A HYBRID HIGH-ORDER METHOD FOR INCREMENTAL ASSOCIATIVE PLASTICITY WITH SMALL DEFORMATIONS

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Abstract. We devise and evaluate numerically a Hybrid High-Order (HHO) method for incremental associative plasticity with small deformations. HHO methods have been introduced in [5] for linear diffusion and in [4] for linear elasticity, and these methods have been bridged in [3] to Hybridizable Discontinuous Galerkin methods and nonconforming Virtual Element methods. In solid mechanics, HHO methods use as discrete unknowns piecewise polynomials of order $k \geq 1$ on the mesh skeleton, together with cell-based polynomials that can be eliminated locally by static condensation. HHO methods support polyhedral meshes with non-matching interfaces, are free of volumetric locking, and, in the context of plasticity, the integration of the behavior law is performed only at cell-based quadrature nodes. Moreover, the principle of virtual work is satisfied locally with equilibrated tractions. Various two- and three-dimensional test cases from the literature are presented including comparison against known solutions and against results obtained with an industrial software using conforming and mixed finite elements. Further insight on the present work can be found in [2]; HHO methods for hyperelasticity have been developed in [1].

Keywords: Associative Plasticity, Hybrid High-Order methods

Mathematics Subject Classifications (2010): 65N30, 65M60, 74S05

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