ABSTRACTS OF PAPERS IN ENGLISH

MOTION ANALYSIS OF A MANIPULATOR MOUNTED ON A VEHICLE WITH SUSPENSION SYSTEM

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Abstract

A manipulator mounted on a moving vehicle is called a mobile manipulator. A mobile manipulator with an appropriate suspension system can pass over uneven surfaces, thus having an infinite workspace. If the manipulator could operate while the vehicle is traveling, the efficiency concerning the time and energy used for stopping and starting will be increased. This paper presents the kinematic and dynamic modeling of a three degrees-of-freedom manipulator attached on a vehicle with three degrees-of-freedom suspension system. the manipulator is a RRR type, with three revolute joints, and the degrees of freedom of vehicle are bounce, pitch, and roll. The vehicle is considered to move with a constant linear speed over an uneven surface while the end effector tracks a desired trajectory in a fixed reference frame. Simulation results for straight-line trajectory are presented.

STRESS FIELD NEAR THE EDGES OF SYMMETRIC BALANCED COMPOSITE LAMINATES

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Abstract

The interlaminar stresses in symmetric balanced compo-

site laminates under uniform extensional strain are studied here by using the layerwise theory of Reddy. The laminates are assumed long in the x direction. Equilibrium equations are derived by using the principle of minimum total potential energy and solved analytically. The results obtained from this theory are compared with those available in the literature. It is found that the theory can accurately predict the stresses in the interior region and near the free edges of composite laminates.

A THERMODYNAMIC MODEL TO STUDY THE ENERGY CONSUMPTION OF GAS COOKING OVENS

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Abstract

Simulation is one of the most suitable and easiest method to investigate the efficiency of cooking ovens and to study the different modifications leading to efficiency enhancement. However, this home appliance being simple in design has a complex physics such as the low rate of fuel burning and complicated domain and boundary conditions. Therefore, the 3-D unsteady governing equations are very difficult to solve and even the solution cannot be validated by experimental data properly. In this paper , by simplifying the governing equations, a thermodynamic model is developed to predict the oven behavior, its container, and insulation, including the combustion chamber and control valve operation. The equations are solved by employing a numerical integration algorithm. In addition, an experimental set up is installed and the model is validated by experimental results.

SOLUTION OF INVERSE HEAT CONDUCTION PROBLEMS USING DUAL RECIPROCITY BOUNDARY ELEMENT METHOD

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Abstract

In the peresent work, the dual reciprocity boundary element method along with sequential function specification method is used for solution of inverse heat conduction problems involving time and space varying heat flux estimation. A new version of the sequential specification method based on using polynomial fit is presented, which shows reduction in sensitivity of the solution to thermocouple locations. The results demonstrate that the method is accurate enough in cases which the amplitude of the errors is up to 2% of the maximum measured temperature. This study illustrate that, the optimum number of future time steps depends on error amplitude.

AERODYNAMIC PERFORMANCE OF A WING MOVING CLOSE TO WATER SURFACE

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Abstract

Performance of a WIG vessel (Wing In Ground effect) moving close to the water free surface is an important issue in aerodynamic design of such vessels. Reliable prediction and analysis for wings as well as considering different factors can have significant effects on WIG design. Hence, aerodynamic modeling of wing sections close to the water surface is sutdied and some practical results are derived in this paper. Furthermore, this paper introduces important procedures and numerical implementations for aerodynamic analyses. The accuracy and efficiency of the methods are discussed and the results are

persented. In addition the effects of flexible water free surface versus the ground are studied and compared with each other. Some other factors such as viscosity and turbulence are taken into account and their effects are evaluated. Finally some conclusions are summarized based on numerical results.

A CAE SIMULATION MODEL FOR VEHICLE AIR CONDITIONING SYSTEM

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Abstract

In this paper a mathematical model is persented to simulate vehicle A/C system under transient operating conditions. The model consists of several sub-models such as evaporator, condenser, compressor, orifice, air handling system, and connecting hoses. The pressure loss and heat capacity of the evaporator and condenser are investigated in this simulation. Exit air temperature and flow rate from registers are the output of this model which can be used as the input for the passenger compartment simulation. Users can take advantage of this CAE tool to optimize the A/C system design and to minimize the development process with time-saving and cost-effective perspectives.

SYSTEM IDENTIFICATION IN (H_∞)

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Abstract

In this paper linear and a nonlinear algorithm for system identification in H_∞ are presented. Error bounds are derived for both algorithms and it is shown that the linear algorithm does not have robust convergence. Conversely, the nonlinear algorithm is robustly convergent and the worst bound identification error (in H_∞ sense) is derived. Linear methods are easier than nonlinear algorithms but for robust control design this method is not suitable. However, for lower order models this method can be utilized for identification purposes. On the other hand, due to robustness of nonlinear identification algorithm it can be used for control design. This method creates less identification errors compared with the linear algorithms.

EFFECT OF DELAMINATIONS ON THE BUCKLING OF COMPOSITE LAMINATES UNDER IN-PLANE SHEAR LOAD

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Abstract

The presence of delaminations reduces the buckling load of composite laminates considerably. This paper examines this effect when the laminate is under in-plan shear load. A rectangular composite laminate with a single or multiple embedded delaminations is considered and a buckling analysis is performed using Mindlin plate elements in a finite element method. The buckling load and mode are obtained by solving an eigenproblem. Unconstrained buckling analysis may result in physically inadmissible modes. To prevent the overlap between the sublaminates and obtain the admissible result, a suitable method is introduced to enforce the required constraints in a penalty function method. Numerical results show the effects of the number, size and depth of delaminations and boundary conditions of the laminate on the buckling load.

EXPERIMENTAL INVESTIGATION OF A PULSE COMBUSTOR FOR INDUSTRIAL APPLICATIONS

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Abstract

Pulse combustion increases heat transfer to the surronding media. Some advantages of pulse combustion are increase in efficiency and decrease in fuel consumption and pollutants. After design and construction of an innovative aerovalved pulse combustor, the effects of operating conditions on the system performance were experimentally investigated. The experimental facility consisted of air and fuel inlet, aerodynamic valve, combustion chamber, tail pipe and feed system. Air and propane are used as oxidizer and fuel respectively. Air and fuel flow rates are measured by sonic nozzle and rotameter. Temperature is measured by a thermocouple. Microphone, amplifier, data acquisition board and PC are also used to measure and record the oscillations. Experimental observations indicate that the increasing inlet flow rate and equivalence ratio increase oscillation frequency. Variation in the tail pipe length has strong effect on the oscillation frequency. The results show that the acoustic is not the only mechanism responsible for oscillations. In addition to acoustic, fluid mechanics and energy release, play an important role in determining the frequencies.

A 3-DIMENTIONAL EULER SOLUTION FOR SUPERSONIC FLOWS USING ROE'S METHOD WITH EXPLICIT AND IMPLICIT TECHNIQUES

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Abstract

In this paper a 3-D Euler code for solving supersonic flows has been developed. The new code uses several numerical algorithms for space and time discretization. Roe's method is used for discretizing the convective terms. Explicit and implicit time marching techniques and a finite volume space discretization are used. The computational model is applied to a hypersonic flow at Mach 7.95 around a cone at different incidence angles. The circumferential pressure distribution is compared with the experimental data. The cases of supersonic flows with Mach number 3 around a secant - ogivo with incidence angles of 6° and 10° are also studied. The circumferential pressure distributions are compared with the experimental data and good agreement is obtained in the location that the separation zone is not large. At the Lee-ward region of the secant - ogive near to the end of the body, especially at incidence angle of 10° the accuracy of numerical result decreases and a Navier-Stokes code should be used to get a better result. The cross-sectional Mach number contours are also presented. It is shown that in this case in addition to the outer shock, a cross-flow shock wave is also present at the incidence angle of 10°. This code has the capability to solve unsteady flow also and the viscous terms can be added easily to prepare a Navier-Stokes code.

THE EFFECT OF ORGANIC LOADING RATE ON THE BIOLOGICAL REMOVAL OF TOLUENE AND XYLENE FROM CONTAMINATED GAS STREAMS

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Abstract

Biofiltration has proven to be an effective and economical technology to reduce VOC and other odiferous gases emitted from industrial sources. It provides significant

advantages over conventional techniques such as absorption and adsorption for large air volumes of low gaseous pollutant concentrations. It is condsidered a clean technology with minimal energy requirements and low waste production. In this study, two labratory-scale biofilters were used for removal of toluene and xylene. The reactors were filled with a mixture of wood chips (0.5-2 cm) and municipal compost (80:20 vol.%) with a void space of 54%. The system was started and oprated under mesophilic conditions while keeping moisture content in the range of 60-70%. Overgrowth of microorganisms coupled with bed compaction reduced the void space resulting in increased pressure drop. To overcome these problems, the biofilter medium was emptied and mixed thoroughly and the system was restarted again. Under stready state conditions and at hydraulic residence time of 60 s, organic loading rate was gradually increased by increasing inlet concentration of pollutants. Results showed that at OLR values of up to 110 and 150 g $m^{-3}h^{-1}$ for toluene and xylene, no signs of removal capacity limitations were observed. However, pressure drop considerations necessitated lower organic loading rates of 78±8 for toluene and 80±14 g $m^{-3}h^{-1}$ for xylene. Under these condition, it was possible to achieve elimination capacities of 73±4 g $m^{-3}h^{-1}$ and 73±14 g $m^{-3}h^{-1}$ and removal efficiencies of 94±6% and 91±8% for toluene and xylene, respectively.

DESIGN AND CONSTRUCTION OF PREMANUFACTURED GAS SEPARATORS FOR THE WASTEWATER INDUSTRY

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Abstract

The most important part of an UASB (Up Flow Anaerobic Sludge Blanket) reactor is its gas separator, wich is why it takes most of the time service and expenditure. In this project, the problems and difficulties of metalic and polymer gas separators are analysed. In order to avoid these difficulties, a concrete premanufactured gas separator of type 5 cement was suggested; after selecting its geometric from, the thickness of the concrete was designed and calculated from the point of neutralizing the buoyant forces. Having considered the cases mentioned above, the constructional calculations were done. After designing the metalic model, a sample of 5.30m lenght, 0.82m width and 0.48m height was constructed in The Water and Energy Research Center. The desired result was obtained from the point of constructional resistance and leackage of Co_2 and Ch_4.