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GODUNOV TECHNIQUES AND SLOPE LIMITERS IN LAGRANGIAN AND ALE HYDRODYNAMICS

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ABSTRACT

Second order Godunov schemes and slope limiters became over the past thirty years a state of the art standard in many Eulerian hydrodynamic simulations. Their application to Lagrangian and Arbitrary Lagrangian-Eulerian codes is more recent and it is still evolving. However, Lagrangian, ALE and MMALE codes are the best choice for solving many multi-material strong shock problems.

Should we use the solution of the Riemann problems to improve current pseudo-viscosity schemes, or we should directly use these Riemann problem solutions to capture shocks? Should we use exact or approximate Riemann solvers? And what kind of approximate solution is adequate for shock capturing? Should it take into account strength? Second order schemes depend on slope limiters to detect shocks. How should we define the slope limiters in 2D and 3D over a deformed mesh? What are the right choice for the slope limiters of vectors and tensors? Should we use convex hull based limiters or is it enough to limit the component of vectors in certain physical directions? Should such Lagrangian and ALE schemes be staggered or cell centered? Which scheme will capture shocks with less mesh imprinting and preserve the symmetries present in a problem? What effect will it have on the growth of instabilities? Do it inhibit the numerical short wavelength hourglass instabilities while allowing the growth of physical instabilities?

This Minisymposium will address these and similar problems aimed at improving the capabilities of Lagrangian and ALE simulations.

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