AUTOMATIC CONTROL and COMPUTER SCIENCE Section

CONTENTS

DEVELOPMENT OF A BOARD ADAPTABLE FOR VOCAL CONTROL APPLICATIONS

by
Mircea Hulea

In this paper it is described the structure and the working way of a development board based on three microcontrollers, which best fits to vocal control of electronic equipment. Also, it is presented one example of speaker dependent speech recognition application developed using this board, together with the digital signal adaptation device and the software architecture.

Keywords: Speech processing, Signal adaptation device, Microcontroller software.

A VISUALIZATION TOOL KIT APPROACH WITH TCL SCRIPTS FOR 3D MODELLING AND OBJECT VISUALIZATION IN COMPUTED TOMOGRAPHY

by
Dorel Aiordăchioaie, Herbert Peremans, Viorel Nicolau and Rustem Popa

The work presents some results in processing of computed tomography artifacts, *i.e.* a set of cross-sections coming from a tomography. The final goal is to obtain a 3D model of the physical object, under various file formats, able to use in simulation environments based on finite element concept. The pinnas of bat species are the considered objects. The approach is based on Visualization Tool Kit (VTK) package software using Tel scripts. After passing the learning stage, *i.e.* the structure, the classes and the methods of the VTK, the software development process is quite efficient, full of satisfactions and inexpensive, because both VTK and Tel are under open source policy. Such approach could be used also into general scientific and engineering applications.

Keywords: Computed Tomography, Image Processing, 3D Object Modelling and Visualization, Computer Graphics, VTK, Tcl.

ON ARTIFICIAL INTELLIGENCE BASED DECISION SUPPORT SYSTEM FOR MANUFACTURING PLANNING

by
Doru Pănescu and Ştefan Dumbravă

Some results from an on-going research on using Artificial Intelligence for the Decision Support System involved in Computer Integrated Manufacturing are presented. Two approaches have been considered by making use of decision trees coupled with rule based programming, and constraint satisfaction method adapted for a distributed architecture, respectively. The proposed methods could be experimented in an environment containing industrial equipment. Some conclusions were got by comparing the two methodologies.

Keywords: Decision Support Systems, Computer Integrated Manufacturing, Rule Based Programming, Constraint Satisfaction, Distributed Artificial Intelligence.

THE USE OF A TEMPORAL FUZZY LOGIC IN THE DECISION-MAKING ALGORITHMS

by
Andrei Pricop

This paper is focused on a new interpretation of fuzzy logic, taking into account some principles of the mathematical modal logic and, in particular, of the temporal logic, which are viewed from fuzzy fundamentals definitions perspective. The focus is on context-sensitive fuzzy sets and on the modal logic developed on their basis. Finally, some principles and methods are derived with a view of implementing new types of rules in the decision-making algorithms.

Keywords: Fuzzy Logic, Modal Logic, Temporal Logic, Decision-making Algorithms.

SELF-ORGANIZING FUZZY LOGIC CONTROLLER FOR REAL TIME TEMPERATURE CONTROL

by
Lucian Mastacan, Iosif Olah and Cătălin Dosoftei

An approach for the design and implementation of a self-organizing fuzzy logic controller that can generate control values on-line and modifies them to the changing process conditions it is presented. A real time application of the self-organizing fuzzy logic controller for a process temperature control demonstrates its ability to operate over a wide range of process variables (non-linearity and parameter variations). The experimental results clearly emphasize the capabilities of the proposed self-organizing fuzzy logic controller to realize the best

performances.

A NEURO-PREDICTIVE APPROACH TO THE DESIGN OF SELF-TUNING CONTROL SYSTEMS

by
Corneliu Lazăr, Drăguna Vrabie and Sorin Carari

A control system design method based on neuro-predicative approach is presented for process with predictable dynamics variations. The design method is based on the optimization of a cost function subject to constraints over a finite prediction horizon in time, and it uses of a neural process model. The performance of this new control design technique is substantiated by experiments on a pH control system and on a pilot plant.

A ROBOT ARM CONTROL SYSTEM WITH SELF-CALIBRATION BASED ON VIDEO MOTION DETECTION

by
Radu Daniel Vatavu and Ştefan Pentiuc

The paper introduces a new self-calibration algorithm developed for an arm type robot based on video motion and colour detection. The algorithm proves to be general enough to be used in other similar computer vision scenarios where self-calibration might be needed. Calibration gets performed in real-time conditions having a very low complexity per processed frame: $O(n\log(n))$. Other real-time enhancements, which pertain to the robot arm command mode, are discussed such as region of interest fast and more robust histogram-based threshold selection. The robot arm is an ongoing computer vision project for which many enhancements have been done during the last years, culminating with a user friendly graphical interface that requires a minimum non-experienced user interaction.

TECHNIQUES FOR STATIC VISUAL OBJECT DETECTION WITHIN A VIDEO SCENE

by

Mihaela Costin, Tudor Barbu, Marius Zbancioc and Gabriela Constantin

This paper addresses the problem of video analysis for providing content-based functionalities. One of the most difficult problems in image processing is detecting objects in an image. The methods presented in this paper are designed to detect new static objects in moving scenes, even if other elements in the scene come between camera and the new static object. We propose an algorithm inspired by the human perception process, based on background modelling and efficient image difference procedures. Parameters can vary and allow great flexibility in scene retrieving quality and time performance. Also, we propose a video segmentation using motion estimation and a formalized model for static visual objects.

Keywords: Moving Visual Object, Static Visual Object, Spatial-Temporal Video Object, Video Shot, Segmentation, Motion Estimation, Motion Vectors, Graphical Object.

A PRACTICAL APPLICATION OF QUATERNIONS IN COMPUTER GRAPHICS

by

Vasile Manta and Florina Ungureanu

This paper provides an overview of the various analytical properties of quaternions and their usefulness in the area of computer graphics. The representation of rotations by quaternions has several advantages over the representation by Euler angles. The parameterization of rotations using quaternions involve only the angle and the axis (vector) of rotation, while Euler angles define a rotation as a composition of three independent rotations about coordinates axes. The using of Euler angles also requires more number of arithmetic operations, compared to quaternions based approach. In this paper we also give some examples of routines in C language. These examples show that rotations involve only some simple algebraic computations.

Keywords: 3D Rotations, Computer Graphics, Unit Quaternion.

A HEURISTIC METHOD FOR SOLVING THE GENERALIZED WATER JUGS PROBLEM

by

Florin Leon, Mihai Horia Zaharia and Dan Gâlea

Classical search procedures by forward or backward reasoning are memory and time consuming because they are uninformed procedures that don't take into account domain knowledge. In this

paper a heuristic solution is presented for the generalized water jugs problem, which finds the optimal solution linearly, with no additional memory requirements.

A NEW MODEL OF INTER-TIER DATA TRANSFER FOR DISTRIBUTED APPLICATIONS BASED ON POLYMORPHIC LIGHTWEIGHT DATA TRANSFER OBJECTS

by
Cristian Butincu, Mihai Horia Zaharia and Dan Gâlea

An efficient model of transferring information between tiers of distributed multi-tiered applications is proposed, using lightweight inter-tier data transfer objects that makes use of two important mechanisms: internal buffers and runtime de fined lazy-load groups' logic. During our tests, we have to highlight that this approach provide higher performances than classical implementations of well known design patterns that deal with inter-tier data transfer in multi-tiered applications.

DESCRIPTIVE SELF-RECONFIGURABLE GENERALIZED STOCHASTIC PETRI NETS FOR PERFORMANCE MODELING OF COMPUTER SYSTEMS

by
Emilian Guțuleac

In this paper, we describe our current work, which aims to open the methodology for performance modelling of dynamically reconfigurable systems. In order to capture these systems, we introduce the descriptive self-reconfigurable Generalized Stochastic Petri Nets (GSPN) models that can modify their own structure at run-time by rewriting some rules of their descriptive expression components. Furthermore, this descriptive approach facilitates the understanding of complex models and their component-based construction as well as the application of modern computer engineering concepts. A case study for performance modelling of parallel computer system is presented to illustrate the approach.

RECURSIVE ALGORITHM FOR 2-TERMINAL NETWORK RELIABILITY EVALUATION

by

Petru Caşcaval and Andreea Bogdana Botez

The problem of exact evaluation of 2-terminal reliability in medium-to-large computer and communication networks is treated, and an efficient algorithm based on the law of total probability and other rules that allow reducing the computation burdens is proposed. In order to demonstrate the effectiveness, this algorithm is compared with the well-known algorithm given by Aggarwal, Chopra, and Bajwa - and improved by Rushdi - defined in terms of minimal paths and based on the network decomposition.

Keywords: Stochastic Networks, 2-Terminal Reliability, Perfect Nodes, Equivalent Transformations, Recursive Algorithm.

MARKOV CHAINS BASED MODELLING OF WEAVING MACHINES WITH FILLING BREAK TOLERANCE AND AUTOMATIC FILLING REPAIR

by

Doina Caşcaval and Petru Caşcaval

A machine interference problem regarding a group of weaving machines with filling break tolerance and automatic filling repair is studied in this paper. Two indicators have to be evaluated: the efficiency of the weaving machines and the work loading for the weaver. A simplified analytical method, based on a reduced semi-Markov chain and the rule of superposition, for evaluating with accuracy the two indicators previously defined is proposed. A case study in which analytical and simulation results are compared demonstrates the effectiveness of this simplified analytical approach.

Keywords: Weaving Process, Automatic Filling Repair, Break Tolerance, Interference Time, Markov Chains.