CONSTRUCTION OF THE ENTROPY SOLUTION OF HYPERBOLIC CONSERVATION LAWS BY A GEOMETRICAL INTERPRETATION OF THE CONSERVATION PRINCIPLE. H. Boing, K. Werner, and H. Jackisch, *Institut für Geometrie und Praktische Mathematik, RWTH Aachen, 5100 Aachen, WEST GERMANY (FRG).*

In this paper we consider scalar hyperbolic equations in one space dimension of the type

$$u_t(x, t) + \frac{d}{dx} f(u; x) = h(u; x), \qquad u(x, 0) = u_0(x), \quad x \in \mathbb{R}, \quad t > 0, \tag{1}$$

where $f \in C^1$ and h is continuous w.r.t. u; x. The initial condition is assumed to be piecewise continuous. We present a new method for constructing the entropy solution of (1) at a fixed time $t = T > 0$ in *one* time step based on transporting the initial values along characteristics. If the solution of (1) is smooth, we obtain the exact solution; in case of shocks the multivalued graph of the initial data is corrected by a geometrical averaging technique via the conservation principle. The method is also applicable to a scalar equation in which there is a mild coupling between the physical dimensions in the problem, for example,

$$u_t(x, y) + \frac{d}{dx} f(u; x, y) + \frac{d}{dy} f(u; x, y) = h(u; x, y). \tag{2}$$

By a change of variables, (2) can be reduced to a quasi one-dimensional problem. We conjecture that the advantage of computing the entropy solution at a fixed time in one time step cannot easily be carried over to systems. But we have some hints that this might be possible in case of scalar equations in two space dimensions with arbitrary fluxes f_1, f_2. The CPU time depends only on the total number of shocks which occur in the entropy solution up to time T; the accuracy of the computed shock position is of order at least 10^{-2}. Since our method is not based on a time discretisation, questions (and problems) concerning stability and convergence do not arise.

ADAPTIVE GRID GENERATION FROM HARMONIC MAPS ON RIEMANNIAN MANIFOLDS. Arkady S. Dvinsky, *Creare Inc., Hanover, New Hampshire, USA.*

In this paper we describe a new method for generation of solution adaptive grids based on harmonic maps on Riemannian manifolds. The reliability of the method is assured by an existence and uniqueness theorem for one-to-one maps between multidimensional multiconnected domains. We formulate an adaptive Riemannian metric consistent with this theorem. Several examples demonstrating application of the developed procedure are provided.

DIFFUSING-VORTEX NUMERICAL SCHEME FOR SOLVING INCOMPRESSIBLE NAVIER–STOKES EQUATIONS. Zhi Yun Lu, *New York Institute of Technology, Old Westbury, New York, USA*; Timothy J. Ross, *University of New Mexico, Albuquerque, New Mexico, USA.*

A new numerical algorithm, the diffusing-vortex method for time-dependent two-dimensional Navier–Stokes equations, which was previously presented and applied to the incompressible viscous flow past a circular cylinder with high Reynolds number by Lu and Shen, is further developed for extension to general two-dimensional initial value problems and boundary value problems. The new algorithm consists of two steps in a simulation cycle: a Lagrangian convection simulation for the first time step and a diffusion simulation through the use of new vortex points at fixed Eulerian mesh points for the second time step. The mathematical mechanisms of computation behind this algorithm and its characteristics of convergence and accuracy are analyzed in applications for the following problems: (1) an initial value problem involving the decay of a single vortex of finite size and the decay and interaction of a vortex