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.

TIMOSHENKO BEAM EXCITED BY A TRAVELING DISTRIBUTED MASS*

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ABSTRACT

The behavior of Timoshenko beam traversed by a uniform partially distributed mass is discussed. The effects of shear deformation and rotary inertia have been found to result in somewhat higher maximum dynamic beam deflections. Maximum induced dynamic shear force is observed to be a nearly decreasing function of the mass speed. However, the maximum dynamic bending moment roughly increases with the load speed. This parameter sensitivity study is believed to be useful in design.

AN IMPROVED MODEL FOR SPEECH EXCITATION USING TIME-FREQUENCY CHARACTERIZATION**

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ABSTRACT

The paper introduces a new method for approximating the excitation in a Linear Predictive Coding (LPC)

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model over both time and frequency domains. In frequency domain, a new two band excitation model is proposed for decomposing the signal spectrum into two periodic and nonperiodic components using the Smoothed Wigner-Ville (SWV) distribution. This model provides high resolution in the time frequency plane which gives accurate information about pitch and voicing. The periodic component is then analysed with a new "Multi Pulse" like technique to approximate the signal in time domain through repeating a representative pattern across each frame. It is shown that combining the spectral and the temporal models improves significantly over the performance of our earlier model for the excitation and gives a good approximation to the signal for most speech sounds. Evaluation results show that the proposed coding method, operating at 2400 b/s, outperforms current standard coders at a similar rate.

SIMULATION OF INTERNAL BALLISTICS OF SOLID ROCKET ENGINES ON A MOVING UNSTRUCTURED GRID*

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ABSTRACT

Internal ballistics of solid rocket engines are simulated by solving axisymmetric Euler equations by cell-centered finite volume formulation using flux difference splitting method of Roe. Geometric conservation law is satisfied to make the solution valid for a moving grid. New nodes are introduced when the boundary elements are too skewed to make the aspect ratio of grid cells appropriate. Conservative interpolation formulas are derived to assure conservation in the interpolation procedure. The algorithm is applied to several rocket engines and all thermodynamic properties during engine fire are computed and are compared to experimental results.

THREE DIMENSIONAL SOLUTION ADAPTIVE APPROACH FOR INVISCID COMPRESSIBLE FLOWS**

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ABSTRACT

Computer running time and memory requirement define the most important restrictive parameters in the field of three dimensional flow simulation. In this paper, a solution adaptive method is developed for solving inviscid compressible flow problems in three dimensional space. The grid generation algorithm produces three dimensional Delaunay mesh based on a modified version of Watson's algorithm which was designed and presented previously by the authors [1]. The three dimensional inviscid compressible flow equations are expressed in the conservative form and discretization is made using a first order upwind scheme based on Roe's flux difference splitting method. The usage of adaptation procedure increases the accuracy in the regions of high gradients. The accuracy and efficiency of the code are evaluated by computing two dimensional and axisymmetric flows in three dimensions and comparing the results to valid existing data. The feasibility of computing three dimensional flows on large grids is demonstrated.

EDMC CONTROL DESIGN FOR NON-LINEAR PROCESSES WITH SIGN CHANGES OF STEADY STATE GAIN***

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** Presented at the 8th Asian Congress of Fluid Mechanics, Shenzhen, China (6-10, Dec. 1999).
*** Presented at 6th IEEE International Conference on Electronic Circuits and Systems, Paphos, Cyprus (5-8, Sept. 1999).

ABSTRACT

EDMC is an extended version of the dynamic matrix control (DMC) approach to control nonlinear processes. In this method, control input is determined based on linear model approximation of the process in each control or optimization interval. Difference between linear and nonlinear models of the process is considered as the known part of the feedback signal in DMC control formulation. Usually the fixed point or the secant method is applied to reduce difference between two models. When the steady state gain of the nonlinear process exhibits sign changes, then linear approximation using the above two methods will not converge to a unique solution. In this paper, a supervisory control scheme is proposed to solve the problem. Computer simulations show the effectiveness of the method.

EVALUATION OF PROPERTIES OF LOCALLY PRODUCED SILICA FUME FOR USE IN CONCRETE*

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ABSTRACT

In this study, the chemical and physical properties of silica fumes produced by Ferrosilice and Ferroalloys factories in Iran are investigated. The test results show that the properties of the two silica fumes correspond with that according to ASTM C-1240 standard. An extensive experimental program was also conducted to determine the compressive strength of concrete containing the locally produced silica fumes. The test variable included: percentage of silica fume (0% to 15%); water to cement ratio (0.3 to 0.57); weight of cement (300 to 520 kg/m^3), and curing period (1 to 91 days). In total, over 50 concrete mixes were designed and more than 600 cubical specimens were tested for compressive strength evaluation. Test results indicate that 5 to 10 percent replacement of silica fume for cement provides the highest strength for short and long terms. Generally, the mixes containing low cement resulted in higher percentage of strength gain. The range of compressive strength gain for silica fume concrete including the above mentioned variables varies between 20 to 67% at 28 days, and 20 to 55% at 91 days with respect to control concrete strength.

ENTROPY-MINIMIZED OPTIMIZATION OF AN AUTOMOTIVE AIR CONDITIONING AND HVAC SYSTEM**

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ABSTRACT

This paper described an integrated engineering approach for a mathematical modeling of an automotive air-conditioner system and method for performing heating and cooling load calculations of a vehicle shell assembly for designing an HVAC system for a passenger vehicle. In addition, there is presented a physical optimization technique based on minimization of the total entropy generation for the vehicle air-conditioner and HVAC system.

Proper design of automotive air-conditioning and the climate control systems of vehicles refrigerants, energy efficiency considerations, lowering of automotive energy consumption, development of adaptive cabin temperature and humidity control systems, responding properly to various operating conditions and cost reductions, due to proper design and selection of vehicle air-conditioning and HVAC system, have been some motivating factors.

The automotive mechanical compression air-conditioning model consists of a steady state, multizone heat exchanger model for evaporator and

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condenser and an experimental rating point model for the compressor and the thermostatic expansion valve. The heat exchanger models for condenser considers the existence of three regions of desuperheated, two phase and subcolled, and the evaporator is modeled considering the existence of two possible regions of two phase and superheated.

The vehicle passenger compartment climate simulation is based on a multigrid one-dimensional analysis, which allows for transient spatial variations of temperature and humidity inside the passenger cabin compartment. The thermal model considers heating loads due to solar radiation, conduction, convection, infiltration with the surrounding ambient, heat generation and absorption effects, as well as the spatial transfer of heat due to forced movement of air by the air handing system of the vehicle. The combined cabin thermal and airhandling system simulation models are referred to as the HVAC system model.

Simultaneous solution of the automotive air-conditioning, air handling and the passenger cabin thermal model provide the transient temperature history for consideration of passenger comfort conditions. The validity of the mathematical model was confirmed using experimental data.

Optimization of the developed model is performed based on minimization of the total entropy generation of the air-conditioning air handling system. Further minimization of the system entropy generation with respect to parameters of the air-conditioner or the HVAC system, as well as those of the vehicle air-conditioning, HVAC and passenger compartment components.

The result of this work assists the automotive industry by providing them with a mathematical tool for analysis of vehicle air-conditioning and HVAC system design and optimization.

LARGE EXTRA DIMENSIONS AND NONCOMMUTATIVE GEOMETRY IN STRING THEORY*

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ABSTRACT

The consequences of noncommutativity of space coordinates of string theory in the proposed large extra dimension solution to the hierarchy problem are explored; in particular the large dimension stabilization and the graviton reabsorption in the brain are considered.

THE CASCADE HMM/ANN HYBRID: A NEW FRAMEWORK FOR DISCRIMINATIVE TRAINING IN SPEECH RECOGNITION**

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ABSTRACT

In this paper, a new formulation for discriminative training of HMMs is presented. This formulation uses a properly trained MLP in a simple interconnection with HMMs called "Cascade HMM/ANN Hybrid". Our training algorithm has simple realization in comparison with other discriminative training for HMMs such as MDI and MMI. We also present a rigid mathematical proof of its convergence. We found that using cascade HMM/ANN for isolated word recognition in noisy environments results in increasing the recognition accuracy from 93.3% in classic HMMs to 99.1% using a two layer MLP. No significant increase in computational requirements is needed in recognition phase. Both theoretical and experimental achievements are included in the paper.

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** Presented at the 1999 IEEE-EURASIP Workshop on Nonlinear Image and Signal Processing, Anatalya, Turkey (20-23, June. 1999).