(a variation on the "spectral element" method developed by Patera). The pseudospectral methods using nonstaggered grids are simpler to implement and have comparable or better accuracy than the staggered grid formulations. Three test cases are presented: a formulation with an exact solution, a formulation with homogeneous boundary conditions, and the driven cavity problem. The solution accuracy is shown to be greatly improved for the driven cavity problem when the analytical solution of the singular flow behavior in the upper corners is separated from the computational solution.

BASIS-SPLINE COLLOCATION METHOD FOR THE LATTICE SOLUTION OF BOUNDARY VALUE PROBLEMS. A. S. Umar, *Vanderbilt University, Nashville, Tennessee, USA*; J. WU, M. R. STRAYER, AND C. BOTTCHER, *Oak Ridge National Laboratory, Oak Ridge, Tennessee, USA.*

We study a particular utilization of the basis-spline collocation method (BSCM) for the lattice solution of boundary value problems. We demonstrate the implementation of a general set of boundary conditions. Among the selected problems are the Schrödinger equation in radial coordinates, the Poisson and the generalized Helmholtz equations in radial and three-dimensional Cartesian coordinates.

TREATMENT OF ANGULAR DERIVATIVES IN THE SCHRÖDINGER EQUATION BY THE FINITE FOURIER SERIES METHOD. R. P. Ratowsky and J. A. Fleck, Jr., *Lawrence Livermore National Laboratory, Livermore, California, USA.*

We describe a finite Fourier series method for treating the angular derivatives in the angular momentum term of the time-dependent Schrödinger equation in spherical coordinates. The method involves a power series expansion of the evolution operator and treatment of singularities at $\theta = 0$ by L'Hospital's rule. It is demonstrated that the method is accurate across the entire spectrum of the angular momentum operator for an appropriate sampling grid.

AN INVERSE COORDINATE MULTIGRID METHOD FOR FREE BOUNDARY MAGNETOHYDROSTATICS. P. S. Cally, *Monash University, Clayton, Victoria, AUSTRALIA.*

The equations of 2D magnetohydrostatic equilibrium with free (pressure) boundary conditions are expressed in inverse (*i.e.*, flux) coordinates for both cartesian and axisymmetric geometries. The resulting quasi-linear elliptic system is solved using FAS full multigrid with line relaxation as the smoothing procedure. If field line connectivity is specified in the ignorable coordinate (*i.e.*, field shear or twist is given), the system is governed by integro-differential equations, which are solved in the same way. Convergence rates are generally excellent, though an expanding fluxtube model, which provides a particularly difficult test, results in somewhat slower, though still acceptable, convergence.

A COMPARISON OF DIFFERENT PROPAGATION SCHEMES FOR THE TIME-DEPENDENT SCHRÖDINGER EQUATION. C. Leforestier and O. Roncero, *Université de Paris-Sud, Orsay, FRANCE*; R. Bisseling, *Koninklijke/Shell Laboratory, Amsterdam, THE NETHERLANDS*; C. Cerjan and M. D. Feit, *Lawrence Livermore National Laboratory, Livermore, California, USA*; R. Friesner, *University of Texas, Austin, Texas, USA*; A. Guldberg, *Radmansquade, Copenhagen, DENMARK*; A. Hammerich and R. Kosloff, *The Hebrew University, Jerusalem, ISRAEL*; G. Jolicard, *Université de Besançon, Besançon, FRANCE*; W. Karrlein, *Institut für Physikalische Chemie, Wurzburg, WEST GERMANY (FRG)*; H.-D. Meyer, *Universität Heidelberg, Heidelberg, WEST GERMANY (FRG)*; N. Lipkin, *Technion-Israel Institute of Technology, Haifa, ISRAEL.*

A comparison of three widely used time propagation algorithms for the time-dependent Schrödinger equation is described. A typical evolution problem is chosen to demonstrate the efficiency and accuracy of the various methods on a numerical grid using a psuedo-spectral (FFT) spatial representation for scattering and bound state evolution. The methods used—second-order differencing, split operator propagation, Chebyshev polynomial expansion—are discussed in terms of their applicability to various classes of dynamic problems. A new method is introduced which is based upon a low-order Lanczos technique. This method appears to offer an accurate and flexible alternative to the existing techniques. Overall the Chebyshev method is recommended for time independent potentials and the Lanczos method for time dependent potentials.

NOTES TO APPEAR

A RIEMANN SOLVER FOR "BAROTROPIC" FLOW. P. Glaister, *University of Reading, Reading, UNITED KINGDOM.*

ON THE SYSTOLIC CALCULATION OF ALL-PAIRS INTERACTIONS USING TRANSPUTER ARRAYS. Filippo Bruge and L. Fornili, *University of Palermo, Palermo, ITALY.*

A NEW, BUT FLAWED, NUMERICAL METHOD FOR VORTEX PATCH EVOLUTION IN TWO DIMENSIONS. David G. Dritschel, *University of Cambridge, Cambridge, UNITED KINGDOM*; Norman J. Zabusky, *Rutgers University, Piscataway, New Jersey, USA.*