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AUTOMATIC CONTROL and COMPUTER SCIENCE Section

CONTENTS

On the Design of Stabilising Conditions for Linear MPC
Mircea Lazăr

Full text

Closed-loop stability has been one of the key issues of model predictive control starting from the early days of this control methodology and this subject has still been attracting an increasing interest over the more recent years. This paper aims at giving an insight into the closed-loop stability problem of (constrained) linear systems when model predictive control is employed. The proposed approach, which belongs to the (quadratic) terminal cost function framework, requires that the set of optimal terminal controls for which the finite-horizon value function is a decreasing function is non-empty, fact that yields new stabilizing conditions regarding the terminal weight. Stability is achieved in this case without involving any additional stability constraints or a local stabilizing controller (as done in dual-mode schemes), *i.e.* the computational complexity of the original optimal control problem remains unaffected. In the case of constrained linear systems, it can be explicitly established whether a given prediction horizon is feasible or not (*i.e.* the intersection between the set of optimal terminal controls and the constraint set is non-empty). The performance of the predictive controller is illustrated on two linear systems examples and several comparisons are made with similar results.

Key words: Model predictive control, Stabilization, Discrete-time systems, Constraints.

2000 Mathematics Subject Classification: 53D25, 53C05.

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Mining Determining Sets for Partially Defined Functions Using Entropy

Dan A. Simovici, Dan Pletea and Rosanne Vetro

Full text

This paper describes an algorithm that determines the minimal sets of variables that determine the values of a discrete partial function. The algorithm is based on the notion of entropy of a partition and is able to achieve an optimal solution. A limiting factor is introduced to restrict the search, thereby providing the option to reduce running time. Experimental results are provided that demonstrate the efficiency of the algorithm for functions with up to 24 variables. The effect of the limiting factor on the optimality of the algorithm for different sizes of partial functions is also examined.

Key words: partially defined function, entropy of a partition, determining set.

2000 Mathematics Subject Classification: 03G10, 54C70, 05A18.

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Post-Rendering Enhancement of Volumes

Marius Gavrilescu, Vasile Ion Manta and Werner Purgathofer

Full text

The paper presents an approach to visually enhance representations of volume data as a means to improve volume visualization. Direct volume rendering is employed to represent several volume data sets, using the popular Ray Casting algorithm. The result is rendered to a texture via an off-screen framebuffer, which then goes through a post-rendering processing stage. This stage involves the application of image enhancement techniques such as the use of spatial filters, to produce clearer, sharper, and less noisy images of the rendered volume. Depending on the specifics of the volumetric data set, post-rendering enhancement may bring forth more relevant visual information or otherwise improve the overall quality of the resulting images.

Key words: volume visualization, Ray-Casting, post-rendering, feature enhancement, image filtering.

2000 Mathematics Subject Classification: 65D18, 68U05.

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Using a Spatial Database in a Location-Based Search Application

Andrei Tabarcea, Pasi Fränti and Vasile Manta

Full text

This paper describes a solution for a georeferencing problem in a location-based search engine. Georeferencing is the process of assigning a geographic location to a web-page or part of it. Our solution is to use a spatial indexed database which acts as a gazetteer and contains geographical coordinates attached to address strings. We perform a series of tests to choose the best indexing solution for the database.

Key words: spatial database, LBS, search engine, gazetteer, georeferencing.

2000 Mathematics Subject Classification: 68P20.

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A Fault Primitive Based Model for all Static Neighbourhood Pattern-Sensitive Faults in Random Access Memories

Cristina Huzum and Petru Caşcaval

Full text

A fault primitive based model for all static neighbourhood pattern-sensitive faults in N × 1 random-access memories is presented. All the types of coupling faults that have been demonstrated to exist in real designs are considered, namely: state coupling faults, transition coupling faults, write disturb coupling faults, read destructive coupling faults, deceptive read destructive coupling faults, and incorrect read coupling faults. Because of the fact that the neighbourhood pattern-sensitive faults concern the physically adjacent memory cells, the model introduced in this work can be used only when the storage cells are arranged in a rectangular grid and the mapping from logical addresses to physical cell locations is known completely. Simulation results concerning the fault coverage of this extended model by some dedicated memory tests are also presented.

Key words: Memory testing, Static faults, Neighbourhood Pattern-Sensitive Faults, Fault primitives, Functional Fault Model.

2000 Mathematics Subject Classification: 94C12.

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Finite Difference Method for a Velocity Estimator and a Sliding Mode Control Algorithm. Application to a Shaking Table Control System

Elena Şerban

Full text

A shaking table system is used to test the behaviour of a building structure during an earthquake. The control of such a system must take into consideration not only the shaking table behaviour during the test, but also the building structure behaviour because some degradation of the structure can appear during the test. So, the system under test can be different from one experiment to another. This paper presents a finite difference method for a velocity estimator and the implementation of a sliding mode control algorithm and results obtained using experimental data acquired from a shaking table in Iasi, Romania.

Key words: shaking table, velocity estimator, sliding mode control.

2000 Mathematics Subject Classification: 65L12, 37N35, 00A71, 37Mxx.

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