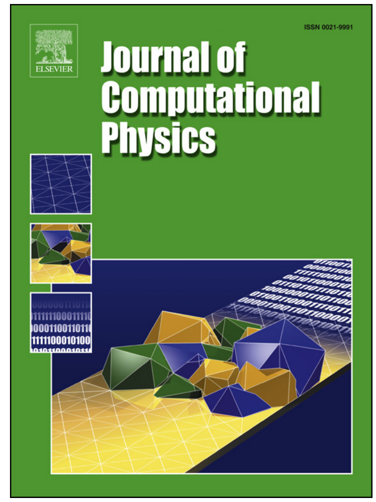

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Some Cell-centered Lagrangian Lax-Wendroff HLL Hybrid Schemes

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Abstract

Lagrangian hydrodynamics is treated by the Lax-Wendroff method with the dissipative fluxes in the HLL form, including both artificial viscosity and artificial energy flux. The symmetry of results for the Noh problem on a Cartesian mesh is very good. On material interfaces we employ the EUCCLHYD nodal solver at the interface nodes with 1D acoustic approximate Riemann solver on the interface edges. The proposed method works reasonably well on several hydrodynamic tests, including Noh, Sedov, Saltzman, Sod, Woodward-Collela and triple-point.

1. Introduction

Lagrangian hydrodynamical methods are essential for modeling of many problems of high speed compressible fluid flows as e.g. inertial confinement fusion. Classical Lagrangian methods are staggered methods presented e.g. in [1, 2, 3]. They employ an artificial viscosity as a dissipative mechanism. Recently another form the dissipative mechanism resulting from an approximate Riemann solver has been proposed in cell-centered methods, which keep compatible numerical fluxes with nodal velocities, so that the geometric conservation law (GCL) is satisfied. The cell-centered methods started by the Godunov-type Lagrangian scheme Conservative for total Energy (GLACE) first order method [4], with the high order extension [5]. This method has been improved in the Explicit Unstructured Cell-Centered Lagrangian Hydrodynamics (EUCCLHYD) first order method [6], with the high order extension [7]. This method has been extended also to cylindrical 2D geometry