NUMERICAL SIMULATION OF UNSTEADY VISCOUS FREE-SURFACE FLOW. Balasubramaniam Ramaswamy, *Rice University, Houston, Texas, USA.*

Velocity/pressure finite element methods are presented for time-dependent incompressible free surface fluid flow problems described by the Navier–Stokes equations. The governing continuum mechanics equations are summarized, and the finite element formulation is given. A special arbitrarily mixed Lagrangian–Eulerian description has been used to avoid the typical problems encountered in a purely Lagrangian description. Finally, sample results that demonstrate some of the capabilities of the present approach are given.

A NEW OPTIMIZED FCT ALGORITHM FOR SHOCK WAVE PROBLEMS. Dusan Odstrcil, *Slovak Academy of Sciences, Geophysical Institute, Bratislava, CZECHOSLOVAKIA.*

The new XDFCT algorithm is presented for the 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 a modification of the existing ETBFCT algorithm. The use of different diffusive and antidiffusive fluxes enables us to use twice the time step with similar accuracy. This is shown by linear numerical analysis and verified by solution of three test problems.

A VLASOV CODE FOR THE NUMERICAL SIMULATION OF STIMULATED RAMAN SCATTERING. A. Ghizzo and P. Bertrand, *Université de Nancy I, Nancy, FRANCE*; M. M. Shoucri, *IREQ, Varennes, Quebec, CANADA*; T. W. Johnston, *Université du Quebec, Varennes, CANADA*; E. Fijalkow and M. R. Feix, *Université d'Orleans, FRANCE.*

Numerical simulation of the stimulated Raman scattering is presented using an Eulerian relativistic Vlasov code. Such a code allows a resolution in phase space finer than that obtained using a particle code and provides a better understanding of the acceleration process for the particles at relativistically high energy. Forward Raman scattering as well as backward Raman scattering are considered to illustrate the possibilities of the Eulerian Vlasov code.

EFFICIENT DATA STRUCTURES FOR ADAPTIVE REMESHING WITH THE FEM. H. H. Dannelongue and P. A. Tanguy, *Université Laval, Quebec, CANADA.*

The meshing and interpolation problems encountered during adaptive remeshing on unstructured finite element grids are analyzed. Both problems are solved independently in 2D and 3D with cost-efficient data structures issued from recent advances in computational geometry. Implementation algorithms and timings are presented in 2D. The performance of commonly used schemes is also reviewed.

OPEN BOUNDARY CONDITIONS FOR EXTERNAL FLOW PROBLEMS. Lars Ferm, *University of Uppsala, Uppsala, SWEDEN.*

The steady Euler equations are considered. Very accurate open boundary conditions are derived for the external problem when the outer boundary is an ellipse. These conditions have the same algebraic form as the corresponding conditions when the boundary is a straight line across an infinitely long channel. A new implementation is introduced for the external problem. At every time step a matrix is applied on a vector containing values from every grid point at the boundary. The computational work for these calculations is kept low by introducing a special set of fewer boundary condition points. Experiments demonstrate the accuracy of the boundary procedure.