USING POLYDPG TO SIMULATE NONLINEAR MECHANICS OF ELASTOMERS

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ABSTRACT

The discontinuous Petrov-Galerkin (DPG) finite element methodology is known to grant discrete stability for any well-posed variational problem. The use of broken test spaces and the ultraweak variational formulation have let DPG be applied on meshes of general polytopal elements, a version of the method that we have labeled PolyDPG (see [1, 2] for theory and numerics in 2D and 3D). According to the elasticity models and numerical results developed in the 2020 PhD dissertation [3], the 3D version of PolyDPG is capable of simulating large compressive deformation of elastomeric foams that are modeled with hyperelastic constitutive relations, far overcoming the simulated stretches attained with traditional finite elements. The proposed approach for this kind of problem results in a better capturing of local deformations and stresses, along with the formerly observed capacity of simulating large global deformations.

References

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