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APPLICATION OF BARYCENTER REFINED MESHES IN LINEAR ELASTICITY AND INCOMPRESSIBLE FLUID DYNAMICS*

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Abstract. The paper demonstrates that enhanced stability properties of some finite element methods on barycenter refined meshes enables efficient numerical treatment of problems involving incompressible or nearly incompressible media. One example is the linear elasticity problem in a pure displacement formulation, where a lower order finite element method is studied which is optimal order accurate and robust with respect to the Poisson ratio parameter. Another example is a penalty method for incompressible viscous flows. In this case, we show that barycenter refined meshes prompt a "first penalize, then discretize" approach, avoiding locking phenomena, and leading to a method with optimal convergence rates independent of the penalty parameter, and resulting in discrete systems with advantageous algebraic properties.

Key words. finite element method, barycenter-mesh refinement, locking-free penalty method, Navier-Stokes equations, linear elasticity

AMS subject classifications. 65F05, 65M60, 65M12, 76D05, 74B05

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