Equilibration-based a-posteriori error estimators for poro-elasticity

Maximilian Brodbeck[1]

Numerical solutions of poro-elasticity suffer from the deterioration of the overall accuracy when re-entrant corners, internal respectively boundary layers or shock-like fronts are present [1]. Estimates of the overall error, based on the numerical solution, offers a systematic way of retaining accuracy by localised mesh refinements. Following the seminal idea of Prager and Synge [2], such error estimates can be constructed based on the comparison of fluxes, directly calculated from the approximation, and any H(div) conforming function, satisfying the equilibrium condition. This function is typically called the equilibrated flux. More recently, this idea has been extended to linear-linear elasticity or the Biot equations [3,4]. Within this contribution we focus on the practice-relevant displacement-pressure formulation for quasi-static poro-elasticity. A space-time adaptive algorithm based on the equilibration of fluid flux and weakly symmetric stresses within the Raviart-Thomas finite element space is derived. Besides the efficiency of the error estimator algorithmic aspects of flux equilibration are discussed.

References:

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[1]University of Stuttgart, Institut of Structural Mechanics and Dynamics
maximilian.brodbeck@isd.uni-stuttgart.de