Abstract Submitted
for the DFD19 Meeting of
The American Physical Society

A High-Order Lagrangian Discontinuous Galerkin Method on Hybrid Curved Meshes[1] XIAODONG LIU, NATHANIEL MORGAN, DONALD BURTON, Los Alamos National Lab, HIGH-ORDER LAGRANGIAN AT LANL TEAM — We present a high-order (up to fourth order) Lagrangian DG hydrodynamic method using subcell mesh stabilization (SMS) for compressible flows on hybrid curved meshes (up to cubic meshes) in 2D Cartesian coordinates. The physical evolution equations for the specific volume, velocity, and specific total energy are discretized using a modal DG method . The challenge for Lagrangian hydrodynamics is to guarantee the stable mesh motion for the edge vertex, that can easily deform in unphysical ways. With SMS, each cell is decomposed into several subcells, that move in a Lagrangian manner. The edge vertex is surrounded by several subcells so that enough information can be obtained, that is similar to the corner vertex. As such, the same multidirectional approximate Riemann problem can be solved for these both types of vertices. This SMS scheme enables stable mesh motion and accurate solutions in a context of the Lagrangian high-order DG method. We also present effective limiting strategies that ensure monotonicity of the primitive variables with the high-order DG method. A suite of test problems are calculated to demonstrate the designed order of accuracy of this method and the robustness for the strong shock problems.

[1]We gratefully acknowledge the support of the NNSA through the Laboratory Directed Research and Development (LDRD) program at Los Alamos National Laboratory. The Los Alamos unlimited release number is LA-UR-19-27300

xiaodong liu
Los Alamos National Lab

Date submitted: 31 Jul 2019 Electronic form version 1.4