

CONTENTS

<u>A FPGA Implementation of A Phase Locked Loop for DC Motor Control</u>	9 - 22
<i>Bogdan Alecsa and Alexandru Onea</i>	
<u>Multiple Genetic Programming Based Techniques for Nonlinear Systems Identification</u>	23 - 36
<i>Alina Patelli and Lavinia Ferariu</i>	
<u>Low-Power Embedded Device Used in Healthcare Systems</u>	37 - 50
<i>Nicolae Alexandru Botezatu and Andrei Stan</i>	
<u>Distributed Differential Criptanalysis of FEAL - 8</u>	51 - 60
<i>Mihai Horia Zaharia and Eugen Cazacu</i>	
<u>An Algorithm for Hierarchical Network Topology Optimization</u>	61 - 70
<i>Elena Șerban and Carmen-Ema Panaite</i>	

A FPGA Implementation of A Phase Locked Loop for DC Motor Control
Bogdan Alecsa and Alexandru Onea



[Full text](#)

The paper proposes a way of implementing a phase locked loop (PLL) motor speed controller. The main emphasis is on the FPGA implementation of the digital PLL. The closed loop sensing element is an optical tachometer, which outputs an impulse train with a frequency proportional to the motor rotational speed. This impulse train will be synchronized by the PLL to a reference impulse train of a given precise frequency, generated inside the FPGA from a quartz crystal oscillator. The phase difference between the two impulse trains is measured by a phase detector. The phase detector converts the phase difference to a numerical value that can be processed digitally by the loop filter. The loop filter acts as a regulator.

The novelty of the design is the phase detector, which allows digital processing of the signals. The design of the PLL can be done only with digital logic. The whole digital controller can be easily implemented in an FPGA. Simulation results show the behaviour of the designed digital circuits.

Key words: PLL, ADPLL, FPGA, motor control.

2000 Mathematics Subject Classification: 93C83.

[top](#)

Multiple Genetic Programming Based Techniques for Nonlinear Systems Identification

Alina Patelli and Lavinia Ferariu



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The issue of nonlinear systems identification is addressed, in the following, by means of genetic programming, as this method is well known for providing a robust and unsupervised data driven model selection mechanism. The generated models are nonlinear, linear in parameter, a mathematical formalism that facilitates the use of a local optimisation procedure based on QR decomposition, to aid in the fast and accurate computation of model parameters. Model structure is configured by enhanced genetic operators, also designed by the authors to effectively exploit the considered parameter wise linearity. The two customisations work together, in an original symbiosis, for simultaneous structure and parameters selection. In order to refine the search for an accurate and compact model, the core algorithm is extended so that it evaluates potential solutions by making use of two separate objectives with dynamically adaptive priorities. A novel fitness assignment scheme is introduced, along with an adaptive threshold migration mechanism. The algorithm performances are then compared against the ones of an elitist procedure, within the experimental framework of an industrial system.

Key words: genetic programming, nonlinear systems, multiobjective optimisation, elitist procedure.

2000 Mathematics Subject Classification 93C30.

[top](#)

Low-Power Embedded Device Used in Healthcare Systems

Nicolae Alexandru Botezatu and Andrei Stan



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The need for chronic and geriatric care at home, due to a great number request of patients who do not wish to stay in clinics, has increased the demand of homecare monitoring wearable mobile devices. Low power consumption is essential in the continuous process of monitoring vital signs and can be achieved combining very high storage capacity, wireless communication, and ultra-low power circuits together with firmware management of power consumption. This approach allows the patient to move unconstrained around an area. The design of a ultra low power wireless monitoring system based on low power circuits, flash memory storage and 2.4 GHz communications is presented in this paper.

Key words: healthcare, low-power, patient monitoring, telemedicine, wireless.

2000 Mathematics Subject Classification: 92C50, 68M12, 94C99.

[top](#)

Distributed Differential Cryptanalysis of FEAL - 8

Mihai Horia Zaharia and Eugen Cazacu



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In this paper a distributed approach for differential cryptanalysis of Fast Data Encipherment Algorithm (FEAL) – 8 is presented. Because that algorithm is intensive computational, a mesh mapping using hypercube routing approach is used. A centralized client-server implementation was chosen. The simple partition of the problem is used in client job generation. Also, an example of MPI code is presented in order to underline the method appliance.

Key words: distributed computing, differential attack, Feistel Cipher.

2000 Mathematics Subject Classification: 68P25, 68N19.

[top](#)

An Algorithm for Hierarchical Network Topology Optimization *Elena Șerban and Carmen-Ema Panaite*



[Full text](#)

This paper proposes an algorithm for hierarchical network topology design. The algorithm is based on Bejan's constructal theory. Starting from an initial construction, the algorithm constructs the hierarchical network adding new nodes according to some optimization criteria. The algorithm was applied for hot water pipes networks design. The initial construction is the pipe from energy supplier to the first distribution point. There are two optimization criteria: the water temperature for new end user (the farthest user) and temperature difference between all end users. The water temperature has to be maximized and the temperature difference has to be minimized. The paper presents the mathematical equations used for network modeling, the network constructing algorithm and some numerical results.

Key words: optimization, constructal theory, network topology, hot water network.

2000 Mathematics Subject Classification: 90C35, 28A80, 68R10, 80A20.

[top](#)