Chak, S. Lee

Parallel solver for H(div) problems using hybridization and AMG

1109 Southwest Pkwy Apt 1809
College Station
TX 77840
chakshinglee@gmail.com
Panayot S. Vassilevski

In this paper, a scalable parallel solver is proposed for $\boldsymbol{H}(\mathrm{div})$ problems discretized by arbitrary order finite elements on general unstructured meshes. The solver is based on hybridization and algebraic multigrid (AMG). Unlike some previously studied $\boldsymbol{H}(\mathrm{div})$ solvers, the hybridization solver does not require discrete curl and gradient operators as additional input from the user. Instead, only some element information is needed in the construction of the solver. The hybridization results in a H^1-equivalent symmetric positive definite system, which is then rescaled and solved by AMG solvers designed for H^1 problems. Weak and strong scaling of the method are examined through several numerical tests. Our numerical results show that the proposed solver provides a promising alternative to ADS, a state-of-the-art solver [Kolev and Vassilevski, 2012], for $\boldsymbol{H}(\mathrm{div})$ problems. In fact, it outperforms ADS for higher order elements.