

ABSTRACTS OF PAPERS PRESENTED AT INTERNATIONAL CONFERENCES

The abstracts of papers published in this magazine pertain to research projects conducted all over I.R. Iran, including those papers which have been previously printed in reputable scientific publications, and are not limited to the Sharif University of Technology alone. The Editor would be happy to include abstracts in future editions of *sharif*, of all scientific papers presented internationally by researchers from throughout the country, with a view to keeping the academic and professional communities informed about research activities carried out by Iranian scientists.

APPLICATION OF A CURRENT SOURCE INVERTER FOR A LINEAR PIEZO- ELECTRIC STEP MOTOR DRIVE*

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ABSTRACT

A linear piezoelectric step motor (LPS) driver using current source inverter is proposed in this study. The mechanism of operation of an LPS motor is first described. Then, a single-Phase equivalent model of the LPS motor is introduced. A detailed theory of driving circuit design using current source inverter for the LPS motor is explained. At the end the simulation and experimental results are presented and compared.

NEW INTEGRATED OPTICAL MEMORY BASED ON THE PLASMA WAVE MOD- ULATOR / SWITCH**

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ABSTRACT

The feasibility of an integrated optical memory is explored. This memory cell is based on the plasma wave modulator/switch, which has a horizontal layered structure. A transverse voltage maintains a bias for the

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structure and can be used for electrical write cycle. The cell content is then read by a propagating guided optical wave across the structure. It is also possible to apply full optical read/write/clear cycles as discussed. The read cycle can be either destructive or non-destructive, depending on the wavelength. A modification of this device may be considered as an opto-transistor, in which and optical signal Controls the flow of another optical beam.

■ AN INTELLIGENT FRAMEWORK FOR DESIGNING ANALOG CIRCUITS BASED ON HYBRID REASONING*

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ABSTRACT

In this paper an intelligent CAD tool is presented for the design of analog circuits. For a set of input specifications, first the system uses fuzzy rule-based reasoning to select alternative architectures for the circuits at each level of hierarchy, and then deduces the device sizes so that the performance of the designed circuits can be satisfactorily comparable with their specifications. To avoid time consuming designs, the above process should be done via using case-based reasoning whose objective is to determine the plausible building blocks subspecifications for the proposed architecture on the basis of past design experiences. In case that some of the building-blocks still have not been determined at device level, the same process of architecture selection and building block determination are repeated until all building blocks can be determined at device level. Finally in case that some input specifications are left which have not been met yet through the entire process

mentioned above, a qualitative reasoning-based approach would subsequently be used to make the final correction on the circuit topology and the related device sizes. Applying the above approach to a number of well-known design examples demonstrate the fact that the hybridation of fuzzy rule-based, case-based and qualitative reasoning can most suitably fit the design of analog integrated circuits.

■ LEATHER TANNERY COMPUTER CONTROL**

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ABSTRACT

The fundamental step in leather production is "tanning" or "processing" the animal hide. This process is performed in a wooden cylindrical device called a "drum" or a "lanner". The raw hide is processed inside the drum with a variety of mixtures of chemicals and water under certain environmental conditions and controlled temperatures. During the process, controlling the temperature and pH of the mixture is of an utmost importance and directly affects the quality of the leather produced. In many developing countries including Iran, control is exerted manually by an experienced worker. Since the quality of leather is directly linked to the level of control maintained during the process, a numerical approach and a precise computer controller could not only increase the quality of the final product but would also make the process more efficient. In this paper the benefits of a computer control system will be studied and the required software will be designed and finally the required computer hardware will be addressed.

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** To be published in *Scientia Iranica*, 9(3), (Summer 2002).

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EXPERIMENTAL PERFORMANCE EVALUATION OF A WAVELET-BASED ON-LINE VOLTAGE DETECTION METHOD FOR POWER QUALITY APPLICATIONS*

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ABSTRACT

This paper evaluates performance of a wavelet-based, on-line (real-time) voltage detection scheme for power quality applications. The objectives are: 1) to demonstrate suitability of the proposed method in detecting faults/disturbances in a power system and 2) to compare its performance with that of a conventional scheme. Two (STS) systems are chosen as frameworks for comparison; a low-voltage laboratory STS setup for which measured results are provided, and a medium-voltage STS system for which detection times are derived based on simulation, using the EMTDC /PSCAD.

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LOW-RATE SUPER-ORTHOGONAL CHANNEL CODING FOR FIBER-OPTIC CDMA COMMUNICATION SYSTEMS**

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ABSTRACT

In this paper, we consider using practical low-rate error correcting codes in fiber-optic code division multiple-access (CDMA) communication systems. To this end, a different method of low-rate channel coding is proposed. As opposed to the conventional coding schemes, this method does not require any further bandwidth expansion for error correction in fiber-Optic CDMA communication systems. The

low-rate channel codes that are used for demonstrating the capabilities of the proposed method are super-orthogonal codes. These codes are near optimal and have a relatively low complexity. We evaluate the upper bounds on the bit-error probability of the proposed coded fiber-optic CDMA system assuming both on-off keying and binary pulse position modulation schemes. It is shown that the proposed method significantly outperforms the uncoded systems for various receiver structures such as a correlator with and without hard-limiter and chip-level detector. Furthermore, the performance of the proposed coded fiber-optic CDMA system is also evaluated in the presence of different values of dark current.

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THYRISTOR CONTROLLED SERIES CAPACITOR CONTROL STRATEGIES FOR ENHANCEMENT OF POWER SYSTEM STEADY STATE AND DYNAMIC BEHAVIOR***

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ABSTRACT

Capability of thyristor controlled series capacitor (TCSC) to improve the dynamic stability of a power system as well as its steady state behavior is investigated in this paper. Using a versatile modeling approach for power system and its dynamic devices, and a flexible control structure for TCSC, control strategies are proposed to regulate real power and reactance in the series compensated line, and to improve damping of power swings. Suitability of these strategies is verified through computer simulation of a sample network.

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** published in *IEEE, Journal of lightwave technology*, 19(6) (June, 2001).

*** Presented at universities power engineering conference, Swansea, UK, (Sept. 2001).

VERTICAL AND HORIZONTAL SEISMIC MICROZONATION BY MICROTREMOR MEASUREMENT*

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ABSTRACT

One of the methods by which one can state the dynamic characteristics of the soil of an area, is by the measurement and analysis of microtremors. In this paper microtremors have been measured on 143 sites located in the city of Tabriz, Iran. These sites were chosen on profiles that covered the city in two orthogonal directions. Three components of the microtremors were measured on sediments and associated rock sites. Spectral amplification with respect to rock has been implemented in addition to Nakamura method for H_s/V_s to interpret the results of measurements for calculation of the natural period of the ground due to horizontal dynamic loadings. The importance of the vertical component of earthquakes, led us to study the vertical component of the microtremors as well. On such basis a method was proposed to study the natural period of deposits for vertical ground vibrations, based on microtremore measurements.

A CLASS OF ABS ALGORITHMS FOR DIOPHANTINE LINEAR SYSTEMS**

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ABSTRACT

Systems of integer linear (Diophantine) equations arise from various applications. In this paper we present an approach, based upon the ABS methods, to solve a general system of linear Diophantine equa-

tions. This approach determines if the system has a solution, generalizing the classical fundamental theorem of the single linear Diophantine equation. If so, a solution is found along with an integer Abaffian (rank deficient) matrix such that the integer combinations of its rows span the integer null space of the coefficient matrix, implying that every integer solution is obtained by the sum of a single solution and an integer combination of the rows of the Abaffian. We show by a counterexample that, in general, it is not true that any set of linearly independent rows of the Abaffian forms an integer basis for the null space, contrary to a statement by Egervary. Finally we show how to compute the Hermite normal form for an integer matrix in the ABS framework.

RESISTANCE SPOT WELDING OF GALVANIZED SHEETS***

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ABSTRACT

In this study the effect of zinc coating on welding parameters has been investigated. By hot dip galvanization, coating with thickness of 46.5 micron were created on the surfaces of steel. After welding for determining mechanical property, peeling and tension-shear tests were carried out. More ever microhardness and metalography tests were used for studing of weld microstructure and hardness. It has been observed that higher current, electrode force and longer weld time are required when galvanized steels are welding for stability in weld strength and nugget size. Weld microstructure is dendritic that at the grain boundris was alotropic ferrite and in the center of them was upper bainite and weld hardness haven't made any difference.

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** published in *Numerische Mathematik*, 90, pp. 101-115 (2001).

*** presented at the second international conference on welding (ICW 2002) Tehran-Iran, (10-13 March 2002).