Robust H(div)-conforming stress approximations for solid mechanics

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Since large local stresses are related to surface traction forces and to failure of the material, accurate stress approximations are of interest in many applications in solid mechanics. The finite elements method for elasticity usually leads to discontinuous stresses. A reconstruction of accurate stresses in a localizable post-processing step for elasticity will be presented. In particular, the asymmetry of such a reconstruction is controlled and the approach remains uniformly accurate in the limit of incompressible materials. This reconstruction can be build on each element or on vertex-patches, is involving constants depending only of the shape regularity, and remains stable in the incompressible limit. This reconstruction leads to an adaptive algorithm and the question of its optimal convergence rate will also be tackled.