Abstracts of Papers to Appear in Future Issues

EFFECTS OF THE COMPUTATIONAL TIME STEP ON NUMERICAL SOLUTIONS OF TURBULENT FLOW. Haecheon Choi and Parviz Moin. *Center for Turbulence Research, Stanford University, Stanford, California 94305, U.S.A., and NASA Ames Research Center, Moffett Field, California 94035, U.S.A.*

Effects of large computational time steps on the computed turbulence were investigated using a fully implicit method. In turbulent channel flow computations the largest computational time step in wall units which led to accurate prediction of turbulence statistics was determined. Turbulence fluctuations could not be sustained if the computational time step was near or larger than the Kolmogorov time scale.

A FAST ADAPTIVE VORTEX METHOD IN THREE DIMENSIONS. Ann S. Almgren. *Lawrence Livermore National Laboratory, Livermore, California 94550, U.S.A.*; Thomas Buttke. *Courant Institute of Mathematical Sciences, New York University, New York, New York 10003, U.S.A.*; Phillip Colella. *University of California, Berkeley, Berkeley, California 94720, U.S.A.*

The method of local corrections (MLC) developed by Anderson for two spatial dimensions is a particle-particle particle-mesh method, in which the calculation of the velocity field induced by a collection of vortices is split into two parts: (i) a finite difference velocity field calculation using a fast Poisson solver, the results of which are used to represent the velocity field induced by vortices far from the evaluation point; and (ii) an N-body calculation to compute the velocity field at a vortex induced by nearby vortices. We present a fast vortex method for incompressible flow in three dimensions, based on the extension of the MLC algorithm from two to three spatial dimensions and the use of adaptive mesh refinement in the finite difference calculation of the MLC. Calculations with a vortex ring in three dimensions show that the break-even point between the MLC with AMR and the direct method is at $N \approx 3000$ on a Cray Y-MP; for $N \approx 64{,}000$ MLC with AMR can be 12 times faster than the direct method. Results from calculations of two colliding inviscid vortex rings demonstrate the increased resolution which can be obtained using fast methods.

SURFACE GRID GENERATION IN A PARAMETER SPACE. Jamshid Samareh-Abolhassani and John E. Stewart. *Computer Sciences Corporation, Hampton, Virginia 23666, U.S.A.*

A robust and efficient technique is discussed for surface-grid generation on a general curvilinear surface. This technique is based on a nonuniform parameter space and allows for the generation of surface grids on highly skewed and nonuniform spaced background surface-grids. This method has been successfully integrated into the GRIDGEN software system.

THE BOUNDARY FORCED MKDV EQUATION. L. R. T. Gardner, G. A. Gardner, and T. Geyikli. *School of Mathematics, University of Wales, Bangor, Gwynedd LL57 1UT, United Kingdom.*

An unconditionally stable numerical algorithm for the modified Korteweg–de Vries equation based on the B-spline finite element method is described. The algorithm is validated through a single soliton simulation. In further numerical experiments forced boundary conditions $u = U_0$ are applied at the end $x = 0$ and the generated states of solitary waves are studied. By long impulse experiments these are shown to be generated periodically with period ΔT_B proportional to U_0^{-3} and to have a limiting amplitude proportional to U_0. This limit is achieved by all waves, after the first, provided the experiment proceeds long enough. The temporal development of the derivatives $U'(0, t)$, $U''(0, t)$ and $U'''(0, t)$ is also periodic, with period ΔT_B. The effect of negative forcing is to generate a train of negative waves. The solitary wave states generated by applying a positive impulse followed immediately by a negative impulse, of equal amplitude and duration, is dependent on the period of forcing. The solitary waves generated by these various forcing functions possess many of the attributes of free solitons.

A FOURTH-ORDER ACCURATE METHOD FOR THE INCOMPRESSIBLE NAVIER–STOKES EQUATIONS ON OVERLAPPING GRIDS. William D. Henshaw. *IBM Research Division, Thomas J. Watson Research Centre, Yorktown Heights, New York 10598, U.S.A.*

A method is described to solve the time-dependent incompressible Navier–Stokes equations with finite differences on curvilinear overlapping grids in two or three space dimensions. The scheme is fourth-order accurate in space and uses the momentum equations for the velocity coupled to a Poisson equation for the pressure. The boundary condition for the pressure is taken as $\nabla \cdot \mathbf{u} = 0$. Extra numerical boundary conditions are chosen to make the scheme accurate and stable. The velocity is advanced explicitly in time; any standard time stepping scheme such as Runge–Kutta can be used. The Poisson equation is solved using direct or iterative sparse matrix solvers or by the multigrid algorithm. Computational results in two and three space dimensions are given.

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