop the measurement system of automotive oxygen sensor parameters,a system hardware flat roof was set up based on DSP56F807. Data collection procedure, SCI sending procedure and interface procedure of LabVIEW and DSP were wrote with C language and LabVIEW language. The measurement method of oxygen sensor voltage signal, inner resistance and transition time was put orward. Experimental results prove that this measurement and control
system can apply to detecting and analyzing a large number of the oxygen sensor parameters reliably.

Paper ID: CCC07-0467
Title: Create Multi-dimension Linked Lists on Recursive Algorithm and the Application
Authors: Chen Guangyi, He Zhaoyong
Abstract:
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.

Paper ID: CCC07-0567
Title: 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)
Authors: 张航，王一军，罗大庸，王潇
Abstract:
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.

Paper ID: CCC07-0568
Title: A Semantics-Reconstruction Based Model-Driven Development Approach for Web Information Systems
Authors: Hou Jinkui, Wan Jiancheng, Yu Yongtang
Abstract:
The size of the gap between source model and target model has a profound impact on the efforts to create mapping rules in model-driven development. Starting from the analysis of semantic consistency requirement of model transformation, a semantics-reconstruction based model mapping approach for web information system development was proposed by abstractly analyzing the syntactic structure and semantic features of modeling languages. Target semantic model is used as an intermediary for disambiguation, and which provides a good basis for the semantic
comparison between modeling elements at different abstract levels. This approach can provide an
effective support for model driven development because semantic consistency between different
level descriptions of the same component model can be ensured. J2EE is used as a target platform
to help interpreting the process of using the approach.

Paper ID: CCC07-0599
Title: 一类企业级信息系统的的关键业务过程的网格服务封装(Grid Services Encapsulation of
the Key Work Flow in a Type of Enterprise Information System)
Authors: 郝卫东，杨扬
Abstract:
本文的目的在于使用服务网格解决过程密集性企业中存在的自动化孤岛环境下的物流问
题的模型化和服务封装。本文揭示了自动化孤岛的信息孤岛本质，扩展了基于 OGSA 的服
务网格框架，阐述了混合动态信息系统的概念和特征，分析了网格服务的虚拟性和自主性等
适合于自动化信息融合的特征，并对混杂型企业的物流和监控等关键过程进行了服务封装。
This paper goal lies in the service grid solution to the isolated automation island problem which
exists in the process intensive enterprise. The paper has proved the isolated automation island is
isolated information island in nature, expanded the service grid framework based on the
OGSA(Open Grid Services Architecture), has illustrated the concept and feature of hybrid
dynamic information system, has developed the virtualization and autonomy characteristic of grid
services which suitable for the convergence of isolated island, has carried out the services
encapsulation of logistics process and monitor process of steel industry as examples

Paper ID: CCC07-0641
Title: 消除采样通道差异的移相算法研究(On Phase-shifting Algorithm to Eliminate Difference
Between Sampling Channels)
Authors: 张涛，薛鹏骞，蒋静坪
Abstract:
多采样通道系统中的采样通道切换会导致被采样信号之间存在相位差异，可以采取逼近算法
来消除通道之间的相移差异。在对逼近算法的相关知识进行介绍的基础上，本文对一般移相
算法、曲线拟合算法和拉格朗日插值算法的原理、计算过程和逼近精度进行了分析和比较，
最后给出了结论。
The switching among channels in multi sampling channels system will result in phase difference
between sampling signals in different channel. Through the computing with all kinds of approach
algorithm, the difference between sampling channels will be eliminated to zero. On the base of
introducing the correlative theory of approach algorithm, this paper analyzed and compared the
principle, computing process and approach precision among of common phase-shifting
algorithm, fitting algorithm and Lagrange interpolation algorithm, and given the conclusion finally.

Paper ID: CCC07-0681
Title: 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)
Authors: 喻飞，夏晓燕，吴蓉晖，徐成
Abstract:
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 a advanced research on current algorithm. The results of our experiments prove that it promotes the precision of text categorization.

Paper ID: CCC07-0708
Title: 模糊证据理论的深入研究(A Further Study on Fuzzy Evidence Theory)
Authors: 马小平, 汪永东, 樊阳
Abstract: 把证据理论向模糊集推广，利用模糊集的隶属函数提出一种构造证据理论中的基本概率赋值函数的方法，使得证据理论应用于实际更加方便和有效；针对D-S证据组合规则和其他一些改进的组合规则对证据冲突处理中存在的不足，提出改进的证据合成规则。该规则兼顾了证据之间的冲突性和一致性，对冲突性证据以证据源的可信度加权合成，对一致性证据采用反映聚焦程度的与运算。理论分析和数值实验表明改进后的规则对高冲突性证据和一致性证据都非常有效，特别对高冲突性证据，该规则比其他一些规则能更快地收敛到合理的目标。

This paper generalizes the evidence theory and makes it can be used in fuzzy sets in order to make it can be used more effectively. With the fuzzy membership function, this paper presents a method to set up the basic probability assignment function (mass function) in evidence theory, and integrates fuzzy theory and evidence theory effectively. This method brings the evidence theory nearer to practice. This paper presents an improved combination rule to deal with consistent or inconsistent evidences obtained from multiple sources. The improved rule reflects the intersection of focus elements and adapts AND-operation to combine consistent evidences, and allocates the conflicts to vary focus elements according to relevant evidences' creditability. From the theoretic analysis and the results of the numerical examples, the given rule is very rational and effective for both high conflictive evidences and consistent evidences. Especially, the given rule can provide reasonable results with better convergence efficiency than other rules when evidence sources are high conflict.

Paper ID: CCC07-0714
Title: Measurement for Water Content in Oil-Water Two Phase Flow Based on Novel Hybrid Intelligent Prediction Model
Authors: Zhang Dongzh, Xia Bokai, Fu Tao
Abstract: Some parameters affecting the measurement of water content in oil/water two-phase flow are detected using multi-sensor technology, and a novel hybrid intelligent prediction model is proposed to improve measuring precision of water content. Some advanced information processing technologies, such as neural networks optimized by hybrid genetic algorithm, combined method for decisions of multiple sub-modules, are introduced in this intelligent
prediction model, which guarantee a good prediction effect with global and fast convergence, strong generalization capability and high precision. The research result in this paper indicates that prediction precision is improved to a great extent in the all-round measuring range for water content, while the development cost is at a low valuation. It is a new and effective method for measuring water content in oil/water two-phase flow.

Paper ID: CCC07-0765
Title: 扩充的基于集对联系度的粗糙集模型(Generalized Rough Set Model Based on Set Pair Connection Degree)
Authors: 徐怡, 李龙澍, 李学俊
Abstract:
本文在已有扩充粗糙集模型的基础上,基于集对分析中集对联系度的概念提出了一种改进的对象之间的分类关系,称之为广义集对相似关系,在此基础上给出了一个更一般的扩充粗糙集模型。选用 UCI 数据库中的数据集进行测试,通过实验表明该模型的分类性能优于已有方法,因此更加适合大型不完整信息系统的处理。
An improved classification relation between objects based on existing generalized rough set models and set pair connection degree of set pair analysis theory, called generalized set pair similarity relation is proposed. Based on this a more generalized rough set model is presented. UCI database is selected to demonstrate that the classification performance of the new model is superior to those existing models. Therefore the proposed method is more suitable for processing large-scale incomplete information system.

Paper ID: CCC07-0852
Title: An Improved PSNR Algorithm for Objective Video Quality Evaluation
Authors: Yuan Fei, Huang Lianfen, Yao Yan
Abstract:
This paper focuses on the application of video quality assessment. The HVS properties had been used in both intra and inter frames. The improved method inherited the advantages of the PSNR such as simple and convenient while overmatch its shortcomings. The experiment result shows that the improved method has better relationship with the subjective assessment and can be more veracious in scale the quality.

Paper ID: CCC07-0914
Title: 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)
Authors: 任佳, 雷美珍, 张益波
Abstract:
随着数据挖掘技术和理论的不断发展,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.

Paper ID: CCC07-1006
Title: Optimization Design on Sensing Field of Electromagnetic Tomography
Authors: Xue Yixuan, Zhao Shu, Dong Feng
Abstract:
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.

Paper ID: CCC07-1038
Title: 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)
Authors: 谭超, 董峰, 王斌斌
Abstract:
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于其在工业现场的应用范围。为此，本论文提出了基于数字 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.

Paper ID: CCC07-1088
Title: A New Multi-scale Estimation Scheme for Dynamic System
Authors: Zhou Funa, Tang Tianhao, Wen Chenglin
Abstract:
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.

Paper ID: CCC07-1112
Title: 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)
Authors: 何晓峰, 胡小平, 吴美平, 秦海力
Abstract:
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.
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.

A data pretreatment algorithm based on principal component analysis and fuzzy c-means clustering for flotation process is proposed in this paper. Linear regression of clustering centers gained by fuzzy c-means clustering algorithm is introduced to carry through data pretreatment. The process prior knowledge and principal component analysis method are used to reduce dimensions of input vectors and to choose the secondary variables. Then the paper uses radial basis function neural network (RBFNN) to set up an inferential estimation model of quality indexes of flotation process aiming at principal component variables. The simulation results show that this inference estimation strategy has high predictive accuracy in flotation process.

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.

Paper ID: CCC07-1493
Title: 基于 Rough 集理论的战场侦察情报处理 (Battlefield Reconnaissance Intelligence
Processing Based on Rough Sets Theory)
Authors: 李雄, 党生
Abstract: 为了提高战场侦察情报处理的效率和自动化、智能化水平，在描述战场侦察情报处理系统的
基础上，运用基于 Rough 集理论的特征约简算法，对战场侦察情报处理过程中大量的冗余
特征进行压缩或约简，实现情报处理种类的优选；并针对失效点建立决策表，利用 Rough
集约简所获得的分析规则对情报处理系统本身进行智能分析。实例表明：Rough 集方法不仅大大减少了特征信息提取的工作量，也为在智能分析中实现自主式学习和决策提供了很大的
便利。
In order to raise the efficiency, automatization and intelligentization of battlefield reconnaissance
intelligence processing, intelligence processing system is discussed and feature reduction
algorithm based on Rough Sets theory is adopted to extract feature information in battlefield
reconnaissance intelligence processing, so that the intelligence processing objects are optimized.
The decision tables for each failure source are built and the analysis rules rooting in Rough Sets
reduction are applied to carry through intelligent analysis for the system. The cases studied show
that Rough Sets method can lighten the work burden in feature selection and afford advantage for
autonomic learning and decision-making during intelligent analysis.

Paper ID: CCC07-0185
Title: An Active Fault Tolerant Controller Design Method for Time-delay Systems
Authors: Wu Junsheng, Weng Zhengxin, Tian Zuohua, Shi Songjiao
Abstract: In this paper, we propose an active fault tolerant control (FTC) design method for time-delay
systems. Based on generalized internal model control (GIMC), the feedback controller
architecture includes two parts: one part for performance and the other part for robustness. The
feedback control system will be solely controlled by the performance controller when there is no
fault and the robustification controller will be active when there are faults.

Paper ID: CCC07-0231
Title: 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)
Authors: 胡绍林, Karl Meinke, 陈如山
Abstract: 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.

Paper ID: CCC07-0237
Title: 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)
Authors: 陈保家, 李力, 赵新泽
Abstract: 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.

Paper ID: CCC07-0289
Title: 基于元流程的 Web 服务组合例外处理模型(Exception Handling Model for Web Service Composition Using Meta-Process)
Authors: 付晓东, 邹平
Abstract: 为实现例外处理的模块化，扩展性以及适应性，提出一种基于元流程的 Web 服务组合例外处理模型，并对该模型的元素及其关系的语义进行了详细说明。模型中的规则基于事件，状态以及基础流程案例数据。当例外事件发生时，若有规则被满足，则相应的元流程启动，
并由元流程对基础流程进行协调和控制。实例分析表明该方法不仅支持错误恢复，同时也支持流程修改等复杂状况。

For modular, extensible and adaptable exception handling of web service composition, a model using meta-process is proposed in this paper. The detail semantic of the model components and their relationship are specified too. The rule in the model is based on event, activity state and case data of base process. When an exceptional event occurs, corresponding meta-process is invoked as controlling and coordinating mechanism for base processes if some rules are met. Examples analysis show that the proposed model not only can be used for failure recovery, but also can be used for more complex situation such as process modification.

Paper ID: CCC07-0412
Title: An FDI Approach for Aircraft Actuator Partial Failure
Authors: Wang Dan, Wu Zhiliang, Yao Yubin, Niu Xiaobing
Abstract:
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.

Paper ID: CCC07-0509
Title: 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)
Authors: 陶新民，杜宝祥，徐勇
Abstract:
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 evaluates 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.

Paper ID: CCC07-0514
Title: Rolling Bearing Fault Diagnosis Based on Wavelet Packet and RBF Neural Network
Authors: Sun Fang, Wei Zijie
Abstract:
Based upon wavelet packet analysis and Radial basis function (RBF) neural network, a method for the fault diagnosis of roller bearings is proposed in this paper. Firstly, wavelet package was used to decompose vibration time signals of bearing to extract the characteristic values-wavelet packet energy, and features were input into the RBF NN. After training, the RBF NN could be used to identify the roll bearing fault patterns. Three typical bearing faults such as inner race fault, outer race fault and rolling element fault were studied. The results showed that the method of RBF NN with wavelet packet could not only detect the existing of the fault in bearings, but also effectively identify the fault patterns. Therefore, the presented modular RBF networks are quite suitable for the large sample problems. And also, compared the effects of the daubechies (db) 8 and the symlet (sym) 8 on the analyzing roller bearings signals, the former is better.

Paper ID: CCC07-0566
Title: A Strategy About Hoist Control and Fault Diagnosis Based on Neural Network
Authors: Dai Yueming, Li Yunfang, Zhang Rui, Sheng Weiwei
Abstract:
In order to exert the potential of mine hoist, a kind of control system is designed by use of integrating fault diagnosis with fault tolerate, according to the property of mine hoist control system. It can auto-monitor, diagnose and tolerate control. It advises that tolerant control can be realized by use of the integrated intelligent sensor tolerant control scheme in the control system of mine hoist. It can assure the mine hoist run stably under the sensor fault and avoid accident. The concrete model is discussed to realize the whole and the part of the tolerant control system of mine hoist which bases on the fuzzy neural network. The system is simulated and the result proves the system is of characteristic of tolerant control and reliability.

Paper ID: CCC07-0571
Title: 基于支持向量机的旋转机械多类故障识别研究(On Rotary Machine's Multi-Class Fault Recognition Based on SVM)
Authors: 顾小军, 杨世锡, 钱苏翔
Abstract:

In response to the lack of rotary mechanical diagnostic samples, this paper takes the advantages of support vector machine (SVM) in small sample classification for rotary machine multi-class fault pattern recognition, and introduces three methods based on binary classifications: "one-against-all", "one-against-one", and "directed acyclic graph" SVM (DAGSVM) and then compare their performance. The experiments indicate that the SVM has high adaptability for rotary machine fault diagnosis in the case of small number of samples.

Paper ID: CCC07-0586
Title: 电子设备机柜结构的模态分析(The Modal Analysis of the Electronic Equipment Cabinet Structure)
Authors: 刘衍平
Abstract:

The modal analysis is an effective method to research on dynamic characteristic of system structure of electronic equipment cabinet and is also the foundation of dynamics response analysis. Using the shell unit, the solid unit and the beam unit of analysis software (ANSYS) of finite element, the finite element model of the cabinet was set up. On the basis of discussion about results of the modal analysis, the degree that distribution of cabinet mass and its stiffness influenced the natural frequency and the vibration model of the system was presented. Furthermore, the weaker region on the cabinet structure was identified and the reasonable corrective measure was provided. In conclusion, the result shows that it can propose the reliable data for dynamic optimum design of the cabinet, as well as the efficient method whether the cabinet will pass the environment tests for the electronic equipment.

Paper ID: CCC07-0695
Title: Fault Diagnosis of Hydro-Generator Unit via GA-Nonlinear Principal Component Analysis Neural Network
Authors: Ji Qiaoling, Qi Weimin, Cai Weiyu
Abstract:

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.

Paper ID: CCC07-0733
Title: 基于 CGHMM 的轴承故障音频信号诊断方法(A Continuous Gaussian Mixture HMM Based Acoustic Fault Diagnosis Scheme for Bearings)
Authors: 陆汝华, 杨胜跃, 樊晓平
Abstract:
轴承音频信号包含其运行状态的重要信息，通过分析这些信息就能对轴承故障进行有效诊断。本文率先引入基于连续高斯混合密度隐马尔可夫模型（Continuous Gaussian Mixture Hidden Markov Model, CGHMM）的轴承故障音频诊断方法，避免矢量量化带来的数据处理误差，提高了系统诊断精度：引入基于聚类算法的模型参数初始化方法和标定系数的前向-后向算法，简化系统复杂度，加快了训练和诊断速度，进一步提高了诊断精度。实验结果表明，诊断精度达到98.75%，具有很好的应用前景。

Plentiful significant information about the operation status of bearings, which is potential for the fault diagnose after processed properly, is contained in their acoustic signals. In this paper, a new fault diagnosis scheme using acoustic signals is proposed for the bearings by introducing continuous Gaussian mixture hidden Markov model (CGHMM) method, in which the data processing error due to vector quantization is avoided, and therefore the diagnosis precision is improved. Besides, a clustering algorithm and a scaled coefficient algorithm are introduced for parameters initiation and the forward and backward algorithms to simplify the complexity in the computation and improve the training and recognizing speed and diagnosis precision. At last, experiment results of a diagnosis precision achieved to 98.75% demonstrated the feasibility and potential for applications of the presented scheme.

Paper ID: CCC07-0773
Title: 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)
Authors: 王丽英, 方攸同, 苏丽颖, 刘宝友
Abstract:
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，先行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所有可靠性指标，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.

Paper ID: CCC07-0843
Title: Transformer Dissolved Gas Analysis Using Least Square Support Vector Machine and Bootstrap
Authors: Tang Wenhu, Shintemirov Almas, Wu Q. H.
Abstract:
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.

Paper ID: CCC07-0873
Title: Modeling and Simulation of Complex Maintenance System Dynamics
Authors: Yin Xiaohu, Wen Xisen, Qian Yanling, Yang Yongmin
Abstract:
Equipment maintenance system is naturally a complex dynamical system. The effective maintenance management must be based on the knowledge of the system's intrinsic dynamics. This paper analyzes the basic structure and elements of maintenance system for complex multi-components equipment. The maintenance system is considered as a dynamic system whose behavior is influenced by its structure's feedback and interaction, and available resources. Building the dynamical model with Simulink, we show some results about the maintenance system's nonlinear dynamics, which are never given by stochastic process methods. The model can be used for understanding and determining maintenance system behaviors, towards which operational adjustments of maintenance infrastructure, precise prediction of maintenance requirements and timely supply of maintenance resources can be made in a more informed way.

Paper ID: CCC07-0989
Title: 基于观测器的 Delta 算子系统故障检测(Observer-Based Fault Detection for Delta Operator Systems)
Authors: 张端金, 张爱玲
Abstract:
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.

Paper ID: CCC07-1225
Title: 支持向量机在齿轮智能故障诊断中的应用研究(Gear Fault Intelligent Diagnosis Based on Support Vector Machines)
Authors: 吕蓬, 柳亦兵, 马强, 魏于凡
Abstract: 本文研究了支持向量机在齿轮断裂智能故障诊断中的应用, 在特征值提取和数据预处理方面作了有益的探讨。时域特征值包括峰值值、相对均值、方根幅值、方均幅值, 频域特征选择的是均方频率。利用齿轮箱振动信号提取的时域、频域特征值作支持向量机(SVM) 故障诊断研究, 通过对齿轮箱振动信号提取的时域、频域特征值作支持向量机 (SVM) 故障诊断研究, 通过对齿轮箱振动信号提取的时域、频域特征值作支持向量机分类, 反映了故障的发展趋势, 并对分类效果图作了对比研究, 证实证明滤波后的诊断效果比滤波前有很大提高。
Support Vector Machines(SVM) was used in fault intelligent diagnosis of gear. The main research in feature extraction and data preprocess. The feature value of time domain includes peak value, peak to peak value, kurtosis and so on. The feature value of frequency domain is MSF. The SVM method was used for detecting the gear case. The feature of time and the feature of frequent was used. The results showed that the SVM can distinguish the different fault in different time. Through designed a band-pass filter, the feature of gear case's signal was extracted, including feature of time and feature of frequent. The results showed that it was better than that signals which didn't use filter.

Paper ID: CCC07-1256
Title: A Multi-sensor Fusion Method for the Detection of Cavitations in the Hydropower Turbine
Authors: Liu Suyi, Wang Shuqing
Abstract: An on line monitoring and diagnosis system for a modern power plant is essential as hydropower turbine failures are rarely single mode events. Normally, hydropower turbine deterioration is a slow process involving many factors. Cavitations are most severe, eventually forcing a shutdown for repair of affected parts. Cavitations phenomenon in an operating turbine are ubiquitous and unpredictable, and much different in one type turbine from others. Cavitations are often connected with efficiency change, increase of noise level and vibrations. Consequently, early studies on cavitations detection in hydropower turbines are indirectly based on observation or feeling of vibration pulsations on surface of the guide-vane stem, the draft tube wall, the lower guide bearing etc or intensity of acoustics emission on the turbine casing. The most feasible approach to detect cavitations must be of less influence to the normal turbine operation conditions, thus we must gain insights into its condition with a nondestructive technique (NDT). The aim in the present paper is to develop an adequate monitoring and diagnosis system on line based on NDT to detect the cavitations occurrence and to quantify its aggressiveness in order to optimize turbine operation.
and to extend inspections and repairs interval.

Paper ID: CCC07-1335
Title: Modeling of a Power Transformer Winding for Deformation Detection Based on Frequency Response Analysis
Authors: Shintemirov Almas, Tang Wenhu, Wu Q. H.
Abstract:
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 delectability. 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.

Paper ID: CCC07-1503
Title: 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)
Authors: 薄翠梅, 李俊, 陆爱晶, 张广明
Abstract:
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, 通过仿真验证 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.
Title: Research on Fault Diagnosis Based on Fuzzy Probability SDG in Complex System
Authors: Zhu Lin, Chen Jie, Chen Wenjie, Deng Fang
Abstract:
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.

Paper ID: CCC07-1542
Title: Vibration Fault Detection and Diagnosis Method of Power System Generator Based on Wavelet Fractal Network
Authors: Kang Shanlin, Liang Baoshe, Fan Feng, Shen Songhua
Abstract:
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.

Paper ID: CCC07-1567
Title: Fault Diagnosis of Aerospace Rolling Bearings Based on Improved Wavelet-Neural Network
Abstract:

针对现有小波神经网络在故障诊断中存在的问题，根据滚动轴承振动信号的频域变化特征，在阐述了小波包分析方法和小波神经网络故障诊断的基本思想的基础上，提出了一种基于小波包分析特征提取和改进的小波神经网络的诊断系统，利用小波包分解后各频段能量的分布作为特征向量输入神经网络，利用改进的小波神经网络完成航空滚动轴承故障模式的识别。理论和试验证明该方法提取故障特征能加快小波神经网络的训练速度，能迅速地对滚动轴承进行故障的检测和定位，具有广泛的应用前景。

In order to improve the performance of fault diagnosis systems based on a wavelet neural network, according to the frequency domain characteristics of the vibration signals of the ball bearings, a diagnosis system which based on the wavelet packet analysis for picking up character and improved wavelet neural network is proposed, the conception of wavelet packet analysis and the basic idea of fault diagnosis of wavelet and neural network are also involved. The energy distributing of each frequency segment which is decomposed by wavelet packet is treated as the eigenvector and input the IWND, and the recognition of the fault models of the ball bearings is completed by using improved wavelet neural network. The result of test and theory shows that circuit fault can be detected and located quickly by using this method and the training speed of wavelet neural network is dramatically accelerated.

Paper ID: CCC07-1614
Title: The Research and Application on Wavelet Energy Eigenvalues of a Faulty Generator Set
Authors: Hou Rongtao
Abstract:
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.

Paper ID: CCC07-1723
Title: 基于支持向量机的电力电子电路故障诊断(Fault Diagnosis of Power Electronic Circuits Based on Support Vector Machine)
Authors: 梁禹, 王义刚, 王娜
Abstract:
本文提出采用支持向量机实现电力电子电路故障诊断的方法, 在小样本的情况下，实现高准确率的故障诊断，克服了神经网络等方法的局限性。并且以三相桥式整流电路为例，对其故障情况进行了分析，选用支持向量机进行了有效的故障诊断。仿真实验表明，本方法是有效的。

Based on support vector machine theory, a new on-line fault diagnosis method for power electronic circuits is presented in this paper. This method can get a high accuracy of fault diagnosis result for
small sample and overcome the limitation of neural network. A support vector machine is constructed, which diagnose fault of three-phase rectifier effectively. The method is verified by simulation experiment.

Paper ID: CCC07-1794
Title: 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)
Authors: 刘士荣, 何文波
Abstract: 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.

Paper ID: CCC07-0001
Title: On Remote Real-time Communication Between MATLAB and PLC Based on OPC Technology
Authors: Zhang Lieping, Zeng Aiqun, Zhang Yunsheng
Abstract: 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.
Title: Switched Control of Networked Control Systems

Authors: Ma Changlin, Jiang Hong

Abstract:

For network-induced delays greater than one sampling period in networked random control systems, when the system delay is several times larger than the sampling period, 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 results verify the validity of the proposed theory.

Paper ID: CCC07-0254

Title: On Modeling of WWW Wireless Traffic in UMTS

Authors: Zhang Youzhi, Pei Tingrui, Wang Yalan, Guo Dezh

Abstract:

With the improvement of capability of computer and simulating technology, the use of computer simulation is more and more wide. This paper proposes a three-layer traffic model from analyzing the ON/OFF model and the WWW traffic stream that fit actual wireless traffic better, and build a single cell UMTS simulation plat. Stimulating on the OPNET model proves that three-layer traffic model is more precise than ON/OFF modeling. It is a kind of ideal traffic model. Applying this model benefit improving quality and efficiency of the wireless network programming and optimizing.

Paper ID: CCC07-0406

Title: Global Behavior of Dynamical Agents in Directed Network

Authors: Yu Hongwang, Zheng Yufan, Leng Cuiping

Abstract:

This paper investigates the aggregation behavior of controlled dynamical agents in directed network. The agents are Lyapunov stable distributed in a line and communicate by directed network. The communication topology of network is
characterized by a directed graph and the control protocol is
designed in simple linear feedback law. We study the conditions
under which agents will achieve aggregation behaviors, critical
and divergent case. Numerical simulations are given and they
demonstrate that our theoretical results are effective.

Paper ID: CCC07-0423
Title: 网络化控制系统传输迟延与数据丢包综合补偿 (Co-Compensation for Transmission Delay and Packet Dropout in Networked Control System)
Authors: 王天堃, 周黎辉, 韩璞, 徐大平
Abstract: 针对网络化控制系统 (NCS) 具有不确定性的传输迟延与数据丢包特性，设计了一个分布式的网络化控制系统模型。综合考虑不同网络节点间的不确定性传输迟延和数据丢包问题，在控制器节点引入了广义预测控制 (GPC) 和 BP 神经网络相结合的补偿算法，并在控制器节点和执行器节点中分别引入排序队列机制，从而实现了针对不同网络节点间传输迟延与数据丢包的综合补偿。在传输迟延与数据丢包并存的以太网络环境下进行仿真试验，验证了综合补偿方案具有良好的控制效果和较强的鲁棒性。

With regards to the characteristics of uncertain transmission delay and packet dropout of networked control system (NCS), a distributed model is proposed in this paper. Queuing strategy is introduced both in controller nodes and actuator nodes while the transmission delay and packet dropout between controller nodes and actuator nodes is co-compensated by multi-step increment given by the algorithm of General Predictive Control (GPC) and BP neural network. Simulation experiments are practiced over Ethernet which embraces both uncertain transmission delay and packet dropout, and it is proved that the scheme of co-compensation remains a good control performance.

Paper ID: CCC07-0450
Title: 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)
Authors: 沈青, 桂卫华, 阳春华, 熊英
Abstract: 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状态矩阵，通过对单个时不变矩阵范数的判断，导出区问系统鲁棒稳定的充分条件，仿真算例表明该判据简单易实现。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.

Paper ID: CCC07-0544
Title: 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)
Authors: 骆吉安, 柴利
Abstract: 文章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算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.

Paper ID: CCC07-0601
Title: 基于子集划分与动态匹配机制的智能标签防冲突算法(An Anti-Collision Algorithm Based on Subset-division and Dynamic Matching Mechanism for Intelligent Tags)
Authors: 曹小华, 周强
Abstract: 文章分析了时隙 Aloha 法在智能标签识别防冲突中的不足,提出了一种新的基于子集划分与动态匹配机制的智能标签防冲突算法。它改进了 ISO/IEC15693 标准中的自匹配模式,根据时间片划分标签子集,动态调整匹配范围,以减少标签冲突,提高系统吞吐率、识别效率和成功率。最后通过计算机模拟仿真,将该算法与 Aloha 等其他算法之间进行比较。结果表明,新冲突算法在待识别标签数量较大的情况下明显提高了识别效率、识别成功率和吞吐量,具有较强的应用价值。

A collision will occur when more than one tag is read by the reader in the RFID system. The Slotted Aloha algorithm is presented to solve tag collision problem. But it has some deficiencies when the number of tags is great. An anti-collision algorithm based on subset-division and dynamic-matching mechanism was presented to advance it in this work. It divided the intelligent tags into different subsets according to time-slices and adjusted dynamically the matching area to reduce the collision probabilities. The simulation results show that compared with slotted aloha, the new anti-collision algorithm enhances obviously the identifying efficiency, success-identifying rate and throughput, and its success-identifying rate can reach 95% even though the number of tags is great. It takes on better application value.
Title: 基于 RBAC 的无线传感器轻量安全模型研究(Light-weight Secured Model for Wireless Sensor Network Based on RBAC)

Abstract: 本文将 RBAC(Role Based Access Control)安全访问控制理论模型进行了理论扩展，提出了一种 TinyOS 环境下基于能量考虑的无线传感器 RBAC 模型——TinyRBAC。文章从模型的核心模块、角色层次和约束机制几个方面对该模型进行了详细描述和定义；针对不同的无线传感器网络体系结构设计了相应的实现机制；对 TinyOS 的相关数据帧格式进行了修改；最后通过理论分析和试验测试，评价了模型中有关安全技术的安全指标与性能指标，证明了 TinyRBAC 在无线传感器网络中的可行性与实用性。

In this paper, the RBAC (Role Based Access Control) model is extended to TinyRBAC which is a light-weight secured model for wireless sensor network in TinyOS. The core module, role hierarchy and restricted mechanism are described and defined in the paper, through the analysis and experiments, the secure targets and performance are evaluated. The result shows that the TinyRBAC is feasible and useful for wireless sensor network.

Title: 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)

Abstract: 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案。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.

Title: Energy Efficient Routing Protocol Based on Residual Energy and Energy Consumption Rate for Heterogeneous Wireless Sensor Networks

Abstract: 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.
Abstract:
The embedded gateway make it possible for the data from different traditional network transparent transmitted with IP network. But most embedded gateway application limited to LAN and can not support the node communication between different WAN. In order to realize the instant communication of network node in different LAN, an embedded gateway based on P2P protocol is proposed in the paper. The protocol packet format is redefined and work flow between server and client is introduced.

Abstract:
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。

Abstract:
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.

Paper ID: CCC07-0952
Title: SCTP 流量的混沌控制研究(On SCTP Traffic Chaotic Control)
Authors: 刘润杰, 申金媛, 穆维新
Abstract:
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（PPBCTC）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.

Paper ID: CCC07-0966
Title: NBTRL: A Software Platform for Network Background Traffic Replay Based on Log
Authors: Zhao Kuo, Tang Kuo, Chu Jianfeng, Hu Liang
Abstract:
While the use of intrusion detection system (IDS), which monitors passively specific computing resources, and reports anomalous or intrusive activities, is becoming ubiquitous in today’s network, evaluating IDS performance has been found to be challenging. Most IDS testing approaches are faced with selections with regard to their use of background traffic, which plays an important role in IDS testing. This paper presents the design and implementation of NBTRL, a software platform for network background traffic replay based on log files applied to IDS testing. NBTRL consists of information extraction module, packet preprocessing module and replay module. This software platform can extract traffic information from log files, control the speed of background traffic replay, process truncated packets, modify MAC address or IP address of packets, and provide a flexible and reusable experimental environment for IDS testing.

Paper ID: CCC07-0985
Title: Adaptive Control for Real-time Computing System
Authors: Chen Yi, Gao Ge, Liu Hao
Abstract:
There may be great degradation in service level management (e.g., an email server) due to dynamical variants of real systems and measured disturbance in the network. An adaptive predictive congestion control is presented for service systems to prevent oscillation and delay induced by highly stochastic behaviors of computing system which can not be got rid of by conventional control. We analyze the controller in detail and prove the error can be reduced to
zero in steady state. The effectiveness of the proposed methods is demonstrated by the simulation results.

Paper ID: CCC07-1055
Title: The Application of Dynamic Programming Algorithm in Route Protocol of Wireless Sensor Network (WSN)
Authors: Shi Weinan, Deng Pengcheng, Zhang Yang
Abstract:
This paper studies 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.

Paper ID: CCC07-1061
Title: A Novel Management Method Based on SNMP
Authors: Cheng Chuanqing, Wang Li
Abstract:
This paper introduces a novel management method based 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 an error return scheme in the process. The method is very fit for high speed network.

Paper ID: CCC07-1075
Title: Study of QoS Based on Flow Classification in Multi-Layer Switch
Authors: Cheng Chuanqing, Wang Li
Abstract:
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.

Paper ID: CCC07-1134
Title: 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)
Authors: 耿宏, 张晓瑜, 陈玖圣, 董健康
Abstract:
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的格式的转换流程, 抽象出空地数据链数据通信及报文转换系统模型, 为甚高频空地数据链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.

Paper ID: CCC07-1205
Title: Fair Congestion Control for FAST TCP
Authors: Lu Quan, Qiu Junping
Abstract:
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.

Paper ID: CCC07-1374
Title: 基于 IEEE802.15.4 的一种分簇算法研究 (A Clustering Algorithm Based on IEEE802.15.4)
Authors: 张维勇, 张芬, 马学森
Abstract:
为实现大型移动传感器网络节点管理, 提出一种简单的分簇算法。算法能够快速部署网络, 同时在节点快速移动时, 维护簇结构的控制开销较小。分析了无线传感器网络通信标准 802.15.4 协议的一些重要特征, 重点给出算法结合 MAC 协议, 利用信标同步和时槽保障机制的实现方法。最后, 仿真结果表明分簇算法能够有效的管理网络。

For the sake of managing the mobile node in the large Wireless Sensor Network, a simple Clustering Algorithm is propounded, which can form the network structure rapidly and make use of less control overhead to adapt to mobility. The algorithm is implemented in combination with IEEE 802.15.4 MAC protocol, which has the characteristics of beacon synchronization and Guaraanted Time Slots. Finally, the simulation experiments illustrate the algorithm is able to managed network effectively.

Paper ID: CCC07-1404
Title: 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
Authors: 王艳, 纪志成, 谢林柏, 胡维礼
Abstract:
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.

Paper ID: CCC07-1406
Title: AODV 协议一种高效的安全性改进(An Efficient Security Enhancement of AODV Protocol)
Authors: 张国庆, 慕德俊, 许钟, 杨卫莉
Abstract:
AODV 协议是一种在 Ad Hoc 网络中广泛应用的路由协议，但它没有任何的安全措施，极易遭到攻击。本文分析了该协议的安全隐患并在其基础上进行了安全性改进。利用构造的 blackholes 和 rushing 两种攻击模型，在 QualNet 仿真环境下对改进协议进行了性能和安全性验证，结果表明，改进协议继承了原协议高效的路由发现和维护能力，在没有显著增加时间延迟情况下协议的安全性得到了极大提高。
AODV routing protocol is widely used in Mobile Ad hoc networks, but it does not have any security mechanism, so it is very vulnerable to security attacks. This paper analyses the common threats of AODV and then a security improvement is carried out. By setting up blackholes and rushing attack models, the performance of improved protocol is simulated using QualNet simulation tools. The results show that our security enhanced solution can not only protect against those attacks but also maintain the efficiency of AODV.

Paper ID: CCC07-1426
Title: 自适应 Internet 主动队列管理算法(Internet Adaptive Active Queue Management Algorithm)
Authors: 赵永升, 张福增, 杨洪勇
Abstract:
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.

Paper ID: CCC07-1438
Title: 传感器网络局部时间同步协议研究(Time Synchronization for Wireless Sensor Networks Based on Local Level Structure)
Authors: 石为人, 张阳, 邓鹏程
Abstract:
时间同步技术是无线传感器网络许多功能实现的基础. 传统的时间同步技术如GPS 和NTP对硬件要求较高, 不适合无线传感器网络. 这篇文章考虑了无线传感器网络的需求, 设计了一个基于局部层次结构的时间同步算法, 通过仿真证明该算法是可行的, 适用于无线传感器网络.

Time synchronization is a critical piece of infrastructure for wireless sensor networks. The existing time synchronization protocols such as GPS and NTP require powerful hardware to support aren't fit to sensor network. This paper analyzes the characteristic of sensor network, propose a time synchronization algorithm based on local level structure. Experiment shows that this method is feasible and can be used to wireless sensor networks.

Paper ID: CCC07-1471
Title: 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)
Authors: 熊永华, 吴敏, 贾维嘉, 张历卓
Abstract:
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)的视频通信的现状, 创新性地利用普通3G modem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, 并被多家报纸所报道。

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 be reported by many newspapers.

Paper ID: CCC07-1482
Title: 基于MATLAB的车载CAN网络模拟技术(Simulation Technique of In-vehicle CAN Network Based on MATLAB)
Authors: 徐小娟, 刘志远

Abstract:
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.

Paper ID: CCC07-1556
Title: 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)
Authors: 贾允毅, 胥布威, 王世华, 刘步春

Abstract:
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.

Paper ID: CCC07-1615
Title: NEMO 网络中基于 NSIS 的资源预留(NSIS-based Resource Reservation for NEMO)
Authors: 严旭影, 彭军, 张伟, 李春明, 童海涛

Abstract:
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.

Paper ID: CCC07-1648
Title: 一种自适应非同步的无线传感器网络 MAC 协议(An Adaptive and Asynchronous MAC Protocol for Wireless Sensor Network)
Authors: 杨玺, 樊晓平, 刘少强, 喻志华
Abstract:无线传感器网络由于其广泛的应用领域而成为研究的热点。本文提出了一种自适应非同步的无线传感器网络访问控制协议—A2FMAC(Adaptive and Asynchronous Medium Access Protocol with FRTS)。A2FMAC 改善了 PMAC 中的工作模式产生机制和帧中时隙调度方法，使得节点的工作-休眠状态能够根据自身和网络流量状况自适应变化。Quorum 矩阵表格非同步设计和 FRTS 机制的引入使得节点减少了休眠导致的网络传输延时，平衡了能量和延时两者的性能指标。经过理论分析及和仿真实验，本文的 A2FMAC 通过适当的休眠策略节省了网络的能量消耗，同时也降低了网络的传输延时。

Wireless sensor networks are appealing to researchers due to their wide range of application. This paper proposes A2FMAC(adaptive and Asynchronous Medium Access Protocol with FRTS) an adaptive and low-latency MAC protocol designed for wireless sensor networks. A2FMAC saves energy by the proper sleep mechanism according to the nodes’ own traffic and the grid quorum-based mechanism solves the asynchrony in the multi-hop wireless sensor network. A better pattern and schedule generation schemes are developed in this paper. And FRTS(Future Request To Send) is used in order to reduce the latency. The analytical and experimental results show that A2FMAC obtains more energy savings and reduce the latency.

Paper ID: CCC07-1722
Title: Collision and Priority of Packet Based Adaptive Enhanced Distributed Coordination Function
Authors: Wang Yan, Jin Shunfu
Abstract: Based on some mechanisms of Distributed Coordination Function mechanism, we give the method of updating the parameters of system adaptively, and propose the CPAEDCF (Collision and Priority of Packet Based Adaptive Enhanced Distributed Coordination Function) mechanism, in which the collision rate and the priority of packet are considered. In CPAEDCF mechanism, the updating of back off time and the size of contention windows depend on a factor c, which can reflect the collision rate and the priority of packet. By numerical results, we conclude that CPAEDCF mechanism can ensure that each kind of packets access the channel adaptively, therefore, the CPAEDCF mechanism can improve the system performance.
Title: Throughput Capacity of Interference-Limited Hybrid Wireless Networks
Authors: Chen Lin, Jiang Changjun, Chen Hongzhong
Abstract:
In this paper, the capacity of ad hoc wireless networks with infrastructure support based on physical model is studied. In the hybrid wireless network model, base stations are placed in a regular pattern, but nodes are independently and uniformly located within a unit area. Two scaling regimes are identified, depending on the growth of the number of base stations relative to the number of nodes. We show that under our routing strategy, a minimum growth speed of the number of base stations is needed, before the base stations start to have an effect. Above the growth speed, the maximum aggregate throughput capacity grows linearly with respect to the number of base stations.

Title: Fair Bandwidth Allocation for Wireless Ad-hoc Networks
Authors: Guan Xinping, Ma Kai, Long Chengnian
Abstract:
This paper examines the fair bandwidth allocation problem for wireless ad-hoc networks through an optimization scheme. The interaction between links in mobile wireless networks introduces the fundamental constraints on the flow rate. We propose a primal-dual algorithm which guarantees fair bandwidth allocation, and is proved to be stable. We can obtain various fairness indexes by choosing the specified form of the utility functions, and the numerical results indicate the effectiveness and fairness of the algorithm.

Title: Modelling and Control of Networked Control Systems with Random Packet Losses
Authors: Zhang Wen'an, Yu Li, Song Hongbo
Abstract:
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.

Paper ID: CCC07-0045
Title: 蚁群算法与遗传算法的混合算法(Hybrid Algorithm Combining Ant Colony Optimization
Algorithm with Genetic Algorithm)
Authors: 高尚, 江新姿, 汤可宗
Abstract:
根据蚁群算法与遗传算法的特性,提出了求解旅行商问题的混合算法。首先由遗传算法生成
信息素分布,然后由蚁群算法根据累计更新的信息素找出若干解后,再经过遗传算法的交
叉、变异操作,得到更有效的解。与模拟退火算法、标准遗传算法、蚁群算法和随机初始化
的蚁群算法进行比较,16 种混合算法效果都比较好,其中交叉策略 B 和变异策略 B 的混合
算法效果最好。

By use of the properties of ant colony algorithm and genetic algorithm, a hybrid algorithm is
proposed to solve the traveling salesman problems. First, it adopts genetic algorithm to give
information pheromone to distribute. Second, it makes use of the ant colony algorithm to get
several solutions through information pheromone accumulation and renewal. Finally, by using
across and mutation operation of genetic algorithm, the effective solutions are obtained. Compare
with the simulated annealing algorithm, the standard genetic algorithm, the standard ant colony
algorithm, and statistics initial ant colony algorithm, all the 16 hybrid algorithms are proved
effective. Especially the hybrid algorithm with across strategy B and mutation strategy B is a
simple and effective better algorithm than others.

Paper ID: CCC07-0130
Title: 免疫连续蚁群算法(Immunized Continuous Ant Colony Algorithm)
Authors: 高玮
Abstract:
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.

Paper ID: CCC07-0133
Title: 一种新的克隆混沌调节算法研究(On A Novel Clonal Chaos Adjustment Algorithm)
Authors: 洪露, 穆志纯
Abstract: 摘要: 基于生物免疫系统克隆选择和独特型免疫网络理论, 引入混沌机制, 提出了一种新的人工免疫算法——克隆混沌调节算法(CCAA)。该算法利用混沌 Logistic 映射的遍历性和随机性, 结合抗体的先验知识和进化代数设计了自适应混沌变异算子对抗体进行变异, 有效地避免了搜索的盲目性, 提高了算法的收敛速度。利用随机过程理论为数学工具, 分析了 CCAA 所形成抗体种群的平均适应度函数的鞅性质并由此得出了算法的几乎处处强收敛性的结论。在多模态函数优化的仿真实验中, 结果不仅验证了 CCAA 理论上几乎处处强收敛性的结论, 同时也表明了该算法能有效地抑制早熟, 具有更好的全局收敛性和稳定性。Abstract: A new immune algorithm——the clonal chaos adjustment algorithm (CCAA) is proposed by integrating the chaos mechanism on the basis of the clonal selection principle and idiotypic immune network theory exhibited in biological immune system. Taking advantages of the ergodic and stochastic properties of chaos Logistic Equation, an adaptive chaos mutation operator is designed by the combination of prior knowledge of antibody and evolution iterations. The operator can avoid blind research and enhance the convergent speed effectively. By using stochastic processes theory as the mathematical tools, the martingale characteristic of the average fitness function of the population is analyzed and the almost sure strong convergence of CCAA is deduced. In the simulation experiments of multi-modal function optimization, the results verify that the theory convergent conclusion proven above is right, and also show that CCAA can inhibit prematurity and has preferable global convergent ability and stability.

Paper ID: CCC07-0154
Title: Large-scale Hydropower Station Economic Dispatch Based on Immune Algorithm
Authors: Xu Chenguang, Zhao Maihuan
Abstract: In accordance with the characteristic of large-scale hydropower stations, a minimum-water-consume model was proposed and Immune Algorithm (IA) was used to solve Economical Operation of Hydropower Plant (EOHP) in this paper. Compared the result obtained by IA with those obtained by Genetic Algorithm (GA) and Evolutionary Programming(EP) in a case study, IA showed its effectiveness and good global search performance. And IA was better than GA in solving EOHP problem.

Paper ID: CCC07-0269
Title: 粒子群算法在高速公路多路径费用拆分方法研究(A Particle Swarm Optimal Algorithm
for Multiple Path Toll Problems on Freeway Networks
Authors: 李曙光
Abstract:
为了解决高速公路多路径费用拆分问题,本文首先给出评估概率拆分方法准确性的三个指标,并以平均 OD 旅行时间为基础,建立了相应的随机用户平衡模型;然后,给出了一个求解全局优化问题的粒子群算法,算法中使用了两种不同的方法处理相应的约束条件。最后,在两个路网中,进行相应的仿真试验;结论表明使用平均 OD 旅行时间估计路径流量的方法,在不同路网中,实际与估计的路径流量、路段流量以及 OD 总旅行时间是非常接近,这表明模型和算法是有效的和可行的。

In order to solve multiple path toll problems on freeway networks, firstly three evaluation indications are given for the fuzzy path toll methods. And a stochastic user equilibrium model is presented based on average OD travel time. Then, a particle swarm optimal algorithm is given, in the algorithm; two methods are used to deal with several constraints of the model. Finally, the numerical examples are given in two networks. The results show the quality of method.

Paper ID: CCC07-0482
Title: Using Good Nodes Set Principle to Evolution Strategy for Constrained Optimization
Authors: Xiao Chixin, Cai Zixing
Abstract:
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.

Paper ID: CCC07-0485
Title: 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)
Authors: 程远林, 李茂军
Abstract:
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.

Paper ID: CCC07-0516
Title: 基于 GA 优化的个人信用评估 SVM 模型 (Personal Credit Scoring Model Based on SVM Optimized by GA)
Authors: 姜明辉, 袁绪川
Abstract:
支持向量机 (SVM) 中的参数影响着模型的分类能力。针对 SVM 中人为选择参数的随机性，提出了利用遗传算法 (GA) 进行优化的方法，构建了基于 GA 优化的 SVM 模型，并将其应用于商业银行的个人信用评估中。利用 GA 的全局搜索能力搜索 SVM 中的参数，并通过染色体适应度函数的设置来控制给商业银行造成较大损失的第二类误判的发生。模型的应用结果与 BP 神经网络进行对比表明，基于 GA 优化的 SVM 模型的分类精度高，第二类误判得到了有效的控制，并且表现出较好的稳健性，对于控制消费信贷风险具有更好的适用性。

The parameters of support vector machine (SVM) are crucial to the model's classification performance. Aiming at the randomness of selecting the parameters in SVM, this paper presents a method to optimize the parameters of SVM by using genetic algorithm (GA). Using GA's global search to optimize the parameters of SVM and using the chromosome's fitness function to control the type II error rate in personal credit scoring which costs great loss to commercial banks, compared with BP neural network, the application results indicate that SVM model optimized by GA gets higher classification accuracy and the type II error rate is limited efficiently. The SVM model optimized by GA also shows stronger robustness which presents more applicable for commercial banks to control the consumer credit risks.

Paper ID: CCC07-0707
Title: 基于协进化方法的多智能体系统及其符号演绎理论模型 (Multi-Agent System Based on Co-evolution Method and Its’ Symbol Deduction Theory Model)
Authors: 薛宏涛, 沈林成
Abstract:
协进化方法是解决多智能体协作问题的一种新途径。本文首先介绍了基于协进化机制的多智能体系统体系结构以及协作机制，然后基于 Wooldridge 关于多智能体系统的符号模型定义了协进化智能体的符号演绎模型，包括协进化智能体的信念、通信、动作、外部动作的评估、整合模型以及协进化决策器模型等各个方面，并将协进化智能体模型与实际世界模型形成一个统一的闭环系统。最后，建立了基于协进化方法的多智能体系统的符号演绎理论模型。

Co-evolution Method is a kind of new approach for solving multi-agent collaboration problem. In this paper, we firstly introduce the multi-agent system based on co-evolution and its' collaboration mechanism, then we make a series of hypotheses about co-evolutionary agent. Basing on Wooldridge’s symbol model of multi-agent systems, we define the symbol deduction model of co-evolutionary agent, including its’ belief, communication, action, evaluation and integration model of external action, and the co-evolutionary decision model. Thus, the model of co-evolutionary agent and the world can form a uniform closed loop system. At last, the symbol deduction theory model of multi-agent system based on co-evolution is established by system modeling method.

Paper ID: CCC07-0818
Title: 一种改进的基于群体的增量学习算法(An Improved Population-Based Incremental Learning Algorithm)
Authors: 张庆彬, 吴惕华, 刘波
Abstract:
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.

Paper ID: CCC07-0863
Title: On Line Parameter Identification of an Induction Motor Using Improved Particle Swarm Optimization
Authors: Chen Guangyi, Guo Wei, Huang Kaisheng
Abstract:
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 aslo 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.

Paper ID: CCC07-0917
Title: On Some Non-linear Decreasing Inertia Weight Strategies in Particle Swarm Optimization
Authors: Huang Chongpeng, Zhang Yulin, Jiang Dingguo, Xu Baoguo
Abstract:
Inspired by analyzing principle of PSO, some non-linear strategies for decreasing inertia weight (DIW) are proposed based on the existing linear DIW (LDIW), in this paper. Then a power function is designed to unify them. Four benchmark functions are used to evaluate these strategies on the PSO performance and select the best one. The experimental results show that for most continuous optimization problems, the best one gains an advantage over the linear strategy and others. It has more varieties of the swarm at the early stages so can escape from local minimum more easily, and also can speed up the convergence of particles at the later stages to improve the performance of PSO.
Paper ID: CCC07-1020
Title: 一种基于 EDAs 和聚类分析的杂合进化算法(A Hybrid Evolutionary Algorithm Based on EDAs and Clustering Analysis)
Authors: 曹爱增, 陈月婷, 魏军, 李金屏
Abstract:
在讨论种群进化趋势的基础上, 结合 EDAs (Estimation of Distribution Algorithms) 和聚类分析的基本思想, 提出了一种改进的杂合进化算法。首先, 利用聚类分析将现有种群进行初步分类, 并根据类内个体信息采用 EDAs 原理构造类内个体的分布状况; 然后, 对于每一分类, 利用 EDAs 产生下一代部分个体, 采用极值组合的思想进行类间信息交互, 产生下一代的其余个体, 从而有效防止早熟收敛。当某类个体的分布区域缩小到一定范围后, 利用 EDAs 产生下一代个体的过程将退化为穷举的局部搜索过程。仿真结果表明, 这种算法能够在极大提高全局搜索效率的基础上, 可以有效地防止早熟收敛。
An improved mixed evolutionary algorithm is proposed, which is based on evolutionary trend, EDAs (Estimation of Distribution Algorithms) and clustering analysis. Firstly, the population is classified by clustering algorithm, then for each class, partial individuals of next generation are generated by EDAs, and the rest are supplemented by combination of extrema among classes, which can overcome the premature effectively. When the individuals in some classes converge to a small field, an exhaustive local search replaces EDAs. Simulation shows the algorithm can not only improve the global searching greatly, but also overcome premature effectively.

Paper ID: CCC07-1110
Title: 量子遗传算法在物流配送计划中的应用(Application of Quantum Genetic Algorithm in Logistics Distribution Planning)
Authors: 王锡淮, 杨英, 肖健梅
Abstract:
本文基于量子遗传算法, 提出一种解决物流配送中心配送优化的新方法。首先将量子比特的编码方式与具体配送量相结合, 同时提出的三种不同的调整策略, 对同类调度优化问题具有参考价值; 然后探讨了新的量子更新进化策略, 使其更好地针对配送问题。最后验证量子遗传算法的“勘探” 和 “开采” 能力, 试验结果表明量子遗传算法在该类问题中的可行性, 以及在调度优化、决策支持等方面巨大的发展潜力。
In this paper, the Quantum Genetic Algorithm is proposed to decide the distribution scheme for logistic centers. Firstly, the key point of the paper is the combination of the quantum bits coding method with the real transportation quantities. At the same time, three different adjustment strategies are also compared in this paper, having the great value for the reference to the schedule problem; Then to be more proper to the distribution problem, a new quantum renew methods is developed. At last proving the ability of exploring and development of QGA, the results of tests proved the algorithm available to the schedule problem, and have a great space to development in SDS(Supply and Distribution System), DS(Decision Support), PS(Production Scheduling).

Paper ID: CCC07-1127
Title: 多种群并行粒子群算法研究(On Multi-population Parallel Particle Swarm Optimization Algorithm)
Authors: 张顶学, 关治洪, 刘新芝
Abstract:
针对粒子群优化（PSO）算法容易陷入局部最优，提出了一种多种群并行粒子群算法（DPPSO）。该算法将子种群分为探测型和开发型，对于探测型种群采用全局模型PSO算法，以增大探测最优个体的能力；而开发型种群采用局部模型PSO算法，加强算法局部搜索能力，在局部范围内搜索全局最优解，同时保持了种群之间的信息交流。实验结果表明，该算法保持了群体多样性，从而避免了早熟。

To improve performance of particle swarm optimization (PSO) algorithm and avoid trapping to local minima, a multi-population parallel particle swarm optimization (DPPSO) algorithm is proposed. In the algorithm, sub populations are divided into exploration and exploitation types. The global version PSO is used in the exploration population to enhance ability of exploring the best individual, and the local version PSO is used in the exploitation population to enhance ability of local search and find the best global result in the local range. Simultaneously, keep communication with sub populations in running. The experimental results show that the restraining premature convergence is enhanced for maintaining the individual diversity.

Paper ID: CCC07-1156
Title: A Kind of Image Segmentation Method Based on the Combination of GA and Two-Dimensional Entropy
Authors: Li Youxin, Mao Zongyuan, Tian Lianfang
Abstract:
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.

Paper ID: CCC07-1177
Title: 改进的遗传算法在虚拟企业伙伴选择问题中的应用(Application of Improved Genetic Algorithm in Virtual Enterprise Partnership Selection)
Authors: 韩江洪, 王梅芳，马学森，王跃飞
Abstract:
合作伙伴的选择是虚拟企业建立的关键问题之一。本文通过建立多目标的虚拟企业伙伴选择优化模型，对各候选企业进行定量分析，采用改进的遗传算法对问题进行求解。在遗传过程中对不同单目标值快速排序后按照综合适应值进行选择，设计自适应的交叉和变异概率操作，最后求出该问题的最优解。通过与普通遗传算法的对比，仿真算例证实了改进后的自适应遗传算法对于这类问题的有效性。

Partner selection is a key problem of organizing a virtual enterprise. A multi-objective optimization model, which analyzes these candidate enterprises quantitatively is proposed and accomplished by an improved genetic algorithm. This algorithm sorts several single object fitness using quick-sorting algorithm and selects based on total fitness, crossovers and mutates using the self-adaptive probability, and finds the global optimal solution at last. Through comparison with standard GA and the improved self-adaptive GA, simulation example testifies the latter efficiency.
Abstract:
Simulated annealing and isolation niche are two helpful methods that can improve performance of genetic algorithm. These two ideas are well combined in this paper, at the same time, production mode of initial population, crossover operator and mutation operator are improved by using the global equilibrium design ideology of orthogonal experiment method and dual mutation operation. On this basis, a new algorithm is derived, that is isolation niche hybrid genetic algorithm based on simulated annealing method. The research results show that this method can not only improve the convergence efficiency, but also evidently improve the computation speed.

Abstract:
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 optimization (PVPSO) which using the size and direction information of velocity vectors to estimate and correct particle's next generation positions is proposed. Theoretical analysis proofs the new algorithm owns an enhanced global search capability. The optimization computing of some examples is made to show that the PVPSO has better global search capacity and rapid convergence speed.

Abstract:
Neural network training BP algorithm has the defects of slow learning speed, easy to fall into local minimum points and poor robustness. Particle swarm optimization is a global random optimization evolutionary group algorithm, which can effectively solve complex optimization problems. In this paper, an improved PSO and L-M algorithm for parity problem is proposed. Theoretical analysis of the new algorithm proves it has better global convergence capability. The optimization computing of some examples shows the new algorithm has better global search capacity and rapid convergence speed.
Despite of the many successful applications of backpropagation (BP), it has many drawbacks. For complex problems,

it may require a long time to train the networks, and it may run into local minima, and

it may not train at all. Particle swarm optimization (PSO) algorithm is a global and stochastic algorithm based

on population evolution which mode is simple, it is effective method for optimization of complex modeling.

The paper uses PSO algorithm as learning algorithm of neural network used to solve parity problem. The PSO

combined with Levenberg-Marquardt algorithm (modified BP algorithm) improve its performance. The simulation

results show that this method not only increases the convergence rate of learning but it increases the

likelihood of escaping from the local minima.

Paper ID: CCC07-1267
Title: 基于遗传算法的中长期电力负荷组合预测 (Middle-long Power Load Forecasting Based on Genetic Algorithm)
Authors: 牛东晓，李金超，李金颖，刘达
Abstract:
中长期负荷预测是电力工业健康发展的保证。本文运用多种预测效果作为单一预测方法的评价指标，利用熵权法形成综合评价指标来建立遗传算法的目标函数，最后运用遗传算法计算每种预测方法的权重，从而使得对于组合预测结果的预测效果最优。实例表明，本方法将在提高预测精度的同时减小预测的风险。

Middle-long forecasting of electric power is the guarantee for the healthy development of the electric industry. In this paper, several forecasting methods are measured by several indexes, and then the entropy method is used to form a comprehensive index to set up the object function of genetic algorithm. Next the genetic algorithm is used to calculate the weight of every forecasting method. At last, we get the final result by adding all the results of every forecasting method. Example in this paper shows that this method will improve the accuracy of middle-long forecasting of electric power and decrease the forecasting risk.

Paper ID: CCC07-1419
Title: 多样度和适应度引导的遗传算法操作概率计算研究 (Research on Calculations of...
Probabilities of Operators in GA Guided by Cooperation of Diversity and Fitness
Authors: 李枚毅, 游维, 蔡自兴
Abstract: 总结前人的一些工作，讨论了进化算子操作概率的计算规则。通过对现有方法的深入分析，提出一种多样度和适应度联合引导的遗传算法操作概率计算方法。分析多样度动态变化曲线的变化规律后，提出多样度动态变化的线性方法和多样度动态变化的指数方法。提出了一种运用变形的 Manhattan 学习方法来动态地调整遗传算法操作概率的适应性调整策略。通过一些仿真实验验证了本文提出的方法能有效地提高 GA 的性能。

Some work of calculations of probabilities of operators in genetic algorithm (GA) is summarized, and computation method of probabilities of operators is discussed. With analysis of developing situation of calculations of probabilities of operators, calculations of probabilities of operators in GA guided by cooperation of diversity and fitness is present. Analysis of dynamical curve for diversity change leads that the method of linear diversity change and the method of exponential diversity change are proposed. Modified Manhattan learning method of adaptive calculations of probabilities of operators in GA is put forward. With simulating experiments, it has been proved that the method present in the paper can improve performance of GA.

Paper ID: CCC07-1517
Title: 自适应 PID 控制微粒群算法 (Self-adaptive PID-Controlled Particle Swarm Optimization)
Authors: 蔡星娟, 崔志华, 曾建潮, 谭瑛
Abstract: 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.

Paper ID: CCC07-1689
Title: 基于离散 PSO 和 Voronoi 图的无人机航迹规划方法研究 (On Route-Planning of UAV Based on Discrete PSO and Voronoi Diagram)
Authors: 彭建亮, 朱凡, 孙秀霞, 孙彪
Abstract: 航迹规划是根据任务目标规划出满足约束条件的飞行轨迹，是实现无人机突防攻击的关键技术。由于无人机航迹规划的复杂性，提出了一种无人机分层航迹规划的方法，该方法首先由 Voronoi 图生成初始航路，然后考虑各约束条件，赋予各航路相应的权值，最终应用离散型 PSO 算法搜索出满意的规划解。仿真结果表明，该方法规划效率高，占用内存少，在工程上有广阔的应用前景。
Route-planning is to generate an optimum flight route that can fulfill some restrict conditions according to the flight mission. It is the key technology in attack and defense of UAV (unmanned air vehicle). Considering the complexity of Route-planning, a new hierarchical Route-planning approach is proposed. This approach contains three steps. The first step is to generate the initial route by using voronoi diagram. The second step is to evaluate the routes by considering all the restrictions. The last step is to get the optimal solution by using the discrete particle swarm optimization (DPSO) algorithm. The simulation result shows that this approach is of high efficiency, and needs litter memory space, so it has a broad application foreground.

Paper ID: CCC07-0127
Title: ERP 柔性平台下物流运输配送系统算法分析(Algorithm Analysis of Logistics Transport System Based on ERP Flexible Flat Roof)
Authors: 刘远新, 邓飞其, 舒添慧, 罗艳辉
Abstract: 运输配送问题是现代物流管理中的重要环节,是一个 NP-hard 问题,虽然当前人们提出的方案很多,但在实际应用中有效的却很少。本文针对当前企业的实际物流运输环节所存在的问题进行分析,提出该问题的设计思路和算法,并结合遗传算法和运筹学中动态规划问题的经典汉加弟算法进行最优比较,最终给出具体实施方法,同时结合实例进行验证。外放问题, a NP-hard problem , is an important link of modern logistic management. Although there are a lot of resolvers have been brought forward, In fact, Available plans are actually very few. Now many company

existed lots of problem on the link of current of materials transportation. The thesis propounded some advice. take practice project into account, combine genetic algorithm with Traveling Shop in operational research dynamic programming problem.

Paper ID: CCC07-0150
Title: Improved Particle Swarm Optimized SVM for Short-term Traffic Flow Predication
Authors: Cao Chengtao, Xu Jianmin
Abstract: Short-term traffic flow predication has played a key role in ITS. Since traffic flow has the property of periodicity and randomicity, a new short-term traffic flow predication model based on support vector machine (SVM) is proposed. On the basis on analyzing the parameter performance of SVM for regression estimation, the parameter of SVM is optimized by an improved particle swarm optimization (IPSO). The IPSO uses the dynamic best inertia weight and acceleration coefficient, which avoids the PSO plunging into local optima and make it converge faster. As the proposed model can reduce the dimensionality of data space and preserve features of traffic flow time series, it can predict traffic flow efficiently. The simulati on results of traffic flow collected from Chinese national highway G107 show that the IPSO-SVM has greater efficiency and better performance than PSO-SVM. The average predication error is 3.3%, which proves the proposed model's validity.

Paper ID: CCC07-0421
Title: HTS Levitation and Transportation with Linear Motor Control  
Authors: Jin Jianxun, Guo Youguang, Chen Jiaxin, Zheng Luhai, Zhu Jianguo  
Abstract:
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.

Paper ID: CCC07-0452  
Title: An New Offset Model for Arterial Road Coordinate Control and Its Optimization Method  
Authors: Lu Kai, Huang Jianxin, Xu Jianmin  
Abstract:
By phase optimization design on arterial road coordinate control system, an new offset model for arterial road coordinate control is established in this paper. The model considers all the factors such as road average speed, fleet dispersion, turning traffic flow from crossway and asymmetry of vehicles arrival distribution which greatly influence the control effect of arterial road coordinate control scheme. In this paper, total delay and total number of stops are taken as the offset model output, and the rules of two directional traffic flow delay at the intersections are particularly analyzed. Moreover, programming calculation of MATLAB is introduced to realize the optimization of the offset model. A new approach that optimizes the offsets of arterial road coordinate control system is put forward.

Paper ID: CCC07-0453  
Title: Vibration Control of Vehicle-bridge Dynamic Interactive System  
Authors: Wu Wei, Liu Lin  
Abstract:
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.

Paper ID: CCC07-0559  
Title: Modeling and Fuzzy Control of Artery
Abstract:

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。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, concurrency and synchronization, is a hybrid dynamic system involving discrete and continuous behaviors. The dynamic actions of the urban 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.

Paper ID: CCC07-0570
Title: 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)
Authors: 吴义虎，宋丹丹，侯志祥，袁祥
Abstract:

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横向稳定性控制系统，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 oversho
de greatly.

Paper ID: CCC07-0613
Title: 城市交通信号的在线强化学习控制(On-line Reinforcement Learning Control for Urban
Traffic Signals

Authors: 刘智勇, 马风伟

Abstract:

It is quite 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.
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癌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.

Paper ID: CCC07-0918
Title: 城市智能交通终端系统的设计和实现(On Designing and Implementation of Urban Intelligent Transportation System)
Authors: 陆渝, 崔贯勋, 陆胜
Abstract:
车载定位与导航系统是智能交通系统（ITS）建设的一项基础内容。本文阐述了车载终端的主要功能、On Vehicle 系统和车载系统中地图数据库的设计与实现方法，从软件分析的角度说明了其设计流程，用 GPS 进行定位时用到的地图匹配算法以及导航功能中的最短路径搜索算法（Dijkstra 算法）。设计分析了以矢量地图和标量地图相结合的方法来实现地图数据库存储地理信息，基于代价计算的地图匹配方法以及最优路径搜索算法。对 GPS 定位信息提出了用卡尔曼滤波的方法来减小误差提高精度的设想。

The vehicle GPS and the vehicle navigation system is a base of the ITS. This paper elaborated the main function of vehicle terminal system and focuses on discussed the designing and implementation of the On Vehicle system and it's map database. The designing process, the map matching algorithm used in positioning by GPS and the optimal route search algorithm were explained by the view of software analysis. And then, the approach to store map data by combining vector map and scalar map, the map matching approach based on cost calculation and the optimal route search algorithm were analyzed. This paper also does some research on the improvement of the map matching algorithm.

Paper ID: CCC07-1016
Title: Vehicular Traffic Flow Dispersion Prediction of Coordinated Signal Control Based on Support Vector Regression
Authors: Liu Ximin, Lu Shoufeng
Abstract:
Signal control can reduce traffic delay and improve traffic safety. But when the vehicle meets with red light, it must stop at intersection to wait green light. Coordinated signal control can improve the continuity of vehicular traffic flow movement and reduce delay. Coordinated signal setting is based on platoon dispersion prediction. Thus, improving prediction accuracy can obtain significant benefit for signal coordination. The paper bases on Support Vector Regression to predict platoon dispersion and compares prediction accuracy with Robertson formula.

Paper ID: CCC07-1113
Title: Based on Hybrid Genetic Algorithm and Cellular Automata Combined Traffic Signal Control and Route Guidance
Authors: Lu Shoufeng, Liu Ximin
Abstract:
Firstly, the conceptual structure and definition of CTSCRG was analyzed. Then, the mathematical models of CTSCRG were summarized. Link travel time function and signal control policy have significant influence on solution uniqueness and convergence of CTSCRG model. Simulation-based method can allow more complex interactions, therefore win in reality value than travel time formula. The paper combines Hybrid Genetic Algorithm with cellular automata simulation to calculate travel time and optimize signal setting plan. Iterative simulation and assignment procedure is built: Road is discretized by Cellular Automata. Traffic flow dynamics is represented by Cell Transmission Model; Signal setting is optimized by Hybrid Genetic Algorithm; Vehicle agent can receive route guidance information and select suggested route. The simulation result is encouraging, when combined traffic signal control and route guidance equilibrium converge, the saving in total travel time is 54.4%.

Paper ID: CCC07-1137
Title: 短时交通流频谱分析与预测(Analysis of Spectrum and Prediction for Short-term Traffic Flow)
Authors: 翁小雄, 翦俊
Abstract:
本文在使用有限长度傅立叶变换分析短时交通流的频谱的基础上, 将交通流数据分别利用神经网络直接预测和经过小波分解与重构后对各尺度数据预测再合成。对比两者预测结果发现, 经过小波分解与重构后各尺度数据预测合成后的预测能得到较高的预测精度, 说明小波分析在交通流预测方面有研究的价值。

In this paper, based on analysing spectrum of short-term traffic flow by FFT transformation in limited length, we make use of neutral network to forecast the direct data and every scales data which was decomposed and reconstructed by Wavelet Analysis. Comparing with two results, prediction of the composing data which has been decomposed and reconstructed by Wavelet has better accuracy, it can prove that Wavelet Analysis has value for studying in prediction of
short-term traffic flow.

Paper ID: CCC07-1147
Title: 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)
Authors: 刘泓, 王慧, 张晋, 郑民
Abstract:
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 critical 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.

Paper ID: CCC07-1174
Title: 自适应的动态地图匹配方法(A Dynamic Map-matching Method for Adaptability)
Authors: 洪伟, 田彦涛, 徐斌
Abstract:
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了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.

Paper ID: CCC07-1183
Title: On Vibration Control Methods of Vehicle
Authors: Sun Jianmin, Yang Qingmei
Abstract:
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.

Paper ID: CCC07-1194
Title: 利用正交遗传算法优化交通检测点分布(Using Orthogonal Genetic Algorithm to Optimize Location of Traffic Counting Points )
Authors: 孙燕, 孙峥
Abstract:
在分析交通检测点分布优化问题的现有算法的基础上, 本文构造了交通检测点优化问题的染色体表达式, 并借助正交试验法的全局均衡设计思想, 建立了此问题的正交遗传算法. 实验结果表明, 此算法可以有效求得交通检测点分布问题的优化解或近似优化解, 是求解交通检测点分布问题的一个较好的方法.

On the analysis of the existing methods of the traffic counting points location problem, this paper proposes an orthogonal genetic algorithm according to global equilibrium design ideology of orthogonal experiment method for this problem. This algorithm can find the optimal or nearly optimal solution to the traffic counting location problem effectively, which is shown by the experiments provided by this paper.

Paper ID: CCC07-1537
Title: 饱和网络的动态用户最优交通分配建模研究(On Dynamic User-optimal Traffic Assignment in Saturated Traffic Network)
Authors: 李润梅, 汤淑明
Abstract:
对饱和交通网络建立了基于路段的动态用户最优变分不等式模型, 以边界瞬时路径行驶时间最优的方式实施交通流动态加载, 并进行了离散化处理和求解. 模型中考虑了遵循强 FIFO 约束的交通流传播的交通流运行方式和路段下游路口的容量约束. 利用排队状态方程进行排队车辆数的求解, 并考虑了车辆的实际长度及由此带来的车辆连续行驶距离和行驶时间的影响, 构造了嵌套的对角化变分不等式求解流程. 最后用仿真示例说明了模型的合理性和有效性.

A dynamic user-optimal link-based variational inequality assignment model in saturated urban traffic network is proposed. The flow is assigned to network accord the boundary-optimal principle. The flow propagation constraint, First-in-first-out constraint, link capacity constraint and the physical queue are considered. The link travel time experienced by vehicles in saturated network is dealt with two components: the uncongested cruise time over the link and the queuing delay. Finally, a discrete model and its nested diagonalization algorithm were given. An example was used to test the necessity and validity of the modeling.

Paper ID: CCC07-1651
Title: 基于禁忌搜索算法的停机位应急调度研究(Disruption Scheduling of Airport Gate Based
Abstract:

During inclement weather, airport will experience a large portion of overall system delay. It is very important for the airport operation manager to reassign the gates in real time. In this paper, an integer programming model for airport gate reassignment is proposed, which reassign the airport gates to the flights entering the airport after the accident, with the objective to minimize the weighted sum of the flights being assigned to the apron and whose reassigned gates are different from what was planned. A tabu search (TS) algorithm is designed to solve the model.

According to the gate configuration and flight schedule of a busy domestic airport, simulation is conducted which shows the effectiveness of the model and the TS algorithm.

Paper ID: CCC07-1686
Title: 高速公路隧道智能控制研究 (On Highway Tunnel Intelligent Control)
Authors: 石志刚
Abstract:

Through analysis the present situation of highway tunnel control system, this paper points out the whole effect consideration of the control system insufficiency. So, this paper proposes an research idea, which uses the information fusion technology to carry on processing to the tunnel many kinds of examinations information, considering tunnel characteristic, applying intelligent control technology to form the control plan.

Paper ID: CCC07-1690
Title: 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

Authors: 孙俊清，李平，韩梅

Abstract:
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.

Paper ID: CCC07-1716

Title: 高速磁浮车辆-轨道梁-桥梁系统建模及仿真研究(Modeling and Simulation of High-speed Maglev Vehicle/Guideway/Bridge Coupling System)

Authors: 邓亚士，魏庆朝，倪永军，时瑾

Abstract:
本文将高速磁浮车辆、轨道梁和桥梁视为整个系统进行研究。将磁浮车辆模拟为由弹簧和阻尼器连接的多刚体，应用能量法建立车体重向振动运动方程，通过动力有限元法分别建立轨道梁和桥梁的振动微分方程，最后通过磁轨关系和梁桥关系把三者联系起来，形成系统动态耦合分析模型。基于此模型编写动力仿真程序，仿真分析了轨道梁表面输入正弦不平顺情况下的车辆、轨道梁以及桥梁的动力响应情况。

In this paper, vehicle, guideway and bridge are studied as a whole body. The vehicle is modeled as a multi-body system connected by springs and dampers. The motion equations of vehicle are built by means of energy method, while guideway and bridge differential equations are deduced by dynamic finite element method. They are connected through magnet/guideway relationship and guideway/bridge relationship, so that the coupling dynamics system is established. The corresponding dynamics simulation programs are compiled base on the above model. Using it, the dynamic responses of vehicle, guideway and bridge are analyzed under sinusoidal irregularity.

Paper ID: CCC07-0404

Title: Studies on the Weak Electric Wave Signals of Plants by the Wavelet Analysis

Authors: Ding Jinli, Wang Lanzhou, Li Haixia, Li Dongsheng

Abstract:
In this study, we choose the 'db3' wavelet as the basis function to decompose the electric wave signal in 5 levels and a low and high frequency coefficient of 6 species plants are obtained, and coefficients after denoise are reconstructed at the first time, A result of the analysis of the wavelet in plant electric wave signals indicates that plant electric wave signals are of changing of characters in the each frequencies scale. In the low frequency level, the main character of the plant electric wave signal is reflected; in the high frequency level, the noise of the determined signal and also the mutation of the signal are reflected respectively. That the denoised signal of plants by
wavelet analysis is similar with the original one indicates that the wavelet analysis is fit for studies on the plant electric wave signal. There are \(-200-500\mu\text{V}\) of the electric wave signals in 6 growing plants.

Paper ID: CCC07-0729
Title: 基于 RBF 神经网络的河湖水华软测量方法(The Method of Soft Sensing for Water Bloom in River and Lakes Based on RBF Neural Network)
Authors: 刘载文, 崔莉凤, 王小艺, 吕思颖
Abstract:
分析水华发生的主要因素，研究水华的软测量主导变量确定方法与短期预测模型，RBF 神经网络基函数中心、宽度和权值的监督学习方法，基于梯度下降的误差纠正算法，提出基于 RBF 网络的水华软测量方法。对 RBF 网络隐层节点数对网络性能的作用和影响进行了分析比较，对径向基函数宽度与网络拟合能力，以及网络泛化性能进行讨论。从网络的训练和水华预测结果来看，采用 RBF 神经网络可以预测叶绿素的短期变化规律，基于 RBF 网络的水华软测量模型泛化能力强，网络预测精度高，拟合性能好，为河湖水华短期预测方法的研究奠定了基础。

After the major elements of water bloom were analyzed, a method to confirm dominant variables of soft sensing and shortdated forecast model for water bloom, and a supervise learning method to determine the clustering center, extent and weighting function value of radial base function were studied, then the soft sensing method based on RBF neural network for water bloom was proposed, The fitting ability and extensive capability of neural network are discussed according to different nodes of hidden layer and the extent of RBF neural network. The results of neural network training and water bloom forecast show that the soft sensing model based on RBF neural network possess strong extensive capability and forecast precision, and it can provide a new method and research groundwork for the forecast of water bloom in river and lakes.

Paper ID: CCC07-0953
Title: Multi-Target Identification in Intracellular Regulation Networks
Authors: Zhou Tong, Li Shao
Abstract:
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.

Paper ID: CCC07-1518
Title: Synchronization Control of Hodgkin-Huxley Neurons Exposed to Sinusoidal Electric Field
Authors: Zhou Sisi, Wang Jiang, Che Yanqiu, Deng Bin
Abstract:
In this paper, $H_\infty$ 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 $H_\infty$ variable universe adaptive fuzzy control is designed to synchronize the HH systems and the simulation results demonstrate the effectiveness of the proposed control method.

Paper ID: CCC07-1529
Title: Ghostburster 模型的混沌分析与控制(Chaos Analysis and Control of the Ghostburster Model)
Authors: 邓斌, 王江, 陈立松
Abstract:
本文以 ghostbursting 模型为研究对象, 把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 ghostburster 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 form 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.

Paper ID: CCC07-1728
Title: Fire Patterns of HH Neuron under External Sinusoidal ELF Stimulus
Authors: Han Chunxiao, Wang Jiang, Li Huiyan
Abstract:
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.

Paper ID: CCC07-0191
Title: 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)
Authors: 王红蕾, 魏一鸣
Abstract:
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。此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 Tianshengqiao 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.

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**Paper ID:** CCC07-0399  
**Title:** 一类金融系统的混沌性与控制(Chaotic Principle and Control of a Kind of Finance Systems)  
**Authors:** 郑继明, 蒲兴成  
**Abstract:**  
针对一类金融混沌系统, 给出了一种平衡点控制法和一种非线性同步控制法。平衡点控制器是以 VFC (状态变量反馈法) 为基础, 结合稳定性理论而得到的。非线性同步控制器是用 Routh 判据为依据, 同时结合稳定性理论实现的。理论分析和数值仿真的结果均证明了两种方法的可行性。这两种方法也可以用来实现一般的金融混沌系统的同步和平衡点控制。

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**Paper ID:** CCC07-0518  
**Title:** 改进的多层次灰色综合评价法在科技中小企业成长能力评价中的应用(The Application of Improved Grey Multi-hierarchical Comprehensive Evaluation Method to the Growth Ability Evaluation of Technological Small and Medium Enterprises)  
**Authors:** 荆浩, 赵希男  
**Abstract:**  
科技中小企业的成长能力, 反映的是其发展过程中继续成长的潜力。本文采用灰色多层次综合评价方法来评价科技中小的成长能力。评价过程中, 通过将目标规划法与灰色关联分析相结合, 更好的保证了评价结果的客观性, 同时有利于体现评价对象的个性优势。

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**Paper ID:** CCC07-0761  
**Title:** 基于 VIKOR 算法的供应商选择方法研究(Selection of Suppliers Based on VIKOR Algorithm)  
**Authors:** 乞建勋, 张之光, 孔峰  
**Abstract:** 供应商的选择是供应链运行的前提和基础, 选择最佳的供应商是供应链管理的一个重要方面。VIKOR 方法是用来解决相互冲突和不同量纲属性间的多属性决策问题，它采取妥
Selection of suppliers is the precondition and foundation of supply chain operation. It is an important aspect to choose the best supplier for supply chain management. The VIKOR method was developed to solve MCDM problems with conflicting and with different units criteria, assuming that compromising is accepted for conflict resolution, the decision maker wants a solution that is the closest to the ideal, and the alternatives are evaluated according to all established criteria. VIKOR algorithm is applied to select the best supplier and weight is given to VIKOR by entropy-weighing method in this paper, an example was shown and validation was proved in Selection of Suppliers.

Paper ID: CCC07-1282
Title: Evolutionary Models of Financial Innovation under Self-organization Theory
Authors: Yang Yunjie, Zhu Shuzhen
Abstract:
This paper considers financial innovation as a system, uses the self-organization theory to explain the openness, imbalance, non-linearity, fluctuation, bifurcation and environment selection in the financial innovation process, and reveals the nature of self-organization evolution of financial innovation. And then, on the base of analysis on self-organization evolution, the paper builds self-organization evolutionary model of financial innovation, and makes a further step to dig into the fluctuation, bifurcation, non-linearity, positive and negative feedbacks in the evolution process.

Paper ID: CCC07-1382
Title: A Decision Support System for Books Procurement of University Libraries
Authors: Li Wu, Li Xia, Zhao Lin
Abstract:
The problem of how to make good use of the expenditure of books procurement is discussed. The authors present a pattern for books procurement decision-making which takes into account both the values of books and the requirements of the readers, and develop the mathematical models for books estimate, budget allocation by subject, and books selection in every single subject. Then a decision support system for books purchase based on the library automation system is developed and which is benefit to improve the quality of books procurement.

Paper ID: CCC07-1441
Title: On Network Dynamic Planar Location Problem Based on Matrix Operation
Abstract: In the actual logistics distribution systems, the demand and the cost can change with time. Many models solving the location problem are stationary models, in which time factors are not considered. This paper develops a dynamic location model in which the time influences the demand, applies matrix operation method to a case and analyses how to make a location decision and bring the minimum total costs, during a company's planning horizon. This method is visual and simple, especially, it isn't necessary that the optimizing decision is obtained by working backward from the end of a problem toward the beginning comparing with dynamic programming.
coagulant dosage system of water treatment. The practical application shows that the control method is effective and brings about good control effect.

Paper ID: CCC07-0250
Title: 单相并联有源滤波器的神经网络控制策略研究 (Neural Networks-based Control Strategy for Single-phase Shunt Active Power Filter)
Authors: 戎袁杰, 汤洪海, 郑雪生, 王荣蓉, 李春文
Abstract: 为了解决单相并联有源滤波器 (Active Power Filter, APF) 控制策略设计时需要精确数学模型. 本文设计了根据系统输入输出信号的神经网络模型辨识, 该辨识模型能精确描述单相并联有源滤波器输入-输出特性. 并基于该模型设计了神经网络反馈线性化 (也称 NARMA-L2) 控制器, 该控制器不仅具有良好的动态响应; 并且对系统参数变化不敏感, 有较强的鲁棒性; 还便于工程应用. 针对单相并联有源滤波器的变负载变参数的仿真实验证明了该控制策略的有效性.

Active power filter (APF) will be the main device in harmonic elimination in future, and the control strategies for APF were generally based on the simplified mathematical models and seldom took the system parametric variation in consideration. Thus the system will destabilize, a novel control strategy based on neural networks is proposed. Discussions on the design of NARMA-L2 model-based controller adopting feedback linearization principle are given. The controller not only discards the system model building, owns a good dynamic response and robustness; but also is convenient for engineering practice. Simulation results are included to demonstrate the effectiveness of the proposed control strategy.

Paper ID: CCC07-0258
Title: Optimization and Application of EPA Device Description Based on XML
Authors: Yang Suying, Fang Lixin, Zhong Chongquan, Lu Xinkai
Abstract: 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.

Paper ID: CCC07-0274
Title: 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)
Authors: 汤洪海, 李春文, 郑雪生, 戎袁杰, 刘艳红
Abstract: 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.

Paper ID: CCC07-0364
Title: 总线技术在汽车车门系统中的应用(BUS Technology Application in Automobile)
Authors: 解小华, 马彦, 陈虹
Abstract:
CAN 是一种先进的现场总线，支持分布式控制。LIN（局部互联网络）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.

Paper ID: CCC07-0418
Title: An LQR/Pole Placement Controller Design for STATCOM
Authors: Nekoui Mohammad Ali, Valipourerakhloo Amin
Abstract:
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.
Abstract:
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 Earthquake 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.

Abstract:
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.

Abstract:
In order to parallel several single phase inverters to increase power capacity and system reliability, several control schemes are proposed: a parallel control scheme, a voltage control scheme and a load sharing control scheme. The parallel control technique is based on preemptive priority, which makes no absolute master or slave inverter into reality. In order to ensure N+1 redundant structure, synchronization signal generating mechanism, a parallel digital bus and a no-conflicted protocol on the bus also are introduced. In order to control voltage, the voltage control scheme employs a local feedback controller. To implement load sharing, the load sharing control scheme introduces an improved droop method to droop voltage and frequency. The analysis of the proposed method and design procedure are provided. Based on the simulation and experiment results, it shows that
the proposed scheme can implement load sharing effectively. The experimental results with
different type loads show that the output current error is less than 1% rating current for each
inverter.

Paper ID: CCC07-0833
Title: 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)
Authors: 高潮
Abstract: 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，从而降低磁损，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.

Paper ID: CCC07-0871
Title: Multi-model Self-learning Control for Turbine Valving Control
Authors: Yuan Xiaofang, Wang Yaonan, Wu Lianghong
Abstract: As turbine valving control of synchronous generator faced practical challenges as nonlinear
characteristics, large-scale operating ranges and changing operation points, this paper proposed a
multi-model self-learning controller (MMSC). Firstly fuzzy logic controller (FLC) rules for
turbine valving control at various operation points were derived from operation samples. Then
data clustering algorithm was employed to remove redundant operating models to N kinds of
typical models, this reached N sub-model fuzzy logic controller (SFLC) at the same time. Then
control output of MMSC was just the output of SFLC multiplying their respective weights, which
were decided by their matching degree. For the self-learning of SFLC rules, support vector
machines, a novel machine learning algorithm with good approximation and learning ability, was employed. Simulations show that MMSC is adaptive to diverse operating points with good control performance and damping ability.

Paper ID: CCC07-0968
Title: The Grey Predictive Control on Grate Cooler System
Authors: Wang Xiaohong, Wu Shuqin, Shen Tao, Fan Yong
Abstract:
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.

Paper ID: CCC07-1004
Title: The Design and Application of Hybrid Intelligent Control System for Rotary Kiln Process in Alumina Production
Authors: Wu Yongjian, Tan Minghao, Zhou Xiaojie, Chai Tianyou
Abstract:
This paper describes the successful application of a hybrid intelligent control system to perform the real time control of rotary kiln for alumina production. The hybrid intelligent control strategy is explained with special emphasis on the adaptive fuzzy control and rule-based expert control. The hybrid intelligent control software package was developed based on the DCS platform. The software package has been found to provide good economic benefits in its successful application in a real rotary kiln process.

Paper ID: CCC07-1060
Title: Load Scheduling Control for Main Steam Temperature of Power Generation Unit
Authors: Wei Le, Fang Fang
Abstract:
为了提高单元制发电机组主蒸汽温度的负荷适应能力,本文以主蒸汽流量信号作为调度变量,设计了主蒸汽温度的负荷调度控制系统。该系统由四个典型工况点下的局部控制器组成,利用模糊隶属度函数集成为全局控制器。各局部控制器采用串级内模原理进行设计和整定,其中,高阶的外回路控制器通过 Taylor 级数展开的方法简化为实际 PID 形式。系统保留了传统串级控制系统克服内回路扰动、提高系统工作频率的优点。在不同负荷下的仿真试验表明,该系统具有良好的负荷适应能力。
For improving the load adaptability of main steam temperature control system, a load scheduling control structure is presented for the power generation unit. In this structure, the steam flow is selected as the scheduling parameter and four sets of local-controllers are embedded which are corresponding to four typical conditions. Each local-controller is designed and tuned by the cascade internal model control theory. The smooth switching among local-controllers is realized by the membership functions of fuzzy subsets. Because of the high order of outer-loop controllers, Taylor series expanded is adopted to reduce them to real PID. The presented control structure keeps the advantages of traditional cascade system: disturbance rejection, frequency increment, etc. Simulation tests show that the load scheduling control structure has good dynamic performance and can work well in a wide range of load.

Paper ID: CCC07-1119
Title: 高性能控制设计 (High-Performance Control Design of Automotive Power Generation System with Claw-Pole Synchronous Generator and PWM Rectifier)
Authors: 卢子广, 付葵花
Abstract: 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，使发电机定子电压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，提出了负载预测前馈控制策略。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.

Paper ID: CCC07-1131
Title: 不间断电源逆变器输出电压的鲁棒跟踪控制(Robust Tracking Control for Output Voltage of UPS Inverter)
Authors: 郑雪生, 李春文, 汤洪海, 戎袁杰
Abstract: 从不间断电源的功能来看不间断电源的逆变器是一个跟踪系统，系统参数有摄动，外界干扰是复杂多变的，要保证系统准确无误的跟踪参考信号，控制器对参数摄动以及变化的干扰要
This paper presents a discrete integral sliding mode control scheme with time-delay compensation for the output voltage regulation of an uninterruptible power supply (UPS) inverter. Since the inverter is subject to the parameter variation and the load disturbance and the time delay is introduced due to the adoption of digital control scheme, the controller is required to reject the disturbance as well as the influence of the time delay. This paper analyzes and models the discrete single-phase UPS inverter with time delay. To enhance the robustness of the inverter the discrete variable control scheme is proposed. An integral controller is added to improve the steady performance of the controller and the time-delay compensation is considered to eliminate the influence of the time delay. The inverter has shown its excellent voltage tracking performance through the simulation results and the effectiveness of the scheme is verified.

Paper ID: CCC07-1201
Title: Logistics Information Platform and Its Key Technologies in Electric Power Industry
Authors: 颜波, 林伟
Abstract:
本文针对电力行业物流信息平台及其关键技术的研究。电力行业物流信息平台的系统架构被划分为五层结构，即物理层、集成层、数据层、功能层和界面层。电力行业物流信息平台的基本功能模块包括物资管理信息系统、电力企业管理系统、网站招标系统和网络配送管理系统，其中的关键技术被详细探讨。电力企业物流信息平台对于建立一个电网坚强、资产优良、服务优质、业绩优秀的现代化电力企业具有重要意义。

Aiming at characteristics of the electric power industry, this paper brings forward establishing a logistics information platform in electric power industry, which is able to unite all power enterprises in a wide area and optimize the allocation of resources. The logistics information platform structure is divided into five layers including the physical layer, the integrated layer, the data layer, the function layer and the interface layer. The basic function modules of the logistics information platform in electric power industry contain the material management information system, the electric enterprises management system, the website bidding system and the network delivery management system, among which the key technologies will be studied in detail. The logistics information platform plays an important role in establishing modern power enterprises which possess strong electric network, superior asset, high-quality service and outstanding performance.

Paper ID: CCC07-1240
Title: Automatic Control System of the Electrode's Position During the Whole Process of LF Steel-Making
Authors: 曹丽婷, 田景文, 李淑琴, 邢莉萍
Abstract:
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
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.

Paper ID: CCC07-1332
Title: 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) Authors: 段平, 吴敏, 徐辰华
Abstract: 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,建立了烧结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.

Paper ID: CCC07-1549
Title: Application of Wavelet Network for Automatic Power Quality Disturbance Recognition in Distribution Power System Authors: Liu Hua, Zhao Baoqun, Wang Guangjian
Abstract: 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.

Paper ID: CCC07-1553
Title: 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)
Authors: 丁光彬, 庞培林
Abstract: 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特征向量，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进行神经网络训练，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 approves to be accurate and comprehensive. The method can be generalized to other devices fault diagnosis.

Paper ID: CCC07-1569
Title: 固体氧化物燃料电池电特性的建模和控制设计(The Design for Model and Control of Solid Oxide Fuel Cell Electrical Characteristic)
Authors: 邓忠华, 李曦
Abstract: 根据固体氧化物燃料电池(SOFC)的组成结构、工作原理,并运用电化学、流体动力学和热力学等学科理论,基于 Matlab/Simulink 建立了合理和有效的 SOFC 性能数学模型。然后,设计衰减曲线整定参数后的 PID 控制器可较好地改善电池的输出性能。数值测试结果证明了该方案的有效性和优越性。

According to Matlab/Simulink, the paper sets up appropriate and effective mathematical model of Solid Oxide Fuel Cell (SOFC) based on its structure and mechanism, using theories of electrochemistry, hydrokinetic and thermodynamics. The output performance of SOFC is adjusted
with good effect by PID controller tuned with decay-curve law. The results of numerical test demonstrate the effectiveness and advantage of this approach.

Paper ID: CCC07-1576
Title: 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)
Authors: 戴波, 盛沙, 田小平, 杨卓然, 谢祖嵘
Abstract:
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.

Paper ID: CCC07-1607
Title: 铝电磁铸轧原理及其控制优化策略(The Principle and Control Optimization Strategy of Aluminum Electromagnetic Roll-casting)
Authors: 谢焱彬, 凌玉华, 廖力清, 杨欣荣
Abstract:
分析了铝电磁铸轧生产过程中电磁感应器的工作原理和基本结构。介绍了智能变频电源控制系统的总体方案、硬件结构和软件结构。在分析铝电磁铸轧的工作原理的基础上，采用模糊自适应PID算法，设计了一个适用于控制对象的特殊波形发生器以优化系统性能。生产效果表明控制系统精度高，可靠性高，能够显著提高铝铸轧板材的质量。
This paper analyzes the basic structure and working principle of electro-magnetic inductor used in aluminum electromagnetic roll-casting production. The paper introduces the project of intelligent variable frequency power supply control system for aluminum electromagnetic roll-casting. And the hardware and software schemes of control system are also analyzed in the paper. The control system use fuzzy adaptive PID algorithm and design a specific waveform generator for the control object, which to optimize the system performance. The acting in the production shows that the control system has high control precision, good reliability and could improve the quality of aluminum roll-casting board obviously.

Paper ID: CCC07-1610
Title: 凹版套色印刷系统的模型控制研究(Model and Control for Gravure Register Printing System)
Authors: 邓忠华, 李曦, 叶小萌
Abstract: 针对传统人工套色控制系统速度低、套色误差大等缺点，结合国外凹版印刷机配备的自动套色系统的特点，采集了大量实验数据，经过系统辨识得出系统是一个纯滞后系统，设计了一种基于 smith 预估控制的模糊 PID 控制器的自动纠偏系统。数值实验表明，采用这种自动纠正系统提高了套印的精度和印刷速度，简化了操作，提高了印刷质量。
According to low speed and register error big of the traditional artificial register control system based on characteristics of overseas register control system, a great deal of experiment data is sampled and used to identify the register system model, which is analyzed and recognized as a dead time system And an adjustment algorithm is designed for automatic color register control system based on smith-fuzzy PID. The numerical experiment demonstrates the scheme adopted can raise the accuracy and printing speed of the system, simplify the operation, and raise the printing quality.

Paper ID: CCC07-1772
Title: 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)
Authors: 王立强, 卢琴芬, 叶云岳, 雷美珍
Abstract: 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.

Paper ID: CCC07-0039
Title: A Modified Filter Trust Region Method for Nonlinear Programming
Authors: Su Ke
Abstract: Sequential quadratic programming (SQP) type method is one of the most effective methods for solving nonlinear
Recently, filter method, for its good numerical results, are extensively studied to handle nonlinear programming problems. In this paper, a new modified approach combined the filter technique and SQP trust region method is proposed to tackle the original problem, which ensures that every trail point will not be far away from the feasible region. Global convergence results of the proposed algorithm are established under suitable conditions. Some numerical results are reported in this paper.

Paper ID: CCC07-0194
Title: An Extensible XML Mapping Architecture
Authors: Wu Jiyi
Abstract:
While XML and related technologies have made heterogeneous data exchange possible, actual information exchange is not yet automatic—or even easy. Although SQL/XML, XSLT, XQuery and someother transformation languages are quite powerful, it can often be very difficult to express the transformation by hand in these languages. Mapping technology is a convenient and valuable solution help to improve this process. After the introduction of mapping tools, an extensible XML mapping architecture is discussed.

Paper ID: CCC07-0273
Title: 基于马氏链的重复囚徒困境博弈动态模型设计(Dynamic Model Making for Iterated Prisoner's Dilemma Based on Markov Chain)
Authors: 彭亮, 刘海云, 刘伟兵, 王先甲
Abstract:
针对进化博弈过程中博弈人的有限理性，考虑到马氏链的无后效性正好符合博弈人策略选择的特性，设计了一种对重复囚徒困境博弈进行分析的动态模型。该模型将博弈中策略的动态调整过程对应到一个两状态的马氏链决策过程，能成功的模拟博弈人策略的动态调整和学习，不但可用于研究有限种群博弈，而且可用来分析无限种群的进化。
Consider the bounded rationality of players in evolutionary games and the character of Markov chain, this paper presented a dynamic model for iterated prisoner's dilemma game. In this model, strategies choosing of players was mapped to a Markov decision process with two states, and this model can successfully simulate strategies choosing and learning of players. It can be used not only in finite populations but also in infinite populations.
Title: Rotor Speed Estimation Using Zero-Crossing Times Signal of Stator Current
Authors: Ghanbarian Mahdi, Mohammadi Ali, Kavehnia Farzad, Keivani Hamid, Askari Mohammad, Mohammadi Sirous
Abstract:
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.

Title: 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 Performance Analysis of Intrusion Detection System)
Authors: 廖桂平, 喻飞, 沈岳, 张林峰, 徐成
Abstract:
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.

Title: 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)
Authors: 刘希民
Abstract:
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
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 milli-voltage 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.
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.

Paper ID: CCC07-0563
Title: Real-time Digital Simulation of Control System with LabVIEW Simulation Interface Toolkit
Authors: Xiang Xuejun, Xia Ping, Yang Sheng, Liu Ping
Abstract:
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.

Paper ID: CCC07-0684
Title: 无线局域网网络流量特征研究(On Wireless Local Area Networks Network Traffic)
Authors: 荣宏, 梁一鸣, 吴蓉晖, 徐成, 喻飞
Abstract:
本文通过对无线局域网流量的一系列测试,通过对无线局域网的流量特征进行分析,得出无线局域网的流量特性呈现出典型的自相似性,并用自相似理论中的重尾分布具有长相关性,来描述无线局域网流量自相似性的过程。最后用自相似理论中的重尾分布来替代传统无线链路业务模型中的指数分布和无后效性的假设得到容易处理的、简洁的仿真模型。Through a series of real tests, this paper analyses the characteristic of IEEE 802.11 traffic, explains the results of the tests. More importantly, the results indicate that the characteristic of IEEE 802.11 traffic exhibits obviously self-similarity. As the first step to set up a 802.11 traffic math-model based on self-similarity theory.

Paper ID: CCC07-0693
Title: A Study of Dependence in the Patellar-Tendon-Reflex on Tapping Locations
Authors: Jiang Yan, Mamizuka Naotaka, Hori Noriyuki, Ochiai Naoyuki
Abstract:
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.

Paper ID: CCC07-0716
Title: An Improved Fourth-order PDE for Noise Removal with Dissipation Reduction
Authors: Ji Jing, Yang Kehu, Guo Jianjun, Yu Wensheng
Abstract:
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.

Paper ID: CCC07-0722
Title: 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)
Authors: 张秀华, 张庆灵
Abstract:
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.

Paper ID: CCC07-0728
Title: Constraint-based Algorithm for Slab Sequencing Problem
Authors: Guo Dongfen, Ye Hongying
Abstract:
Slab sequencing problem is an NP-hard problem with complex side constraints. In this paper,
slab sequencing problem is modeled as a constraint satisfaction problem. A constraint-based algorithm is proposed to solving this problem. During the solving procedure, domains of the variables are firstly preprocessed by using consistency technology to prune the search space; the solution is secondly constructed by the dynamic variable selection and value selection algorithm, when a variable is instantiated, the constraint propagation is triggered, domains of the unscheduled variables are filtered and the subtours are dynamically forbidden. Slab sequence is further adjusted by a modified 2-opt exchange to improve the solution quality. The validity of the proposed algorithm is demonstrated by the simulation experiment.

Paper ID: CCC07-0731
Title: Reentry Telemetry Data Collection System Based on TMS320F206
Authors: Zheng Jian, Hua Yafeng, Zheng Wenda
Abstract:
The reentry telemetry data collection system is complicate for its adverse environment. According to the system's features, this paper presents a novel data collection system based on two high-speed TMS320F206 chips with ping-pong storage. The system applies the blocking design and vast scale programmable logic devices to vast measuring parameters and so on. The results we obtained demonstrate that the designed system can meet the special requirements of the reentry telemetry data collection system.

Paper ID: CCC07-0855
Title: 统一集，战争方程的智能分析与可拓力控制(Unified Set, Intelligent Analysis and Extension Force Control of War Equation)
Authors: 杨斯崑, 贺仲雄
Abstract:
随着科学技术的发展及其在军事领域的广泛应用，战争这个复杂系统所涉及的问题愈来愈多，战争形态发生了巨大变化。现代战争实质上就是 n \geq 2 个人—机—环境系统的博弈。其数学模型可以借助新兴智能数学分支统一集建立战争问题方程组。研究与发展战争方程将大大提高现代战争中的预测、决策与控制的能力。本文在战争方程的基础上结合战争实例进行智能分析，并讨论了利用可拓力控制战争。

With the development of science and technology, and their widespread application in the field of military, the war complex system is facing with more and more problems, war formation changed greatly. In substance modern war is a game of n (n \geq 2) man-machine-environment systems. By making use of Unified Set theory, this article tries to set up the mathematical model of war—War Equation. Researching and developing of War Equation will heavily improve the ability of military on forecast, decision and control. This article analyses a specific example of a famous battle intelligently based on the theory of War Equation, and discuss how to use extension force to control war.

Paper ID: CCC07-0904
Title: 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)
Authors: 尹春杰, 孙洁君, 张承慧

Abstract:
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.

Paper ID: CCC07-0942
Title: 学习者情绪空间定义及应用 (The Research of Emotion Cognition Model and Its Application)
Authors: 解迎刚, 王志良

Abstract:
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进行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得二维情绪模型, 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

Paper ID: CCC07-0982
Title: A New Control Approach of Output Probability Density Functions for Dynamic Stochastic Systems Using Parzen Window Estimate
Authors: Yang Chengzhi

Abstract:
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
电子市场环境下的回购契约协调研究

**Abstract:**
在电子市场环境下的供应链模型中，如果分销商采用电子市场进行季节后销售，传统的供应链契约不能达到供应链的协调。本文运用供应链契约理论，通过比较分析，证明了改进后的回购契约可以使电子市场环境下的供应链达到协调，并且使供应链成员达到 Pareto 改进。最后通过仿真分析，进一步验证文中的结论。

**Paper ID:** CCC07-1011
**Title:** The Application of Soft-Sensor Technology in Measuring Water Boiling Point
**Authors:** Chen Baojun, Zhong Chongquan, Yang Suying, Yan Ming
**Abstract:**
在水加热过程中，速度受到水量影响。考虑水加热过程中的预警信号，通过使用子段最优斜率均值测得沸点。根据水温变化的速率特性，建立少量水的计算公式和大量水的线性相关参数比较表，通过实验数据来分析。实验结果证明，在给定低配置硬件的情况下，通过软传感器技术可以有效测得最佳结果。

**Paper ID:** CCC07-1040
**Title:** A New Method to Enhance the Network Synchronizability
**Authors:** Dai Kun, Wang Xiaofan, Li Xiang
**Abstract:**
在本论文中，我们提出了一种方法来增强复杂网络的同步性，并观察到这种方法不会影响节点的度和度的度的正相关性。我们的数值模拟证明了这种方法可以有效地增强网络的同步性。我们发现有最高度差的边的度差可以影响网络的同步性。
Title: 在油田热采过程中，蒸汽质量难以在线精确测量，本文提出了一种油田注汽锅炉蒸汽质量在线测量的软测量方法，采用测量相关辅助参数法，建立神经网络模型，实现注汽锅炉蒸汽质量在线测量，提高了蒸汽质量的精度。以此建立的智能蒸汽质量测量系统在油田蒸汽质量检测方面有良好的应用前景。

During the process of heavy oil production, steam dryness is a key point of secure and effective production. It has an effect not only on security of the steam-injection boiler but also on the quality of the heavy oil. In order to resolve the low accuracy problem of dryness measurement, a new steam quality on-line measurement technique is presented in this paper. The soft measurement model is established based on neural network. By establishing the dryness system, the dryness can be on-line measured and high precision can be achieved. This system is promising in steam dryness measurement.

Title: 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，控制系统运行良好，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.
Abstract:
Rough set is a powerful mathematics tool with merits of intelligent data analysis and rule extraction, an intelligent control scheme based on rough sets is introduced. The comparability of PID controlling rule is proposed in this paper, which is used to building rough sets controller, employed to settle the adaptability problem of rough control rule. The effectiveness of the control scheme and the advantage of rough control is shown through the simulations of anti-swing system of container crane.

Paper ID: CCC07-1139
Title: 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)
Authors: 林鹃, 任胜兵, 蒋平, Mahammed Jalloh
Abstract:
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需求。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利。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.

Paper ID: CCC07-1153
Title: 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)
Authors: 朱通, 朱熀秋, 孙永波, 郝晓红
Abstract:
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.

Paper ID: CCC07-1186
Title: 基于Windows Vista的TTS系统实现(Implementation of TTS System Based on Windows Vista)
Authors: 肖志, 于凤芹, 李玉
Abstract: 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.

Paper ID: CCC07-1319
Title: 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)
Authors: 禹思敏, 吕金虎
Abstract: 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, discretizing 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 secret communication method with very high practical value.

Paper ID: CCC07-1320
Title: 高阶蔡氏电路及其 FPGA 实现 (High Order Chua's Circuit and Its FPGA Realization)
Authors: 禹思敏, 吕金虎
Abstract:
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 PI 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结果。上述结果为复杂高阶电路系统的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 subcircuit 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 detailedly 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.

Paper ID: CCC07-1387
Title: 适用于大距离拦截场景的零控脱靶量计算方法 (Zero Effort Miss Formulation for Longer Range Targeting)
Authors: 郑立伟, 荆武兴, 张建英
Abstract:
对于制导后具有大距离拦截场景的大气层外拦截问题，为了精确确定零控脱靶量，两飞行器间的重力差必须被合理考虑。本文利用牛顿二项式定理及现代控制理论推导出两飞行器间相对运动方程，并利用牛顿迭代法计算零控脱靶量发生时刻，最后得出一种具有快速计算和较高精度的零控脱靶量预测方法。为验证提出预测方法的精度，几种常见的零控脱靶量计算方法被简介，通过算例仿真实验得出，本文提出的 ZEM 预测方法具有明显的应用优势。

For long range targeting applications with significant ballistic coasting after burnout, determination of the zero effort miss must account for the different gravitational accelerations experienced by each vehicles. A new expression of relative motion is derived using the Newton's binominal Theorem and Modern Control Theory, then the final time at miss is calculated by Newton iteration, and a new predicted method of zero effort miss is obtained. In order to validate the fidelity of proposed zero effort miss, several methods of determination of the zero effort miss are compared with proposed method by simulation. Simulation results show that zero effort miss
formulation better than other methods and has obvious advantages of the application.

Paper ID: CCC07-1447
Title: 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)
Authors: 周璇, 闫军威, 朱冬生, 梁列全
Abstract:
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.

Paper ID: CCC07-1521
Title: 卷积型小波包在轧辊偏心信号检测中的应用(Inspection for Roll Eccentricity Signal Based on Convolution Type of Wavelet Packet Transform)
Authors: 朱启兵, 黄敏, 崔宝同
Abstract:
提出了一种基于卷积性小波包变换的多尺度降噪方法。采用卷积型小波包变换，克服了传统小波包变换数据点数随分解尺度的增加而呈指数减小的问题；改进了噪声方差估计方法，较好地保留了信号的主要细节；采用了新的阈值函数，新阈值函数表达式简单易于计算。将卷积型小波包降噪理论用于轧辊偏心信号的检测与补偿，从而消除轧辊偏心引起的轧制力波动。仿真研究表明，该算法对于提高轧件的厚度精度优于传统的傅立叶算法。

A multi-scale de-noising algorithm based on the convolution type of wavelet packet transformation is presented. This algorithm overcomes shortcomings of the classical wavelet packet transformation, in which the length of sequences obtained always decreases by decomposition scales. The new algorithm improves estimated method of white noise standard deviation at each scale and thus keeps the main edges of signal well. A new thresholding function is employed in this algorithm, which is simple in expression. A compensation algorithm based on the convolution type of wavelet packet transformation is presented to eliminate the fluctuation of rolling force caused by roll eccentricity. Simulation results show that the novel algorithm is superior to the Fourier algorithm.

Paper ID: CCC07-1560
Title: 基于 DSP 的飞机防滑刹车交叉双余度控制器的设计与实现(Design and Realization on the Digital Aircraft Anti-skid Braking Controller of Crossing Dual Redundancy Based on DSP)
Authors: 刘建良, 安剑奇, 廖力清
Abstract:
本文介绍的基于高速嵌入式 DSP 的双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。文章阐述了交叉双余度飞机防滑刹车控制器的系统设计思想，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.

Paper ID: CCC07-1612
Title: 最大化网络广告收入的投放决策(Launch Decision on Revenue Maximization in Web Advertising)
Authors: 张志华, 王莉, 刘洪
Abstract:
研究了优化配置有限广告空间问题，在均衡网站和广告客户利益的条件下建立了基于混合定价的优化数学模型。采用 BP 神经网络拟合印象与点击率的函数关系，并在此基础上用罚函数法将有约束的优化问题转换为无约束优化问题，针对无约束问题采用了遗传算法进行求解，仿真结果说明了模型和算法的有效性。
The optimal problem of scheduling limited advertising resources was studied in this paper. Under the circumstances that the benefits of both websites and advertisers were balanced, a model based on hybrid pricing was proposed for maximizing website revenue. The relation between impression and clicks ratio was fitted by BP neural network, and the constrained optimization problem was converted into unconstrained optimization problem by penalty function method. Genetic algorithm was applied to solve the unconstrained problem. Simulation result shows the effectiveness of this model and algorithm.

Paper ID: CCC07-1643
Title: 精密光电尺寸几何量测量装置的研究和设计(On Precise Photoelectric Measurement Device for Dimension)
Authors: 李明伟, 周雷, 杨光伟
Abstract:
在现代加工业中，精密的尺寸几何量测量需求越来越大。本文结合光学技术、信号处理技术，研究和设计了一种精密的光电尺寸几何量测量装置。光源采用高强度窄波谱 LED，经特殊的光学结构形成均匀的平行光。同时采用高分辨率线阵 CCD 传感器及细分技术，结合数字信号处理技术，实现了稳定的微米级尺寸几何量的测量。微处理器采用 TMS320-F240 DSP，配有大屏幕触摸屏进行图形显示，仪表使用方便、准确。此装置在精密机械加工等方
面有很好的使用前景。

In modern manufacture, the need of precise dimension measurement with no touch is bigger and bigger. This paper studies and designs a precise photoelectric measurement device for dimension integrated with optics and signal proceeding technology. Using narrow-spectrum of high brightness LED as lamp-house, even parallel light comes into being when passing special optical structure. Adopting high resolution linear CCD sensor and subdivision technology and integrated with digital signal proceeding technology, the system has achieved steady micron-grade dimension measure. We select TMS320-F240 DSP as microprocessor, and use touch screen with big screen to display graph. The device is convenient and exact to use, and its application foreground is very good in various fields such as precision machining to the manufacture.

Paper ID: CCC07-1650
Title: 不完全信息下发电厂商最优生产策略(Optimal Production Strategies for Power Providers with Incomplete Information)
Authors: 张小玉, 朱小六, 徐保国, 焦竹青
Abstract:
随着电力体制改革的不断深入，发电厂商竞争策略问题正在受到越来越多的关注。本文通过对电力市场产量竞争数学模型的合理描述，经过推理给出了一种发电厂商最优生产策略，将利润最大化生产问题转化为求解不完全信息下贝叶斯—纳什均衡，针对竞争对手的成本展开预测，最终实现生产量的最优反应。具体的算法实例验证了该策略的有效性和实用性。

The problem of the game strategy attracts more and more attentions with the reform of electricity market. Through establishing a reasonable mathematical model, this paper formulates an optimal production strategy for an independent power provider. The method treats the maximum profit as a Bayes-Nash equilibrium with incomplete information and gives an estimation according to the production cost of rivals. The target of the strategy is to get an optimal response to the output of an independent power provider. Finally a detailed calculation example is given to show that the model and algorithm are applicable.

Paper ID: CCC07-1662
Title: Forecasting of Urban Water Demand Based on Chaos Theory
Authors: Wei Xizhu
Abstract:
Forecasting of urban water demand is the precondition to guarantee urban water safe supply. The daily water demand is a nonlinear time series. According to the complexity and non-linearity of urban required water demand, the predicted method is extracted based on chaos theory. By making full use of data and information, water quantity is conducted after restructuring of phase space based on chaos theory. Comparing water time series with historical data by chaos theory, rationality and feasibility of the predicted method are indicated. There will be a bright merit to use chaos theory predicting urban water demand and controlling water safe supply of pump station.

Paper ID: CCC07-1702
Title: 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)
Authors: 周璇, 梁列全

Abstract:
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与实现方法，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.

Paper ID: CCC07-1736
Title: Autonomous Construction of Reliable Multi-agent Systems
Authors: Zhang Libin, Zhu Qianyu, Wang Wei
Abstract:
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. Every agent can implement trust management autonomously. The simulation experiment results prove that the autonomous trust construction is effective.

Paper ID: CCC07-1755
Title: A Design of Vision-based Location Control System for Steel Rolling Mill
Authors: Chen Wei, Fang Kangling, Liu Xinhai
Abstract:
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.

Paper ID: CCC07-1764
Title: 基于 DS18B20 分组方式的沥青转运车温度场测试系统研究(Research on Temperature
Testing System of Pitch Transport Vehicle Basing on DS18B20 Mode
Authors: 邓奕, 刘少军, 刘忠伟, 周育才
Abstract:
测量沥青转运车温度场时采用数字式温度传感器 DS18B20 进行多点测温。本文采用
DS18B20 均匀分组布置的方法，通过软件编程，可有效改善单总线布置测温系统巡检周期
长的缺陷。并结合车载无线数传系统，可得到转运车壳体温度场实时数据，为沥青转运车保
温措施的设计提供直接依据。

The DS18B20 digital temperature transducer is used as multi-angle testing method in the process
of testing the pitch transport vehicle’ s temperature. This paper, using the equal grouping of
DS18B20 system, through soft programming, tries to improve the defects of the long circle of
temperature testing system. By concerning the car-carrying non-line sending system, it can get
the data of the temperature of the car at the same time it be used. Therefore, it provides the direct
provements for designing the temperature of the pitch transport vehicle.

Paper ID: CCC07-1773
Title: Tracking of Nonholonomic Control Systems Based on Visual Servoing Feedback
Authors: Li Qingsong, Wang Chaoli, Niu Wenbin
Abstract:
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.

Paper ID: CCC07-1775
Title: On Control for Static Unstable Missiles  
Authors: Fan Junfang, Qi Zaikang, Lin Defu  
Abstract:  
Some benefit results on control for static unstable missiles are established. Based on LTI model of missile plant, it validates complete controllability and existence for pole assignment by output feedback instead of state feedback. The focus is to examine the control effect of two and three loop autopilot on a static unstable missile and determine the proper control strategy from a control capacity perspective. It will be shown that there are transformations that can provide equivalent closed loop properties for the output feedback opposite to state feedback in missile control field. The open loop properties will be some different, however. The analysis is accomplished by establishing a standard algorithm in virtue of MATLAB for autopilot design. The simulation results are indicated that this method has well practicability and robustness.

Paper ID: CCC07-1777  
Title: Physiological Control of Rotary Left Ventricular Assist Device  
Authors: Wu Yi  
Abstract:  
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.
基于 Gabor 小波特征跟踪的物流载运工具识别方法

Title: 基于 Gabor 小波特征跟踪的物流载运工具识别方法
(A Logistics Vehicle Classification Method Based Gabor Wavelet Feature Tracking)

Authors: 毛佳, 李晖, 潘强, 孙淼

Abstract:
提出一种基于 Gabor 滤波器的物流车型识别跟踪方法。为了提高 Gabor 小波特征跟踪的计算速度和效果, 对提取初始特征的方法进行了研究, 提出了一种综合利用边缘检测与特征点密度来自动提取重要边缘, 寻找 Gabor 小波特征点的新方法——外部包围法。它利用边缘检测的方法确定初始点的范围, 自适应判断重要边缘, 利用线段长度作为特征点分布的依据, 计算特征点分布的密度。分布合理的初始特征点一方面不需要优化位置和角度参数从而减少了优化参数的个数, 提高了提取初始特征点的计算时间, 另一方面从根本上保证了 Gabor 小波参数的收敛速度和效果。实验结果表明, 这种方法与已知的其他方法比较, 能更有效、快速地提取目标的重要特征, 并降低整体跟踪运算的平均时间和最慢时间。

A new logistics transport classification method for target tracking based on Gabor features is proposed in this paper. To improve computation speed and effect of Gabor wavelet feature tracking, methods of extract initialization feature points was studied. Provided a new method edge surrounding, which detect important edge automatically based on edge detection and edge surrounding to find Gabor wavelet feature point. Firstly it detects edge to get area of initialization points, and calculate distributing density of feature points, and looks length as estimate of distributing; it need not optimize position and angle parameter so that we decrease number of parameter, and can improve computer speed of wavelet and effect. Experiment results indicate that edge detection can get effecter target feature shorter computer time than that method, and reduces whole track operation mean time and the slows time.

激光陀螺捷联惯导系统的系统级标定方法研究

Title: 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)

Authors: 杨晓霞, 黄一

Abstract:
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.

应用非线性规划求解月球探测器软着陆最优控制问题

Title: 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)

Authors: 单永正, 段广仁

Abstract:
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。
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 boundary 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.

Paper ID: CCC07-0176
Title: A Lunar Terrain Reconstruction Method Using Long Base-line Stereo Vision
Authors: Jie Ming, Huang Xianlin
Abstract:
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.

Paper ID: CCC07-0262
Title: A Novel Algorithm Reducing All-sky Star Pattern Recognition's Delay Time
Authors: Hu Haidong, Huang Xianlin
Abstract:
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.
Title: 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)

Authors: 李瑞康, 荆武兴, 高长生

Abstract: 以超高声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-spherosomes 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.

Title: 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)

Authors: 郑立伟, 荆武兴

Abstract: 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.

Title: Optimal Guidance Law Design for Reentry Vehicle Using Virtual Displacement Concept

Authors: Gao Changsheng, Jing Wuxing, Li Chaoyong

Abstract: 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.

Paper ID: CCC07-0614
Title: Convergence Analysis in the Sense of Lebesgue-p Norm for Open-Closed-Loop Iterative Learning Control
Authors: Ruan Xiaoe, Chen Fengmin, Wang Jianguo
Abstract:
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.

Paper ID: CCC07-0495
Title: Hybrid Adaptive Iterative Learning Control of Non-uniform Trajectory Tracking for Nonlinear Time-delay Systems
Authors: Li Junmin, Li Xinmin, Xing Keyi
Abstract:
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.

Paper ID: CCC07-0790
Title: Iterative Learning Identification and Control of Discrete Time-varying Systems
Authors: Sun Mingxuan, He Xiongxiong
Abstract:
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.

Paper ID: CCC07-0815
Title: Dual-mode Structure Repetitive Control
Abstract:
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.
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 $H_\infty$ 无穷优化设计问题，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了算法的仿真结果。

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 $H_\infty$ 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.

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.

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.

Paper ID: CCC07-0768
Title: Improved Stabilization Method for Networked Control Systems
Authors: Wu Min, He Yong
Abstract:
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.

Paper ID: CCC07-0853
Title: Design and Simulation of Fuel Cell Networked Predictive Fuzzy Control Systems
Authors: Tong Shiwen, Liu Guoping
Abstract:
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.

Paper ID: CCC07-0885
Title: System Architecture Design of Supervisory Software for Networked Control Systems
Authors: Zhu Youzhi, Zheng Geng, Liu Guoping
Abstract:
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.

Paper ID: CCC07-1064
Title: Networked Control System and Its Application in Fire Control System
Authors: Chen Chen, Chen Jie, Zhang Juan
Abstract:

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.

Paper ID: CCC07-1261
Title: Design and Implementation of Networked Predictive Control Over Wireless IP Networks
Authors: Dong Zhe, Liu Guoping, Tao Yuegang
Abstract:

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.

Paper ID: CCC07-0977
Title: Reinforcement Strategy Using Quantum Amplitude Amplification for Robot Learning
Authors: Dong Daoyi, Chen Chunlin, Li Hanxiong
Abstract:
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.

Paper ID: CCC07-1012
Title: 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)
Authors: 楼跃升，丛爽
Abstract:
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始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 a arbitrary initial state to a target state, and numerical simulation is also be done to get the track of evolution on Bloch sphere. The relationship between the parameters and the track is analyzed.

Paper ID: CCC07-1014
Title: 操控多个量子位系统的“代价”分析(Cost Analysis of Manipulating Multiple Qubit Systems)
Authors: 张明
Abstract:
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-量子位系统是能控的；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. Furthermore, 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.

Paper ID: CCC07-1286
Title: Performance Comparison Between Classical and Quantum Control for a Simple Quantum System
Authors: Xi Zairong
Abstract:
Branczyk 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.

Paper ID: CCC07-1738
Title: 基于状态转移矩阵的薛定谔方程的解(Solution of Schrodinger Equation Based on State Transition Matrix)
Authors: 邢艺凡, 肖钦文, 储迪阳, 孙喜策, 吴俊
Abstract:
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。

Paper ID: CCC07-1308
Title: 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))
Authors: 吴建武, 李春文, 张靖
Abstract:
-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
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.
concurrent development, and introduce some example applications. We also describe some key points for efficient model development.

Paper ID: CCC07-0927
Title: Automatic Parking Benchmark Problem: Experimental Comparison of Nonholonomic Control Methods
Authors: Horii Masaki, Liu Kang-Zhi
Abstract:
This paper presents several experimental results for typical nonholonomic 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.

Paper ID: CCC07-0962
Title: Experimental Analysis and Control-Oriented Modeling for Cyclic Variation of Cylinder Pressure in IC Engines
Authors: Li Po, Shen Tielong, Oguri Yasufumi
Abstract:
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.

Paper ID: CCC07-0998
Title: Nonlinear Feedback Speed Control of Internal Combustion Engines
Authors: Zhang Jiangyan, Shen Tielong, Junichi Kako, Jiao Xiaohong
Abstract:
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.

Paper ID: CCC07-1018
Title: A Model Predictive Control Method for A High-speed Magnetic Actuator
Authors: Mukai Masakazu, Seikoba Suguru, Kawabe Taketoshi
Abstract:
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.

Paper ID: CCC07-0929
Title: Beyond the Small-gain Paradigm: How to Make Use of the Phase Information of Uncertainty
Authors: Liu Kang-Zhi
Abstract:
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.
Paper ID: CCC07-0961
Title: A Switching Control Scheme for the Synchronization of Serially Connected Multi-Stage Systems
Authors: Lu Di, Shen Tielong, Fu Minyue
Abstract: 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.

Paper ID: CCC07-0969
Title: Structural Insights and Constructive Procedures for Multidimensional Realization and LFR Uncertainty Modeling
Authors: Xu Li
Abstract: 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.

Paper ID: CCC07-0999
Title: Equivalent-Input-Disturbance Method Improves Disturbance Rejection Performance: the MIMO Case
Authors: She Jinhua, Xin Xin
Abstract: 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.

Paper ID: CCC07-1813
Title: Modeling and Control of an Underactuated Helicopter Experimental System
Authors: Deng Mingcong, Inoue Akira, Kishida Takuya, Ueki Nobuyuki
Abstract:
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 system is also given. Simulation shows the effectiveness of the proposal.

Paper ID: CCC07-1148
Title: Finite-Time Input-to-State Stability and Related Lyapunov Analysis
Authors: Hong Yiguang, Jiang Zhong-Ping, Feng Gang
Abstract:
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.

Paper ID: CCC07-1162
Title: Global Robust Output Regulation for Non-minimum Phase Nonlinear Systems in Lower Triangular Form
Authors: Zhong Renxin, Huang Jie
Abstract:
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.

Paper ID: CCC07-1325
Title: Design and Implementation of a Fully Autonomous Flight Control System for a UAV Helicopter
Authors: Peng Kemao, Dong Miaobo, Chen Ben M., Cai Guowei, Lum Kai Yew, Lee Tong H.
Abstract: 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.

Paper ID: CCC07-1498
Title: An Improved Approach to Robust H2 and H-infinity Filter Design for Uncertain Linear Systems with Time-varying Parameters
Authors: Xu Jun, Xie Lihua
Abstract: 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.

Paper ID: CCC07-1546
Title: Synchronization of Vicsek Model with Large Population
Authors: Liu Zhixin, Guo Lei
Abstract: 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.

Paper ID: CCC07-1814
Title: A Parametric Lyapunov Equation Approach to the Design of Low Gain Feedback
Authors: Zhou Bin, Duan Guangren, Lin Zongli
Abstract:
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.

Paper ID: CCC07-1557
Title: 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)
Authors: 苏彩红，曾永发，张志飞，吴菁
Abstract:
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抑制、反馈抑制和前馈抑制三种抑制形式。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.

Paper ID: CCC07-1663
Title: Simple Grid Based on Cognitive Mechanism and Application Research on Description for Structure of Chinese Character
Authors: Liang Tiancai, Qiu Zhiwen, Pi Youguo
Abstract:
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.

Paper ID: CCC07-1665
Title: The Frame of Cognitive Pattern Recognition
Authors: Pi Youguo, Shu Huailin, Liang Tiancai
Abstract:
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.

Paper ID: CCC07-1487
Title: 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)
Authors: 康原原, 李彬, 田联房, 毛宗源
Abstract:
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.

Paper ID: CCC07-1497
Title: Bi-criteria Acceleration Minimization of Redundant Robot Manipulator Using LVI-based Primal-Dual Neural Network
Authors: Zhang Yunong, Yin Jiangping, Tian Lianfang
Abstract:
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.

Paper ID: CCC07-1784
Title: 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)
Authors: 邓九英, 毛宗源
Abstract:
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.

Paper ID: CCC07-1197
Title: Reaching Agreement in Finite Time via Continuous Local State Feedback
Authors: Xiao Feng, Wang Long
Abstract:
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.

Paper ID: CCC07-1253
Title: Sampled-Data Based Average Consensus Control for Networks of Continuous-Time Integrator Agents with Measurement Noises
Authors: Li Tao, Zhang Jifeng
Abstract:
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.

Paper ID: CCC07-1280
Title: Decentralized Discrete-Time Consensus Algorithms for Multi-agent Systems
Authors: Li Qin, Jiang Zhong-Ping
Abstract:
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.

Paper ID: CCC07-1322
Title: Consensus of Multi-agent System with Diverse Communication Delays
Authors: Liu Chenglin, Tian Yuping
Abstract:
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.

Paper ID: CCC07-1327
Title: Integration and Implementation of a Low-cost and Vision-based UAV Tracking System
Authors: Lin Feng, Chen Ben M., Lum Kai Yew
Abstract:
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.

Paper ID: CCC07-1541
Title: Robust Consensus of Multi-agent Systems with Noise
Authors: Wang Lin, Liu Zhixin, Guo Lei
Abstract:
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 nonnegative 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.

Paper ID: CCC07-1122
Title: Non-smooth Agent-based Dynamics of Strategic Bidding with Linear Supply Function
Authors: Xue Ancheng, Hong Yiguang
Abstract:
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.
Title: Parameter-Dependent Robust $H_\infty$ Model Reduction for Discrete-Time Switched Polytopic Linear Systems
Authors: Qiu Jianbin, Feng Gang, Yang Jie
Abstract:
This paper investigates the problem of parameter-dependent robust $H_\infty$ 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 $H_\infty$ 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.

Title: Observer Based Leader-Following Formation Control Using On-board Sensor Information
Authors: Gustavi Tove, Hu Xiaoming
Abstract:
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.

Title: Stabilization of Power Systems by Switched Controllers
Authors: Li Zhengguo, Yang Guanghong, Wen Changyun, Xie Wenxiang
Abstract:
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.

Paper ID: CCC07-1398
Title: Consensus of Multi-agent Systems with Higher Order Dynamics
Authors: Wang Jinhuan, Cheng Daizhan
Abstract:
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.

Paper ID: CCC07-1578
Title: Complex Hybrid Systems: Stability Analysis for Omega Limit Sets
Authors: Cai Chaohong, Goebel Rafal, Sanfelice Ricardo, Teel Andrew
Abstract:
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.