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Abstracts of Papers to Appear in Future Issues

NEWTON'S METHOD APPLIED TO FINITE-DIFFERENCE APPROXIMATIONS FOR THE STEADY-STATE COMPRESSIBLE NAVIER–STOKES EQUATIONS. Harry E. Bailey and Richard M. Beam, *NASA Ames Research Center, Moffett Field, California, USA.*

Newton's method is applied to finite-difference approximations for the steady-state compressible Navier–Stokes equations in two spatial dimensions. The finite-difference equations are written in generalized curvilinear coordinates and strong conservation-law form and a turbulence model is included. We compute the flow field about a lifting airfoil for subsonic and transonic conditions. We investigate both the requirements for an initial guess to ensure convergence and the computational efficiency of freezing the Jacobian matrices (approximate Newton method). We consider the necessity for auxiliary methods to evaluate the temporal stability of the steady-state solutions. We demonstrate the ability of Newton's method in conjunction with a continuation method to find nonunique solutions of the finite-difference equations, i.e., three different solutions for the same flow conditions.

INADEQUACY OF FIRST-ORDER UPWIND DIFFERENCE SCHEMES FOR SOME RECIRCULATING FLOWS. A. Brandt, *The Weizmann Institute of Science, Rehovot, ISRAEL*; Irad Yavneh, *Los Alamos National Laboratory, Los Alamos, New Mexico, USA.*

Spurious numerical solutions of problems with closed sub-characteristics by upwind difference schemes, in particular problems of recirculating incompressible flow at high Reynolds numbers, are proved to be due to the anisotropy of the artificial viscosity. Numerical examples are presented to show that even very simple problems, including basic problems in fluid dynamics, are not approximated well by schemes with anisotropic artificial viscosity, regardless of numerical parameters.

A DEFERRED-CORRECTION MULTIGRID ALGORITHM BASED ON A NEW SMOOTHER FOR THE NAVIER–STOKES EQUATIONS. Paolo Luchini, *University of Naples, Naples, ITALY.*

An algorithm which brings together the techniques of multigrid and deferred correction through their common relationship with imperfect Newton iteration manages to combine the ease of calculation of a low-order with the accuracy of a high-order difference approximation of any given differential-equation problem. A stable explicit Gauss–Seidel relaxation algorithm for the ψ-ζ Navier–Stokes equations based on an appropriate kind of "upwinding" of ψ- as well as ζ-derivatives, especially developed for use as a multigrid smoother in this context, is presented and the complete algorithm is tested on the standard conservative second-order discretization of the driven-cavity problem.

FLAIR: FLUX LINE-SEGMENT MODEL FOR ADVECTION AND INTERFACE RECONSTRUCTION. N. Ashgriz and J. Y. Poo, *State University of New York at Buffalo, Buffalo, New York, USA.*

A computational technique for solving fluid problems with free surfaces and interfaces is presented. The conventional cell volume fraction approach is employed for tracking the interfaces. However, for surface advection and its reconstruction, a new and more accurate FLAIR (flux line-segment model for advection and interface reconstruction) algorithm is developed. The surface is approximated by a set of line segments fitted at the boundary of every two neighboring computational cells. A criterion is

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