IMPLEMENTING ALE MOTION IN A DISCONTINUOUS FINITE ELEMENT HYDRO CODE

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We describe a numerical scheme to solve 3D Arbitrary Lagrangian Eulerian (ALE) hydrodynamics on an unstructured mesh using discontinuous Galerkin method (DGM) and an explicit Runge-Kutta time discretization. Upwinding is achieved through Roe's linearized Riemann solver with the Harten-Hyman entropy fix. For shock stabilization, a 3D quadratic programming generalization of van Leer's 1D minmod slope limiter is used along with a Lapidus type artificial viscosity.

This DGM scheme has been tested on a variety of hydrodynamics test problems and is the basis of a fully integrated inertial confinement fusion (ICF) modeling code (ICF3D) which includes electron and radiation diffusion transport along with laser ray tracing. The code, written in object oriented C++, has been parallelized using domain decomposition and runs on a variety of platforms and architectures.

We present results of various simulations using ICF3D on problems relevant to ICF.

References

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