

Billett, S. J.; Toro, E. F.

On WAF-type schemes for multidimensional hyperbolic conservation laws. (English)

Zbl 0873.65088

J. Comput. Phys. 130, No. 1, 1-24 (1997).

The aim of the paper is to explore how the weighted average flux (WAF) approach can be used to generate finite volume schemes in more than one space dimension. There is a large class of second-order Godunov-type methods (e.g. MUSCL). The WAF-type schemes can be considered as an alternative approach for constructing second-order Godunov-type methods. Its key feature is that the second-order accuracy is achieved by solving the piecewise constant Riemann problem as in the first-order Godunov method, no reconstruction step is necessary. The accuracy comes from utilizing this solution averaged over space and time.

Multidimensional schemes are obtained reproducing the first-order CTU scheme of *P. Colella* [J. Comput. Phys. 87, No. 1, 171-200 (1990; Zbl 0694.65041)] and using the WAF approach. The authors derive two new second-order finite volume schemes. They are conservative, second-order accurate in space and time, have multidimensional upwinding aspects and good stability properties. Spurious oscillations are controlled by the use of one-dimensional TVD limiter functions. Numerical experiments, presented for the shallow water equations in two space dimensions, confirm reliability of the schemes.

Reviewer: *M.Kukacova (Brno)*

MSC:

- 65M06** Finite difference methods for initial value and initial-boundary value problems involving PDEs
- 65M12** Stability and convergence of numerical methods for initial value and initial-boundary value problems involving PDEs
- 76B15** Water waves, gravity waves; dispersion and scattering, nonlinear interaction
- 65M60** Finite element, Rayleigh-Ritz and Galerkin methods for initial value and initial-boundary value problems involving PDEs
- 35L65** Hyperbolic conservation laws

Cited in **2** Reviews
Cited in **36** Documents

Keywords:

weighted average flux; finite volume schemes; second-order Godunov-type methods; MUSCL; piecewise constant Riemann problem; upwinding; stability; spurious oscillations; numerical experiments; shallow water equations

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