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## Multi-Agent System for Monitoring and Analysis Prahova Hydrographical Basin

*Alexandra Maria Matei*



[Full text](#)

The development of an efficient flood forecasting and river monitoring system requires the use of an automated data acquisition system and the analysis of several hydro graphic basin parameters that are monitored. Due to the strategic importance of river basin monitoring, in the last years, different modern technique were applied, including some techniques based on artificial intelligence, such as knowledge based system, agent-based modelling and neural networks. This paper presents the development of a multi-agent system in the Prahova hydrographical basin. For monitoring and analyzing the Prahova River parameters it was necessary to design and implement in the Zeus Agent Toolkit generator a prototype agent-based system that was experimented as a simulation. The monitoring and analyzing multi-agent system (MASMA) is a distributed system which includes central aspects (the dispatcher agent) and local aspects (the measuring agents).

**Key words:** Floods, Flood Forecasting, Hydrology, Intelligent Agent, Multi-agent system.

*2000 Mathematics Subject Classification:* 53B25, 53C15.

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## An Algorithm Designed to Determine the Optimum Number of Communication Channels in a Modular Simulator

*Lucian-Florentin Bărbulescu*



[Full text](#)

The distributed modular applications represent the next step in developing simulators for industrial applications. In this way several simple software components can be created, placed on different machines within a high-speed network and linked together in order to obtain a simulator for an installation. The main problem found in this approach is determining the optimum way of linking together those software components. The current paper offers an algorithm that can be used to determine the optimum number of communication channels in a modular simulator based on the type of data exchanged within the system. This algorithm is part of a complete distributed simulation framework written in Java.

**Key words:** algorithms, graph theory, distributed simulation frameworks.

*2000 Mathematics Subject Classification:* 68W05.

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## Unsupervised Colour - Based Image Recognition Using a LAB Feature Extraction Technique

*Tudor Barbu, Adrian Ciobanu and Mihaela Costin*



[Full text](#)

We propose an automatic content-based image recognition technique in this paper using colour features. Our intention is to cluster a set of digital images in several categories on the colour similarity basis. The images are processed using LAB colour space in the feature extraction stage. The resulted colour-based feature vectors are clustered using an automatic unsupervised classification algorithm. Some experiments based on the proposed recognition technique have also been performed. The described recognition method can further be applied in content-based indexing and retrieval (CBIR) domains.

**Key words:** image recognition, colour-based feature extraction, LAB colorspace, unsupervised classification,  $K$  - means algorithm, validation indexes.

*2000 Mathematics Subject Classification:* 62H30, 68T10, 68T45, 68U10.

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## Algorithmic Solution for Design and Optimisation of Multi-Phase Pulse Generators

*Aleodor Daniel Ioan*



[Full text](#)

This paper introduces a new design method for the generators of multiple phase pulses, which can be independently positioned over the signal period, overlapped or not. Such hardware structures are particular counter based FSMs (Finite State Machines) and they can be frequently encountered in many applications that need a sequence of pulses to control the execution path, like video synch-generators, three phase inverters, pipeline processing. The classical design approach uses magnitude comparators on all counter outputs that can be reduced to equality comparators on fewer counter outputs only by heuristic methods. Here is presented an algorithmic solution that can be systematically applied as universal technique, which uses only AND gates to detect the match combinations for the start and the end of each pulse. Furthermore, an innovative optimization procedure that reduces the global number of the gates inputs to a minimum, useful even in FPGA implementations is proposed. These solutions were practically applied and extensively tested by designing multiple resolution/refresh synch-generators in a FPGA video interface for embedded systems.

**Key words:** Pulse generators, counter FSM, AND detection, BER cell, FPGA video interface.

*2000 Mathematics Subject Classification:* 68M99, 68W35.

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## Parallel Tools and Techniques for Biological Cells Modelling

*Salvatore Cuomo, Pasquale De Michele and Marta Chinnici*



[Full text](#)

In this paper we show a way to use high performance computing techniques in order to achieve a more suitable neural network simulation approach. Several mathematical models and softwares for biological cells modelling are described. The performance of a modified and optimized biological neuron computational model, based on multi-thread and message passing tools, are reported.

**Key words:** biological reality, neural network simulation, computational model, cells modelling, computing power, simulation.

*2000 Mathematics Subject Classification:* 68T05, 68T42.

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## Nonlinear $H_\infty$ Control of Variable Speed Wind Turbines for Power Regulation and Load Reduction

*Jován Oseas Mérida Rubio and Luis Tupak Aguilar Bustos*



[Full text](#)

A control strategy is realized which solve the problem of output power regulation of variable speed wind energy conversion systems by combining a linear control for blade pitch angle with a nonlinear  $H_\infty$  torque control which mitigate the effects of external disturbances that occur at the input and output of the system. The controller exhibits better power and speed regulation when compared to classic linear controllers. We assume that the effective wind speed and acceleration are available from measurements on the wind turbine. In order to validate the mathematical model and evaluate the performance of proposed controller, we used the National Renewable Energy Laboratory (NREL) aerolastic wind turbine simulator FAST. Simulation and validation results show that the proposed control strategy is effective in terms of power and speed regulation.

**Key words:** nonlinear control, power and speed regulation, wind turbine simulator.

*2000 Mathematics Subject Classification:* 34H05, 93A30

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## Achieve Faster Spanning Tree Convergence

*Roxana Stănică and Emil Petre*



[Full text](#)

Spanning Tree Protocol (STP) is a Layer-2 protocol that provides path redundancy and ensures a loop-free topology for bridged Local Area Networks (LANs). Rapid Spanning Tree Protocol (RSTP) is an evolution of STP. RSTP provides faster spanning tree convergence after a topology change. While STP can take 30 to 50 sec to respond to a topology change, RSTP is able to respond to changes within  $3 \cdot \text{hello-timer}$  or within a few milliseconds of a physical link failure. This paper contains detailed explanations of STP and RSTP features and new developed commands to ensure a faster convergence. The STP and RSTP structures permit the configuration of different parameters such as hello, forward-delay and MaxAge timers and priority for Bridge Protocol Data Units (BPDUs).

**Key words:** network protocol, LAN bridge, fault tolerance, topology change.

*2000 Mathematics Subject Classification:* 94C12

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## Singular Perturbation Approach to RBNN Adaptive Control of Unknown Flexible Joint Manipulators

*Bahram Karimi and Morteza Ghatee*



[Full text](#)

In this paper, a composite control approach to the adaptive RBNN is presented for rigid link flexible joint (RLFJ) with unknown parameters. Singular perturbation method was used for robot motion dynamics in two subsystems: a slow subsystem and a fast subsystem. Furthermore, simultaneous tracking and suppression of vibration in joint of manipulator is possible by application of the composite controller and the stability of the closed loop system is guaranteed through Lyapunov stability analysis. After proposing the controller, we perform some simulation studies for a rigid link flexible joint manipulator system. The simulation results show the effectiveness of the approach.

**Key words:** neural networks, stability, robot motion, perturbation, adaptive control.

*2000 Mathematics Subject Classification:* 37B25, 93C40

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## 2-Connected Synchronizing Networks

*Eduardo Canale, Pablo Monzon and Franco Robledo*



[Full text](#)

Networks synchronization is a fundamental issue in networks analysis and design, and has become an important research topic in several communities, like electrical engineers, computer scientists and applied mathematicians. The intrinsic multidisciplinary context, that combines communication protocols, dynamical systems and graph theory, stimulates different approaches to the same problem. In this article, we study the synchronization properties of the classical model of Kuramoto coupled oscillators, specially for particular classes of 2-connected often used in communication networks.

**Key words:** synchronizing graphs, coupled oscillators, almost global synchronization.

*2000 Mathematics Subject Classification:* 68M10, 90C35, 05C85

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## Implementing a Public-Key Infrastructure for the Academic Environment

*Marius Marian and Andrei Pîrvan*



[Full text](#)

This paper presents a pilot deployment and implementation of a public-key infrastructure within the IT academic environment of University of Craiova. PKIs are both useful and complex security-enabling instruments. Without a careful analysis and planning, it becomes difficult to find a way to alleviate its complexity and impact on end users and decision makers. Best practices concerning PKI can be derived from precedent and alternative experiences, and therefore they can help throughout the PKI setup and maintenance.

**Key words:** public-key infrastructure, security services.

*2010 Mathematics Subject Classification:* 91G20

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