CONTENTS

Design and Real Time Implementation of Multiple-Model Control Solution for Some Classes of Nonlinear Processes
Bogdan Iliuţă and Ciprian Lupu

Full text

Multiple model structure is one of the successful solutions for the real-time control of the nonlinear or multi-regime processes. The use of this structure imposes solving some specific problems, like best algorithm selection or control algorithm switching. The main goal of this paper is to provide a method for switching the algorithms of the multiple-models structure, based on the principles of manual to automatic bumbles transfer. The applicability of the method is proved using a real-time structure with an RST control algorithm. The results are tested on a special designed hardware and software experimental platform.

Key words: multiple model, switching algorithm, manual-automatic bumpless transfer, real-time control systems.

2010 Mathematics Subject Classification: 34A34, 93C10.

Image Moments Based Predictive Control for Eye-in-Hand Servoing Systems
Cosmin Copot, Adrian Burlacu and Corneliu Lazăr

In this paper, a model predictive controller based on image moments is presented. The image moments are computed from a set of point features that describe a fixed object. An eye-in-hand configuration, composed from a 6 degree of freedom manipulator robot and a video camera, is considered. For validation through simulation, an implementation in Matlab of the proposed architecture was considered. A comparison with classical proportional visual control architecture was conducted and simulation results are revealed and commented.

Key words: image moments, visual servoing systems, predictive control.

2000 Mathematics Subject Classification: 53B25, 53C15.

Real Time Constraints Monitoring for OSEK Applications
Cătălin Brăescu and Lavinia Ferariu

This paper presents a real time constraints monitoring algorithm suitable for the dynamic reconfiguration of embedded applications developed for real-time operating systems with static priorities. The application reconfiguration is achieved by using the tracer facilities for providing the on-line computation of the execution times and laxities' prediction updating. The schedule feasibility is tested and monitored at the activation/termination of each process. The current processor utilization is estimated and the application is reconfigured accordingly. The proposed algorithm is able to detect overloading situations that are difficult to predict, whilst preserving high average resource utilization. In this way, the embedded system can benefit of increased predictability and flexibility. The algorithm is customized for OSEK/VDO real-time operating system and the performances of the suggested approach are illustrated on a multiple embedded controller with independent loops, designed for a DC motor with separate excitation.

Key words: real time systems, embedded systems, control algorithm, scheduling.

2010 Mathematics Subject Classification: 68M20, 68N25, 68W27, 93C95.

Suboptimal Control Strategies for Servo Drive Systems
Corneliu Botan and Florin Ostafi

An optimal control problem for a servo drive system is presented. A convenient method for implementation is indicated. A simple algorithm in this direction and a cascade based structure are presented. The last one ensures the tracking of the optimal prescribed variation of the angle, which is independent on the load torque.

Key words: optimal control, servo drive system, suboptimal structure.

2010 Mathematics Subject Classification: 49J15.

Known and Less Known Connections Between the Dynamics of Discrete-Time Linear Systems and Matrix Algebra

Octavian Păstrăvanu, Mihaela Matcovschi, Alina Doban and Dorian Florescu

The existence of important connections between the dynamics of discrete-time linear systems and matrix algebra is well-known even at the level of undergraduate courses dealing with state-space models. Nevertheless the emphasis is traditionally placed on the eigenvalues and their location in the complex plane as a standard instrument for stability tests. Concomitantly one can say that another tool, equally relevant for the dynamics analysis, remains almost hidden; we refer to the use of matrix norms that support investigations complementary to the eigenvalue-based ones. This paper develops a systematic construction that discusses, in parallel, the significance of the mathematical results expressed in terms of eigenvalue location and matrix-norm inequalities, respectively. Our discussion covers discrete-time linear dynamics described by both single and polytopic state-space representations.

Key words: (single model, polytopic model) discrete-time linear systems, free response, stability, set invariance, eigenvalue location, matrix-norm inequalities.

2010 Mathematics Subject Classification: 93C05, 93B25, 93C41, 93D20, 15A18, 15A45, 15A60.

Design and Implementation of a Multiagent System for Auctioning and Voting

Alin Ionuţ Pandichi and Florin Leon

Auctioning and voting are important capabilities for agents acting in open environments. This paper presents the design and implementation of a multiagent system capable of executing some of the most important auctioning and voting protocols. The experiments prove the possibility of using such a system on a large scale, with the benefits of reduced costs and flexibility to participate in auctions or elections organized in different settings. Due to its implementation using the JADE framework, which complies with the FIPA specifications for the interoperability of heterogeneous agents, the system can be easily integrated with other multiagent software.

Key words: multiagent systems, auctions, voting, JADE framework.

2000 Mathematics Subject Classification: 68T99, 68N19.

A Practical Case Study on the Performance of Text Classifiers

Mircea Ionuţ Astratiei and Alexandru Archip

This paper aims to improve the K-Means clustering and K-NN classification algorithms results in order to aid the human expert in choosing the number of clusters and theirs initials centers for K-Means algorithm and the variable K for the K-NN algorithm. We present a set of comparative results between classifications that are performed using only the human expert as trainer and an automatic approach that uses clustering results as training sets for the classification of text documents.

Hypercube Parallel K-Means: a Closer Analysis of the Reduction Stages

Alexandru Archip and Vasile Manta

Clustering represents the data mining process of partitioning or grouping a given set of objects into a set of disjoint clusters. One of the most popular parallel algorithms is Parallel K-Means (PKM). While the MPI parallel model is efficient, its actual implementations should consider the topology as it can further aid in obtaining better response times. A hypercube approach for PKM has been developed. This paper focuses on the advantages of using such a topology in order to correctly manage the reduction stages involved by the parallel model. Experimental results underline the better performances of this approach.