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Autor(en) des Beitrags: Gee, M.W.; Dohrmann, C.R.; Key, S.W.; Wall, W.A.

Titel des Beitrags: A uniform nodal strain tetrahedron with isochoric stabilization

Abstract:
A stabilized node-based uniform strain tetrahedral element is presented and analyzed for finite deformation elasticity. The element is based on linear interpolation of a classical displacement based tetrahedral element formulation but applies nodal averaging of the deformation gradient to improve mechanical behavior, especially in the regime of near-incompressibility where classical linear tetrahedral elements perform very poorly. This uniform strain approach adopted here exhibits spurious modes as has been previously reported in the literature. We present a new type of stabilization exploiting the circumstance that the instability in the formulation is related to the isochoric strain energy contribution only and we therefore present a stabilization based on a isochoric?volumetric splitting of the stress tensor. We demonstrate that by stabilizing the isochoric energy contributions only, reintroduction of volumetric locking through the stabilization can be avoided. The isochoric?volumetric splitting can be applied for all types of materials with only minor restrictions and leads to a formulation that demonstrates impressive performance in examples provided.