

CONTENTS

<u>Application of Neuro-Predictive Approach for Disturbance Rejection in a Steam Drum Boiler</u>	9 - 20
<i>Cristina Budaciu</i>	
<u>Automatic Carpet Wear Classification Based on Support Vector Machine and Haralick Descriptors</u>	21 - 34
<i>Cosmin Copot, Robin De Keyser, Syam Syafie, Sergio Vargas, Lieva Van Langenhove and Corneliu Lazăr</i>	
<u>Manufacturing Systems Analysis and Design. Qualitative Versus Quantitative Techniques in a Petri Net Setting</u>	35 - 46
<i>Cristian Mahulea, Timotei Asaftei and Mihaela Matcovschi</i>	
<u>Proportion Based Protocols for Load Balancing and Lifetime Maximization in Wireless Sensor Networks</u>	47 - 70
<i>Andrei Dumbavă, Rahim Kacimi, Riadh Dhaou and André-Luc Beylot</i>	
<u>Object Recognition in Video Sequences Using Interest Point Detection</u>	71 - 85
<i>Lucian Carata and Vasile Manta</i>	
<u>Functional Approximation Using Neuro-Genetic Hybrid Systems</u>	87 - 102
<i>Constantina Raluca Mihalache and Florin Leon</i>	
<u>Recognition of Handwritten Digits Using Multilayer Perceptrons</u>	103 - 114
<i>Violeta Sandu and Florin Leon</i>	

Application of Neuro-Predictive Approach for Disturbance Rejection in a Steam Drum Boiler

Cristina Budaciu



[Full text](#)

In this paper a neuro-predictive method is proposed in order to control the water level in the steam drum boiler system being in use at a Power Plant of Iași, Romania. The steam boiler provides thermal and electrical power and it works under complex technology in order to satisfy numerous technical, security and economical requirements. A nonlinear dynamic simulator for the proposed steam drum boiler was used in order to build up the neuro-predictive structure. Based on the data taken from the simulator, the adopted strategy was tested and simulation results are given.

Key words: steam drum boiler, neural model, neuro-predictive strategy, drum level control, steam flow disturbance.

2000 Mathematics Subject Classification: 93C10, 93C40, 93C83.

[top](#)

Automatic Carpet Wear Classification Based on Support Vector Machine and Haralick Descriptors

Cosmin Copot, Robin De Keyser, Syam Syaftie, Sergio Vargas, Lieva Van Langenhove and Corneliu Lazăr



[Full text](#)

For every carpet produced nowadays, the industry requires a label to attest the quality of produce. This label is determined through visual assessment by human experts, but this method has a number of problems generated by the subjectivity of people. The idea of using computers for automatic labelling is not new but until now all the results were not satisfying and the human experts are still the best choice. This paper presents an approach to this problem using 3D lasers for scanning the carpets. Resampling 3D data on different grid sizes, a 2D image is obtained and then a technique based on Haralick descriptors is applied to detect the features. The features extracted with Haralick descriptors represent the input of a classifier system based on support vector machine (SVM). The performance of the new technique proposed gives an average of over 92% correct labelling.

Key words: support vector machine, optimal hyperplane, co-occurrence matrix, features.

2000 Mathematics Subject Classification: 53B25, 53C15.

[top](#)

Manufacturing Systems Analysis and Design. Qualitative Versus Quantitative Techniques in a Petri Net Setting

Cristian Mahulea, Timotei Asaftei and Mihaela Matcovschi



[Full text](#)

The paper discusses and illustrates by examples the role of Petri net (PN) models in the analysis and design of flexible manufacturing systems (FMSs). Qualitative techniques use untimed PN models in developing control strategies that ensure good behavioral properties of FMSs. Timed PN models serve for a refined approach where quantitative information is incorporated in the model. The case study presented herein proves the utility of a Petri net simulator with appropriate facilities for the selection of the most adequate policy in controlling a production flow.

Key words: flexible manufacturing systems, deadlock, Petri nets, simulation, performance analysis.

2010 Mathematics Subject Classification: 93C65, 37M05.

[top](#)

Proportion Based Protocols for Load Balancing and Lifetime Maximization in Wireless Sensor Networks

Andrei Dumbravă, Rahim Kacimi, Riadh Dhaou and André-Luc Beylot



[Full text](#)

The paper presents the problem of minimizing energy consumption and lifetime maximization in a many-to-one sensor network. In such network pattern, all sensor nodes generate and send data to a single and fixed sink (base station), via multi-hop transmissions. When all the sensor data have to be forwarded to a single base station via multi-hop routing, the traffic pattern is highly non-uniform, putting a high burden on the sensor nodes close to the base station. Some strategies that balance the energy consumption of the nodes and ensure maximum network lifetime by balancing the load are proposed and analyzed. The key element of the research is the use of multiple transmission power levels. We studied an optimal solution for calculating the hop-by-hop traffic proportions for the particular case of nodes having just two transmission power levels, and compared the results given by the heuristics with those from the optimal analytical case. Another goal is to propose and implement a systematic approach for the construction of the sensor network based on real sensor nodes. The neighbor discovery phase, the way in which the base station finds out the network topology and then impose the strategy and decide whether the nodes to act locally or respect the instruction from the sink are part of the protocol that is described in the paper.

Key words: wireless sensor network, lifetime maximization, load-balancing, transmission power control, power consumption, simulated annealing, optimization.

2000 Mathematics Subject Classification: 94C99, 90C50.

[top](#)

Object Recognition in Video Sequences Using Interest Point Detection

Lucian Carata and Vasile Manta



[Full text](#)

Object recognition in video sequences is an important problem, being actively studied in computer graphics and especially in computer vision. This article presents the theoretical background and the details of an implementation that is capable of solving the problem, at minimum hardware costs. The approach is based on object identification using points of interest (determined with algorithms like SURF) and on parallel computation in order to achieve real-time frame rates. A number of different similar methods are analysed, stressing their advantages and disadvantages compared to the proposed method.

Key words: object recognition, feature detection, interest points, SURF.

2000 Mathematics Subject Classification: 68U05, 65D18.

[top](#)

Functional Approximation Using Neuro-Genetic Hybrid Systems

Constantina Raluca Mihalache and Florin Leon



[Full text](#)

Artificial neural networks provide a methodology for solving many types of nonlinear problems that are difficult to solve using traditional techniques. Neuro-genetic hybrid systems bring together the artificial neural networks benefits and the inherent advantages of evolutionary algorithms. A functional approximation method using neuro-genetic hybrid systems is proposed in this paper. Three evolutionary algorithms are used: simple evolutionary algorithm, adaptive evolutionary algorithm and differential evolution. It is also proposed an optimization method for convergence lapse of evolutionary algorithms using a hybrid technique for training neural networks, combining an algorithm based on the gradient descent (backpropagation) and evolutionary algorithms.

Key words: functional approximation, neural networks, evolutionary algorithms, backpropagation.

2000 Mathematics Subject Classification: 92B20, 68T24, 65D15.

[top](#)

Recognition of Handwritten Digits Using Multilayer Perceptrons

Violeta Sandu and Florin Leon



[Full text](#)

Neural networks are often used for pattern recognition. They prove to be a popular choice for OCR (Optical Character Recognition) systems, especially when dealing with the recognition of printed text. In this paper, multilayer perceptrons are used for the recognition of handwritten digits. The accuracy achieved proves that this application is a working prototype that can be further extended into a full handwritten text recognition system, addressing both digits and letters.

Key words: neural networks, multilayer perceptrons, handwritten text recognition, backpropagation.

2000 Mathematics Subject Classification: 92B20, 68T24.

[top](#)