Abstracts of Papers to Appear in Future Issues

A Comparison of Parallel Programming Models for Multiblock Flow Computations. M. L. Sawley and J. K. Tegnér, *Institut de Machines Hydrauliques et de Mécanique des Fluides, Ecole Polytechnique Fédérale de Lausanne, CH-1015 Lausanne, Switzerland.*

A study is presented of the implementation of four different parallel programming models in a code that solves the fluid flow equations on block structured meshes. Performance results obtained on a number of distributed-memory parallel computer systems are given, in particular, for a 1024 processor Cray T3D system. Using the appropriate programming model, it is shown that excellent performance scaling can be obtained even for small problem sizes. The relative merits of each programming model in terms of ease of use, functionality, and performance are assessed.

A Shock-Adaptive Godunov Scheme Based on the Generalised Lagrangian Formulation. C. Y. Lepage, *Department of Applied Mathematics, University of Waterloo, Waterloo, Ontario, Canada N2L 3G1.* W. H. Hui, *Department of Mathematics, The Hong Kong University of Science & Technology, Clear Water Bay, Kowloon, Hong Kong.*

Application of the Godunov scheme to the Euler equations of gas dynamics based on the Eulerian formulation of flow smears discontinuities, sliplines especially, over several computational cells, while the accuracy in the smooth flow region is of the order $O(h)$, where h is the cell width. Based on the generalised Lagrangian formulation (GLF) of Hui *et al.*, the Godunov scheme yields superior accuracy. By the use of coordinate streamlines in the GLF, the slipline—itself a streamline—is resolved crisply. Infinite shock resolution is achieved through the splitting of shock-cells. An improved entropy-conservation formulation of the governing equations is also proposed for computations in smooth flow regions. Finally, the use of the GLF substantially simplifies the programming logic resulting in a very robust, accurate, and efficient scheme.

Methods of Solution of the Velocity–Vorticity Formulation of the Navier–Stokes Equations. S. C. R. Dennis, *Department of Applied Mathematics, University of Western Ontario, London N6A 5B7, Canada.* J. D. Hudson, *School of Mathematics, University of Sheffield, England.*

Some methods are proposed for solving the Navier–Stokes equations for two-dimensional, incompressible, flow using the velocity–vorticity formulation. The main feature of the work is the solution of the equation of continuity using boundary-value techniques. This is possible because both of the velocity components are known at each boundary point. Some illustrative results are computed including some for heat convection inside a square cavity when one side is held at a constant temperature.

A Spine-Flux Method for Simulating Free Surface Flows. F. Mashayek and N. Ashgriz, *Department of Mechanical and Aerospace Engineering, State University of New York at Buffalo, Buffalo, New York 14260, U.S.A.*

A new technique for the advection of liquid domains with free surfaces is developed. This technique is based on describing the liquid surface by a spine function $h(\alpha, t)$, with α being the angle measured from one axis at time t. After discretization, the spines $h_i(\alpha_i, t_i)$ subdivide the liquid zone into conical subvolumes. The volume of each of the subvolumes is updated using the local velocities at the interface of every two neighboring subvolumes. A technique is developed to calculate the new spines based on the updated subvolumes. The method is referred to as the spine-flux method and it is implemented in a Galerkin finite element method with penalty formulation. The problems of drop oscillation and drop collision are utilized to show the accuracy and efficiency of the technique.

Non-reflecting Boundary Conditions for the Steady Euler Equations. Lars Ferm, *Department of Scientific Computing, Uppsala University, Uppsala, Sweden.*

Artificial boundary conditions for the steady Euler equations in a channel are considered. Non-reflecting terms are added to the boundary conditions to accelerate the convergence to the steady state. The aim of the article is to investigate how the steady and non-reflecting parts of the combined conditions should be balanced. It turns out that the scaling of the non-reflecting terms depends on the solution and on the size of the computational region. Numerical examples are presented.

0021-9991/95 $12.00