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High order stabilized finite elements for gas dynamics.

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We considering the Euler equations in one dimension. The system is discretized in space using an arbitrarily high order Bernstein finite element scheme. In time, the equations are discretized using a high order implicit or explicit Runge-Kutta time stepper. To deal with shocks and spurious oscillations in the numerical solution, stabilization, in the form of algebraic flux correction is introduced to the method. The flux corrected transport method here consists of a low order local extremum diminishing part and a constrained antidiffusive part. The low order part is based on a either a scalar Rusanov diffusion operator computed from the maximum propagation speed or a coupled Roe diffusion operator. Mass conservative mass lumping is also performed on the time derivative term of the system. The antidiffusive part is the difference between the low order part and the original Galerkin discretization of the equations. This is scaled element-wise such that in the vicinity of steep fronts the low order stable solution is returned and in smooth regions the original Galerkin scheme is realized. Challenging shock problems such as the Sod test tube problem and Woodward Colella are considered. A linear waves tests is used to demonstrate the numerical convergence of the method.

Apply to be considered for a student ; award (Yes / No)?

Yes

Level for award;(Hons, MSc, PhD, N/A)?

MSc

Consent on use of personal information: Abstract Submission

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