Abstract Submitted
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Unstructured finite element simulations of compressible phase change phenomena[1] EHSAN SHAMS, FAN YANG, YU ZHANG, ONKAR SAHNI, MARK SHEPHARD, ASSAD OBERAI, Rensselaer Polytech Inst, SCIENTIFIC COMPUTATION RESEARCH CENTER (SCOREC) TEAM — Modeling interactions between compressible gas flow and multiple combusting solid objects, which may undergo large deformations, is a problem with several challenging aspects that include, compressible turbulent flows, shocks, strong interfacial fluxes, discontinuous fields and large topological changes. We have developed and implemented a mathematically consistent, computational framework for simulating such problems. Within our framework the fluid is modeled by solving the compressible Navier Stokes equations with a stabilized finite element method. Turbulence is modeled using large eddy simulation, while shocks are captured using discontinuity capturing methods. The solid is modeled as a hyperelastic material, and its deformation is determined by writing the constitutive relation in a rate form. Appropriate jump conditions are derived from conservations laws applied to an evolving interface, and are implemented using discontinuous functions at the interface. The mesh is updated using the Arbitrary Lagrangian Eulerian (ALE) approach, and is refined and adapted during the simulation. In this talk we will present this framework and will demonstrate its capabilities by solving canonical phase change problems.

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Ehsan Shams
Rensselaer Polytech Inst

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