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Performance Evaluation of the Selective Smoothed Finite Element Method with Deviatoric/Hydrostatic Split

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Smoothed finite element methods (S-FEMs) are promising for accurate numerical approach in various PDE problems. The selective S-FEM is especially expected to be a locking-free formulation in solid mechanics problems. Recently, we have developed a selective S-FEM for severely large deformation problems of nearly incompressible materials. Our method adopts the deviatoric/hydrostatic split in selective integration, which is a simple extension to the conventional selective S-FEM with the μ/λ split, i.e. selective FS/NS-FEM-T4 and ES/NS-FEM-T3. This extension makes our method applicable to most of material models with keeping the locking-free feature of selective S-FEMs. However, the performance of our selective S-FEM is not thoroughly evaluated so far. In this talk, we present some results of performance evaluation of our method in various points of view: pressure oscillation, total strain energy, motion of nodes along with element distortion, compatibility with adaptive mesh rezoning, and so on.

Keywords: Smoothed finite element method, Tetrahedral element, finite deformation, Locking, Pressure oscillation