NUMERICAL TREATMENT OF GRID INTERFACES FOR VISCOUS FLOWS. Yannis Kallinderis, *Department of Aerospace Engineering and Engineering Mechanics, The University of Texas at Austin, Austin, Texas 78712, U.S.A.*

Numerical treatment of grid interfaces is one of the most important considerations for algorithms that employ different grids within the computational domain. The issue of numerical treatment of quadrilateral grid interfaces with a representative finite-volume Navier–Stokes integration scheme is addressed. Interfaces are created by local embedding of quadrilateral grids and are the borders between different grids. Grid embedding is one of the basic functions of adaptive algorithms that have been developed in order to increase both accuracy and efficiency of computation. The present work both develops and investigates interface treatment schemes that have certain properties such as accuracy and conservation. It is a novel study of interfaces for the case of viscous flow computations. Various treatments are proposed and evaluated with the emphasis being on a comparison between accurate and conservative treatments. Two methodologies have been followed in order to study interface treatments. The first is analytical and yields orders of possible numerical errors, while the second approach employs model test cases, which are especially designed to evaluate certain aspects of the described interface treatments. Also, a transonic airfoil flow case is included as an example of accuracy and robustness of a particular interface treatment scheme. All numerical treatment schemes that are discussed have been coded and evaluated.

ACCURACY OF PRODUCT-FORMULA ALGORITHMS. C. B. Vreugdenhil, *ECN Netherlands Energy Research Foundation, P.O. Box 1, NL-1755 ZG Petten, THE NETHERLANDS.*

To obtain accurate solutions to the time dependent Schrödinger equation, a "product formula" algorithm has been proposed in the literature which is both explicit and unconditionally stable. In this paper the accuracy of this algorithm is considered for a few basic problems in mathematical physics, viz. the convection equation and the diffusion equation, in addition to the Schrödinger equation. From a theoretical analysis, which is confirmed by numerical experiments, it is concluded that the product-formula method can indeed produce accurate solutions, but only for small time steps so that the unconditional stability is not of very much use. A comparison is also made with standard finite difference methods, such as leapfrog and Crank–Nicholson.

ENCLOSURES OF THE SOLUTION OF THE THOMAS–FERMI EQUATION BY MONOTONE DISCRETIZATION. C. Grossman, *Dresden University of Technology, Department of Mathematics, Mommsenstrasse 13, Dresden 8027, GERMANY.*

In this paper a new discretization concept is proposed which generates uniform lower und upper bounds of the solution of the Thomas–Fermi equation. There convexity is used to modify the occurring non-linearity such that the right-hand side originally given is bounded from below and from above by piecewise tangents and secants, respectively.

NUMERICAL EVALUATION OF AIRY FUNCTIONS WITH COMPLEX ARGUMENTS. R. M. Corless, D. J. Jeffrey, and H. Rasmussen, *Department of Applied Mathematics, University of Western Ontario, London, Ontario, CANADA.*

We present two methods for the evaluation of Airy functions of complex argument. The first method is accurate to any desired precision but is slow and unsuitable for fixed-precision languages. The second method is accurate to double precision (12 digits) and is suitable for programming in a fixed-precision

language such as FORTRAN. The first method uses the symbolic manipulation language Maple to evaluate either the Taylor series expansion or an asymptotic expansion of each function. The second method extends an idea of J. C. P. Miller to the complex plane. It uses the first method to obtain a grid of points in the complex plane where the functions are known to high precision and then uses Taylor series from these base points. The resulting algorithm is accurate and efficient.

Notes to Appear

Semi-Implicit Particle Simulation of Kinetic Plasma Phenomena. Bruce I. Cohen and Timothy J. Williams, *Lawrence Livermore National Laboratory, University of California, Livermore, California 94550, U.S.A.*

About the Time Evolving Voronoi Tessellation. L. Zaninetti, *Instituto di Fisica Generale, Via Pietro Giuria 1, 10125 Torino, ITALY.*

The Fast Adaptive Vortex Method. Thomas F. Buttke, *Courant Institute of Mathematical Sciences, New York University, 251 Mercer Street, New York, New York 10012, U.S.A.*