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Abstracts of Papers to Appear in Future Issues

RESOLUTION OF THE 2D NAVIER–STOKES EQUATIONS IN VELOCITY–VORTICITY FORM BY MEANS OF AN INFLUENCE MATRIX TECHNIQUE. O. Daube. *LIMSI-CNRS, BP 133, 91403 Orsay Cedex, France.*

An influence matrix technique is proposed to enforce both the continuity equation and the definition of the vorticity in the treatment of the 2D incompressible Navier–Stokes equations. It is shown and supported by numerical experiments that at each time step the divergence is actually equal to zero within machine accuracy. The same result is obtained for the definition of the vorticity.

THE COMPUTATION OF RESISTIVE MHD INSTABILITIES IN AXISYMMETRIC TOROIDAL PLASMAS. T. R. Harley, C. Z. Cheng, and S. C. Jardin. *Princeton University, Plasma Physics Laboratory, P.O. Box 451, Princeton, New Jersey 08543, U.S.A.*

We describe the linear MHD eigenmode code NOVA-R, which calculates the resistive stability of axisymmetric toroidal equilibria. A formulation has been adopted which accurately resolves the continuum spectrum of the ideal MHD operator. The resistive MHD stability equations are transformed into three coupled second-order equations, one of which recovers the equation solved by the NOVA code in the ideal limit [1]. The eigenfunctions are represented by a Fourier expansion and cubic B-spline finite elements which are packed about the internal boundary layer. Accurate results are presented for dimensionless resistivities as low as 10^{-30} in cylindrical geometry. For axisymmetric toroidal plasmas we demonstrate the accuracy of the NOVA-R code by recovering ideal results in the $\eta \to 0$ limit and cylindrical resistive interchange results in the $a/R \to 0$ limit. Δ' analysis performed using the eigenfunctions computed by the NOVA-R code agree with the asymptotic matching results from the resistive PEST code for zero beta equilibria.

COMPLEX KOHN VARIATION PRINCIPLE FOR THE SOLUTION OF LIPPMANN–SCHWINGER EQUATIONS. Sadhan K. Adhikari. *Instituto de Física Teorica, Universidade Estadual Paulista, 01.405 São Paulo, São Paulo, Brazil.*

A recently proposed version of the Kohn variational principle for the t matrix incorporating the correct boundary condition is applied for the first time to the study of nucleon–nucleon scattering. Analytic expressions can be obtained for all the integrals in the method for a wide class of potentials and for a suitable choice of trial functions. Closed-form analytic expressions for these integrals are given for Yakawa and exponential potentials. Calculations with two commonly used S-wave nucleon–nucleon potentials show that the method may converge faster than other solution schemes not only for the phase-shifts but also for the off-shell t matrix elements if the freedom in the choice of the trial function is exploited.

AN EVALUATION OF THE GRADIENT-WEIGHTED MOVING-FINITE-ELEMENT METHOD IN ONE SPACE DIMENSION. P. A. Zegeling and J. G. Blom. *Centre for Mathematics and Computer Science, P.O. Box 4079, 1009 AB Amsterdam, The Netherlands.*

Moving-grid methods are becoming increasingly popular for solving several kinds of parabolic and hyperbolic partial differential equations involving fine scale structures such as steep moving fronts and emerging steep layers. An interesting example of such a method is provided by the moving-finite-element (MFE) method. A difficulty with MFE, as with many other existing moving-grid methods, is the threat of grid distortion which can only be avoided by the use of penalty terms. The involved parameter tuning is known to be very important, not only to provide for a safe automatic grid-point selection, but also for efficiency in the time-stepping process. When compared with MFE, the gradient-weighted MFE (GWMFE) method has some promising properties to reduce the need of tuning. To investigate to what extent GWMFE can be called robust, reliable, and effective for the automatic solution of time-dependent PDEs in one space dimension, we have tested this method extensively on a set of five relevant example problems with various solution characteristics. All tests have been carried out using the BDF time integrator SPGEAR of the existing method-of-lines software package SPRINT.

A COMPUTATIONAL STUDY OF THE DISCRETIZATION ERROR IN THE SOLUTION OF THE SPENCER–LEWIS EQUATION BY DOUBLING APPLIED TO THE UPWIND FINITE-DIFFERENCE APPROXIMATION. P. Nelson. *Department of Computer Science, Texas A & M University, College Station, Texas 77843-3112, U.S.A.*; D. L. Seth. *Ames Laboratory, Iowa State University, Ames, Iowa 50011, U.S.A.*; A. K. Ray. *Department of Physics, University of Texas at Arlington, Arlington, Texas 76019, U.S.A.*

A detailed and systematic study of the nature of the discretization error associated with the upwind finite-difference method is presented. A basic model problem has been identified and based upon the results for this problem, a basic hypothesis regarding the accuracy of the computational solution of the Spencer–Lewis equation is formulated. The basic hypothesis is then tested under various systematic single complexifications of the basic model problem. The results of these tests provide the framework of the refined hypothesis presented in the concluding comments.

HYBRID COMBINATIONS OF GLOBAL AND LOCAL OPERATORS FOR SOLVING HELMHOLTZ AND POISSON EQUATIONS. I.-Tai Lu. *Department of Electrical Engineering, Weber Research Institute, Polytechnic University, Farmingdale, New York 11735, U.S.A.*; H. K. Jung. *Department of Electrical Engineering, Kangwean National University, Chuncheon, Kangweando, Korea*; C. M. Tsai. *Department of Electrical Engineering, Weber Research Institute, Polytechnic University, Farmingdale, New York 11735, U.S.A.*

This paper addresses hybrid methods which employ analytic or asymptotic approaches as global operators and employ numerical algorithms as local operators for studying physical phenomena in complex environments governed by Helmholtz and Poisson equations. Specifically, a ray–mode–boundary elements–finite elements method for analyzing wave scattering from a scatterer embedded in a waveguide is shown. This hybrid method can also be employed to analyze static problems as the source frequency becomes zero. Numerical results show smooth transition between static and dynamic responses.

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