# 791. SPACETIME DISCONTINUOUS GALERKIN METHOD FOR NONLINEAR SOLID MECHANICS

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We present a spacetime discontinuous Galerkin (SDG) method for finite-deformation solid mechanics. In contrast to the linearized formulation presented in Abedi et al. [1], the new formulation addresses both geometric and material nonlinearities and balances exactly energy, mass and momentum over each spacetime element. Our formulation can be specialized to treat hyperelastic, hypoelastic and other nonlinear constitutive relations.

We use differential forms to express the balance laws on a deformed (Eulerian) spacetime. We apply pull-back to an undeformed spacetime to obtain a Lagrangian formulation. These models can be combined to obtain a spacetime arbitrary Eulerian-Lagrangian (ALE) formulation that would be useful for modeling fluid-structure interaction problems and solids problems with moving phase boundaries.

An extended version of the Tent Pitcher algorithm [2] generates adaptive, unstructured spacetime grids that satisfy a patch-wise causality constraint. This enables an advancing-front, patch-by-patch solution algorithm with linear complexity and rich parallel structure [3]. We present selected numerical examples to demonstrate the method's performance and modeling capabilities.

References:

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