Acoustic mode shapes and frequencies for combustor chambers, including the convergent part of the nozzle, have been measured and the results have been fitted with modified theoretical relations.

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RANKING THE INTER-BASIN WATER TRANSFERS USING INDUCED ORDERED WEIGHTED AVERAGING OPERATOR

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Abstract

Traditional Multi - Attribute decision making (MADM) methods can not take in the optimism of decision makers. Ordered Weighted Average (OWA) is one of the important aggregation operators that incorporates some characteristics as risk acceptation or aversion. This paper compares the OWA method to other MADM methods and shows the vigor of OWA. An extended version of OWA (Induced OWA) will be used in a real case study of water resources management. The problem is based on the ranking of four Inter-basin Water Transfers through 8 criteria, in Iran. A NLP model has been developed to find the optimum order weights. Also, a sensitivity model has been developed for assessing the score of each alternative versus the changing optimistic degree of the decision maker/s. Analytical results show the applicability of OWA in ranking national water resources projects.

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STUDY OF POSSIBILITY OF NEURAL NETWORK USAGE IN INVERSE HEAT TRANSFER PROBLEMS

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Abstract

The inverse heat conduction problem, IHCP, refers to the type of heat conduction problems, in which part or all of the thermal boundary conditions imposed on the body are unknown; instead, measured temperature data at certain locations within the body interior or at its surface are available. The task is, usually an estimation of the unknown boundary condition, which, in a great majority of the cases, is the surface heat flux. The problem is mathematically ill-posed, meaning that a small error in the measured data (due to inevitable noise in the data) greatly contaminates estimation of the boundary condition.

This paper discusses a non-classical method for the solution of the IHCP, namely Artificial Neural Networks. In this method, first, the neural network is "trained" how to estimate the heat flux in a particular system by using a set of known heat flux components, as well as a set of "measured" data, both of which can either be obtained by actual experiments performed on the system or, equally as well, by performing simulated experiments, using a "direct" heat conduction solution. Once the training (i.e. system identification) is complete, the neural network algorithm can be used for estimation of any unknown surface heat flux history for that particular system. The neural network algorithm used in this work consists of a 3-layer perceptron, a training algorithm of resilient error back propagation, which is quite improved, as compared to the one used previously by Raudensky et al for simultaneous parameter and function estimations. It is shown, via a classical triangular heat flux test case, that the method can yield accurate, as well as stable, estimations. The method does not require calculation of the sensitivity coefficients and it is shown that the well-known lagging and damping effects in classical IHCP is not a particularly important issue for this algorithm, as the estimation of heat flux by sensors located far from the active surface are almost equally as good as those located near it.

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Abstract
The hydroforming process is one of the processes in metal forming technology which was originally used to form hollow pieces under pressure of a fluid. The basic parameter in this process is the pressure control of the fluid. This paper deals with the process of hydroforming of a pair of metal sheets. After obtaining the kinematically admissible velocity field, the pressure equation is obtained by an upper bound analysis. The effects of the parameters of work-hardening, friction, blank size and stretch condition in the die cavity have been taken into consideration. The pressure estimation equation obtained for each geometrical type can be applied, if the instantaneous geometry of the sheet in the die cavity zone can be analytically expressed. To validate the results of this work, a hemispherical part, formed in the hydroforming of a single sheet process, has been considered. The results obtained by this analysis have been compared with the published experimental results.

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MEASUREMENT AND COMPARISON OF THE NET MOMENTS OF HUMAN JOINTS DURING WEIGHT LIFTING AT DIFFERENT SPEEDS

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Abstract
This paper studies the effects of lifting speed (with stoop technique) on the moments and forces of human joints. A two dimensional 8-segment model of the human body was analysed to obtain the joint forces and moments using and inverse dynamic method. The force and kinematic data were recorded using a force platform and video imaging techniques, respectively. Results indicated a sudden increase of knee and hip joint forces and moments following an increase of lifting speed, particulartly at the weight lifting instant.

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EXPERIMENTAL DETERMINATION OF LIQUID ENGINES COMBUSTION CHAMBER ACOUSTIC CHARACTERISTICS

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Abstract
Liquid rocket engines occasionally experience severe pressure fluctuations and flame oscillations resulting in injector damage and total engine failure. High frequency combustion instability is caused by the coupling between the combustion process and the combustion chamber acoustic field. Therefore, knowledge of the combustion chamber acoustic characteristics is essential in dealing with this phenomenon. An experimental approach for determination of the combustion chamber acoustic characteristics is outlined here. An acoustic laboratory, consisting of a hemi-anechoic room, sound generation, recording devices and complete three dimensional sweeping capabilities, has been designed and built. The experimental set up and the measurement procedures have been validated by determining natural acoustic modes of several sizes of open and closed ended cylindrical combustor. Such measurements and comparisons have provided insight into acoustic interaction in the three dimensional chamber and the effects of different boundary conditions. The phenomenon of the destruction of standing waves has been observed. Experimental results indicate that, at frequencies where the ratio of the wave length of the standing wave to the diameter of the chamber is about 1/7, the destruction of the standing wave is observed.

ing, sintering, coating and moving of material along the kiln and the control process in a rotary kiln. An inverse geometry heat conduction problem is solved to detect the unknown location of the surface of the charge material or unknown bed depth in the rotary kiln. The finite volume method is employed to discretize the governing equation of the direct problem domain and the inverse model is constructed to identify the unknown boundary location. A sequence direct problem is solved in an effort to update the boundary geometry by minimizing an objective function. The objective function is constructed by summation of the squared differences between the actual and computed temperatures at the sensor locations. This function (objective function) is minimized, based on the two optimization algorithms, (L-MM) and (CGM) methods. Since, for each optimization step, a new grid is generated in the computational domain, this producer may be defined as one kind of an inverse geometry problem. In another way, by estimating the unknown location of the bed surface (bed depth) for each cross section of the kiln, the amount of charge material at this slice can be obtained.

■

EFFECT OF SURFACE ROUGHNESS ON THE AERODYNAMIC PERFORMANCE OF A SECTION OF A WIND TURBINE BLADE

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Abstract
A series of wind tunnel tests on a section of 660 KW wind turbine blade at various Reynolds numbers were performed to investigate its aerodynamic behavior. The tests included the effects of surface roughness and free stream Reynolds number on the pressure distribution and corresponding aerodynamic parameters. The results indicate that surface roughness causes significant performance degradition at all Reynolds numbers. Further, it diminishes the transition point at low angles of attack, reduces upper surface static pressure and enhances the separation region over the model. However, the Reynolds number has a significiant effect on the aerodynamic performance of the airfoil, as expected, but, its effect on the surface roughness is minimal. The experimental results were compared with the available engineering and CFD codes, Eppler, Xfoil and Fluent, and the results, at low to moderate angles of attack for the clean model, are satisfactory.

■

MOBAILE MANIPULATOR ROLLOVER RECOVERY BY USING VISION SYSTEM

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Abstract
Applications of mobile manipulators over uneven terrain, for doing complex tasks autonomously, will be increased. In many cases, robot control algorithms and path planning methods ignore some characteristics of a robot and its environment. Thus they have a limited performance over uneven terrain. Therefore, robot instability that leads to roll over is not an unexpected matter. In this paper, mobile manipulator rollover recovery, by using a manipulator and a vision system, is presented. A genetic algorithm and a quasi static model are used to find the optimal recovery process. The criterion of optimization is the power consumption of actuators of the mobile manipulator. The power consumption depends on the path that the end effector negotiates over the surface. To estimate the surface curve, a human like stereo vision is used. Finally, simulation results are presented.

■

PRESSURE ETIMATION IN HDROFORMING OF SHEET METALS USING THE UPPER BOUND TECHNIQUE

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Abstract
Mass transfer is one of the most common methods in the estimation of free water surface evaporation. In this paper, the Daltonian form of this method was considered. Using the volume balance of the Chahnimeh Reservoir in Sistan, the coefficient of the Dalton equation was calibrated empirically. Statistical tests were used for model development and verification and a sensitivity analysis was also performed. Results showed that ±10 percent changes in the coefficient caused a change of less than ±10 percent in reservoir storage. The Dalton coefficient was independent of wind velocity over a wind speed of 4 m/s for dry years, during which the Hamun Wetlands are fully dry. The coefficient of less than this threshold is a nonlinear function of wind velocity. The threshold for wet and normal years, in which Hamun Wetlands are not dry, was estimated to be about 6 m/s.

■

APPLICATION OF THE EXTENDED FINITE ELEMENT METHOD (X-FEM) IN COHESIVE CRACK MODELING

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Abstract
The finite Element Method (FEM) and other numerical methods, in recent years, are widely used in modeling of the fracture problem. Remeshing requirements and mesh sensitivity are the major disadvantages in analyzing crack growth using conventional FEM methods. Recently, advanced FEM methods, such as the Extended Finite Element Method (X-FEM), have been proposed to model discontinuities through the elements. The advantage of these methods is that remeshing is not required in the crack growth process. The cohesive crack method is a simplified field model to simulate the complicated behavior of the crack growth in quasi-brittle materials. In this paper, we use the advantages of the X-FEM and crack length control method for modeling of the cohesive crack growth.

■

CRACK INTERACTION AFFECTED BY LONGITUDINAL WAVES

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Abstract
Crack interaction in infinite media, in which plane Longitudinal waves are supposed as the external loading, is studied in this paper. The effects of longitudinal waves, with different angles of propagation, on a single crack are studied as a basis of comparison and, in the next steps, another crack is placed near this single crack with different placements and orientations, in such a way as to facilitate the study of the effects of wave reflection from the faces of the cracks and the scattering around the tips of the cracks. The results are presented in terms of stress intensity factors. Using the dual boundary element method and discontinuous elements on boundaries, the SIFs were computed by the crack opening displacement method (COD). It is concluded that it is the crack arrangement that causes the most significant effect.

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BED-DEPTH ESTIMATION IN ROTARY KILN USING INVERSE PROBLEM METHOD

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Abstract
The bed depth or the amount of charge material is an important parameter that can affect the heat-

ABSTRACTS OF PAPERS IN ENGLISH

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EXPERIMENTAL STUDY OF A ONE SIDED MASONRY WALL REHABILITATION DESIGN FOR EARTHQUAKE DAMAGED BUILDINGS

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Abstract

Unreinforced masonry buildings are among the most popular types of construction in Iran. In these buildings, walls are used to resist both lateral and gravity loads. Since brittle materials are used in the construction of these walls, they, typically, are not ductile and, when load exceeds capacity, they suddenly lose their load carrying capacity.

After an earthquake, different kinds of damage are introduced to buildings which fall into the following categories; members with permanent deformation or members with cracks. Rehabilitation is the best way for enhancing the behavior of the cracked members. It is possible to rehabilitate cracked members using different approaches so that they regain their strength. This is important from two aspects: 1-There are a lot of cracked members in a structure after an earthquake 2- Because of the loss of lateral strength in the case of cracks in a load carrying member, the structure is vulnerable to future quakes. In this research, a design for the one sided rehabilitation of damaged masonry walls, using of one undamaged masonry wall and one damaged, but rehabilitated, wall, with a scale of 0.5 under cyclic load, has been investigated. Results show that this design strategy has restored most of the load carrying capacity of the wall.

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STUDY OF WIND EFFECTS ON FREE WATER SURFACE EVAPORATION FROM CHAHNIMEH RESERVOIR IN SISTAN, USING THE DALTONIAN METHOD