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Riemann solvers with evolved initial conditions. (English) Zbl 1108.65091
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Summary: The scope of this paper is three fold. We first formulate upwind and symmetric schemes for hyperbolic equations with non-conservative terms. Then we propose upwind numerical schemes for conservative and non-conservative systems, based on a Riemann solver, the initial conditions of which are evolved nonlinearly in time, prior to a simple linearization that leads to closed-form solutions. The Riemann solver is easily applied to complicated hyperbolic systems. Finally, as an example, we formulate conservative schemes for the three-dimensional Euler equations for general compressible materials and give numerical results for a variety of test problems for ideal gases in one and two space dimensions.

MSC:

- 65M06 Finite difference methods for initial value and initial-boundary value problems involving PDEs Cited in 4 Documents
- 35L65 Hyperbolic conservation laws
- 76M20 Finite difference methods applied to problems in fluid mechanics
- 76N15 Gas dynamics, general

Keywords:

hyperbolic systems; non-conservative terms; Riemann problem; evolution of data; linearized Riemann solver; Euler equations; general equation of state; numerical results; gas dynamics

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