with one using a second-order smoother. The Runge–Kutta smoother enables us to make long-time integration of the Korteweg–de Vries equation for large amplitudes.

NUMERICAL SOLUTION OF A HYPERBOLIC SYSTEM OF CONSERVATION LAWS WITH SOURCE TERM ARISING IN A FLUIDIZED BED MODEL. I. Christie and G. H. Ganser, *West Virginia University, Morgantown, West Virginia, USA*; J. M. Sanz-Serna, *Universidad de Valladolid, Valladolid, SPAIN.*

A model of a gas fluidized bed is considered which leads to a hyperbolic system of conservation laws with a source term. The system is solved numerically by a second order operator splitting technique based on a Roe approximate Riemann solver. Numerical experiments demonstrate the ability of the model to reproduce qualitatively the slugging phenomenon in the case when the bed is subject to a relatively large gas flux.

APPROXIMATING THE DIRAC DISTRIBUTION FOR FOURIER ANALYSIS. Stuart B. Cohen and Ivan N. Krischner, *University of Michigan, Ann Arbor, Michigan, USA.*

For some boundary or initial value problems, the presence of a Dirac distribution on the boundary or in the field results in finite solutions at some points in the domain. However, its presence leads to difficulties if the problem is solved analytically using a Fourier decomposition, since computation and presentation of the solution usually necessitate some sort of truncation. To circumvent this problem, the Dirac distribution is often approximated by a Gaussian distribution, which results in a very simple Fourier transform on an infinite domain. On a finite domain the transform is not as simple, but may still be computed. However, the derivative of the Gaussian is discontinuous on the finite domain, since the smooth function has been truncated. Thus a different approximation, the β_π-distribution, is proposed. This function satisfies the same criteria which make the Gaussian applicable as an approximation of the Dirac distribution on the infinite domain, but its derivative is continuous everywhere on the finite domain. This article presents a procedure for computing the Fourier coefficients of the β_π-distribution. Since a large value of the order of the distribution is chosen to approximate the singular behavior, the integral for the Fourier coefficients must be evaluated using a Fourier–Bessel decomposition, which allows the computation to be carried out over large values of the Fourier index. The technique is illustrated with application to a simple two-dimensional boundary value problem containing a singularity in the boundary condition. Convergence is significantly improved if the proposed distribution is used. Values of some Fourier coefficients of the β_π-distribution are provided in an appendix for several values of its order.

ON THE NATURE OF BOUNDARY CONDITIONS FOR FLOWS WITH MOVING FREE SURFACES. Michael Renardy and Yuriko Renardy, *Virginia Polytechnic Institute & State University, Blacksburg, Virginia, USA.*

We consider small perturbations of plane parallel flow between a wall and a moving free surface. The problem is posed on a rectangle with inflow and outflow boundaries. The usual boundary conditions are posed at the wall and the free surface, and the fluid satisfies the Navier–Stokes equations. We examine the nature of boundary conditions which can be imposed at the inflow and outflow boundaries in order to yield a well-posed problem. This question turns out to be more delicate than is generally appreciated. Depending on the precise situation and on the regularity required of the solution, boundary conditions at just one or both endpoints of the free surface need to be imposed. For example, we show that if the velocities at the inflow and outflow boundaries are prescribed, then the position of the free surface at the inflow boundary can be prescribed, but not at the outflow if an H^1-solution is desired. Numerical simulations with the FIDAP package are used to illustrate our analytical results.