ADAPTIVE GRID SIMULATION OF HYPERBOLIC PDES

Haojun Li and Myungjoo Kang
Department of Mathematical Sciences, Seoul National University, Seoul, KOREA

ABSTRACT
In this talk, we present an adaptive grid method for hyperbolic conservation laws. A multiresolution analysis, based on a biorthogonal family of interpolating scaling functions and lifted interpolating wavelets, is used to dynamically adapt grid points according to the physical field profile in each time step. Traditional finite-difference schemes with fixed stencils produce high oscillations around discontinuities. We combine high-resolution schemes, which are suitable for capturing singularities, and apply a finite-difference approach to the scaling functions at other points. We use a total variation diminishing Runge-Kutta method for the time update. The computational cost is proportional to the number of points present after compression. We provide several numerical examples to verify our approach.

REFERENCES
Figure 1. Evolution of density in the Sod shock-tube problem