Locking-Free Stabilized Hybridized FEM for incompressible and nearly incompressible elasticity

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ABSTRACT

A primal hybrid finite element method for nearly incompressible linear elasticity problem consisting of locally discontinuous Galerkin problems in the primal variable coupled to a globally continuous problem in the multiplier which is identified with the trace of the displacement field is proposed here following Faria et al [1]. Next, we formulate an equivalent mixed formulation, for stress tensor and displacement field, allowing for completely incompressible elasticity problems. Numerical analysis shows that the proposed formulation preserves the main properties of the associate DG method such as consistency, stability, boundedness and optimal rates of convergence that are uniform with respect to Poisson's ratio in the energy norm on triangular meshes. The method is thus locking free. Convergence studies confirm the optimal rates of convergence predicted by the numerical analysis presented here.

REFERENCES

[1] Faria, C. O; Loula, A. F. D. ; Santos, A. J. B, *Primal Stabilized Hybrid and DG Finite Element Methods for the Linear Elasticity Problem*, Computers & Mathematics with Applications, v. 68, p 486-507, 2014.