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Abstracts of Papers to Appear in Future Issues

SOLUTION OF EVOLUTIONARY PARTIAL DIFFERENTIAL EQUATIONS USING ADAPTIVE FINITE DIFFERENCES WITH PSEUDOSPECTRAL POSTPROCESSING. L. S. Mulholland, Y. Qiu, and D. M. Sloan. *Department of Mathematics, University of Strathclyde, Glasgow G1 1XH, Scotland.*

A coordinate transformation approach is described that enables pseudospectral methods to be applied efficiently to unsteady differential problems with steep solutions. The work is an extension of a method presented by Mulholland, Huang, and Sloan for the adaptive pseudospectral solution of steady problems. A coarse grid is generated by a moving mesh finite difference method that is based on equidistribution, and this grid is used to construct a time-dependent coordinate transformation. A sequence of spatial transformations may be generated at discrete points in time, or a single transformation may be generated as a continuous function of space and time. The differential problem is transformed by the coordinate transformation and then solved using a method that combines pseudospectral discretisation in space with a suitable integrator in time. Numerical results are presented for unsteady problems in one space dimension.

A NUMERICAL STUDY OF THE EFFECT OF FREE SURFACE DEFORMATION ON BUOYANCY AND THERMOCAPILLARY CONVECTION. G. Labonia,* F. Stella,* E. Leonardi,† and G. Guj.‡ **Dipartimento di Meccanica e Aeronautica, Università di Roma La Sapienza, Rome, Italy; †School of Mechanical and Manufacturing Engineering, The University of New South Wales, Sydney, NSW 2052, Australia; and ‡Dipartimento di Meccanica e Automatica, Terza Università di Roma, Rome, Italy.*

In this paper an improved formulation of the equilibrium equation for the free surface is presented which eliminates the need to evaluate the constant pressure effect. This has then been used in conjunction with a vorticity–velocity formation discretized using a curvilinear coordinate system in two dimensions. The system of nonlinear equations resulting from the discretization of field equations, the free surface displacement, and mesh description are solved simultaneously using Newton's method. This method has been validated using a number of previously reported test cases. The techniques presented have been used to study the effects of free surface deformation and fluid/solid contact angle on combined buoyancy and thermocapillary convection in a steel container filled with water.

NUMERICAL MODELLING OF WAVE PROPAGATION IN ELASTIC RECTANGULAR BLOCK MEDIA. Jianwei Zhou and Nader Saffari. *Department of Mechanical Engineering, University College London, Torrington Place, London WC1E 7JE, United Kingdom.*

Novel formulations for numerical modelling of elastic waves in block media are developed in this paper. A single differential-difference equation, which can be discretized to give explicit finite difference models of wave propagation in elastic block media, is obtained after incorporating continuity conditions of stresses into the equation of motion. Further decompositions of the differential-difference equation also lead to a parallel algorithm for computing the wave field.

SOLUTION OF THE POISSON EQUATION IN AN ANNULUS. Ivar Christopher,* George Knorr,* Magdi Shoucri,† and Pierre Bertrand‡. **Department of Physics and Astronomy, University of Iowa, Iowa City, Iowa 52242; †Hydro-Québec, Varennes, Québec, Canada J3X 1S1; ‡LPMI-URA 835 CNRS, Université de Nancy I, France.*

A simple method is described to solve Poisson's equation in an annulus using conformal mapping and fast Fourier transforms.

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