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Abstracts of Papers to Appear in Future Issues

IMPROVED FCT ALGORITHM FOR SHOCK HYDRODYNAMICS. Dušan Odstrčil. *Geophysical Institute, Slovak Academy of Sciences, Dúbravská cesta 9, 842 28 Bratislava, Czechoslovakia.*

The new YDFCT algorithm is presented for the numerical solution of hydrodynamic flow problems with steep gradients. This algorithm is an explicit finite-difference scheme based on the flux-corrected transport technique and it is an improvement of the ETBFCT and the XDFCT algorithms. The erosion of sharp edges, the phase distortion of curved profiles, and the terracing effect and velocity oscillations are eliminated or significantly reduced. These improvements are obtained by following action of the limiter at edges, more detailed linear numerical analysis of the difference scheme, and considering the velocity gradient in the diffusion and antidiffusion coefficients. Properties of the new algorithm are also demonstrated by the solution of three test problems.

THE STABILITY OF NUMERICAL BOUNDARY TREATMENTS FOR COMPACT HIGH-ORDER FINITE-DIFFERENCE SCHEMES. Mark H. Carpenter. *Theoretical Flow Physics Branch, Fluid Mechanics Division, NASA Langley Research Center, Hampton, Virginia 23681, U.S.A.*; David Gottlieb. *Division of Applied Mathematics, Brown University, Providence, Rhode Island 02912, U.S.A.*; Saul Abarbanel. *Division of Applied Mathematics, Tel-Aviv University, Tel-Aviv, Israel.*

The stability characteristics of various compact fourth- and sixth-order spatial operators are assessed with the theory of Gustafsson, Kreiss, and Sundström (G–K–S) for the semidiscrete initial boundary value problem. These results are generalized to the fully discrete case with a recently developed theory of Kreiss and Wu. In all cases, favorable comparisons are obtained between G–K–S theory, eigenvalue determination, and numerical simulation. The conventional definition of stability then is sharpened to include only those spatial discretizations that are asymptotically stable (bounded, left half-plane eigenvalues). Many of the higher order schemes that are G–K–S stable are not asymptotically stable. A series of compact fourth- and sixth-order schemes that are both asymptotically and G–K–S stable for the scalar case are then developed.

NUMERICAL SIMULATION OF VISCOELASTIC FLUID FLOW PAST A CYLINDER ON A STREAMFUNCTION COORDINATE SYSTEM. I. Husain and O. P. Chandna. *University of Windsor, Windsor, Ontario, Canada N9B 3P4.*

Steady two-dimensional flow of a viscoelastic fluid past a streamlined cylinder is numerically modeled using the von Mises coordinates. The governing equations for a second-order fluid flow past the cylinder are first transformed into a streamfunction coordinate system (ϕ, ψ), where ψ is the streamfunction of the flow. Taking $\phi = x$, the von Mises coordinates (x, ψ) are obtained and the governing equations reduced to a system of two equations in two unknowns $y(x, \psi)$ and $\omega(x, \psi)$ which are solved subject to the appropriate boundary conditions in the von Mises computational domain. Several approximation formulas for the vorticity on the surface of the cylinder are derived and employed in obtaining the solutions at various Reynolds and Weissenberg numbers for two specific cross sections.

NUMERICAL CONFORMAL MAPPING METHODS FOR EXTERIOR REGIONS WITH CORNERS. Thomas K. DeLillo and Alan R. Elcrat. *Wichita State University, Wichita, Kansas 67260-0033, U.S.A.*

The main purpose of this paper is to present a method for computing the conformal map between the exterior of the unit disk and the exterior of a simple closed curve with corners. The method may be regarded as a generalization of the Schwarz–Christoffel transformation and is derived from the integral equation of Timman. Some comparison is made with other methods such as a version of Timman's equation with corners, Fornberg's method with explicit corner removers, Davis' method, and CONFPACK. The method proves to be quite flexible and robust.

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