Josh, W Nolting
Efficient Adaptive Local Refinement for FOSLS-AMG

2467 East 127th Court
Thornton
CO 80241
josh.nolting@colorado.edu
Tom Manteuffel
Steve McCormick
Yang, Ulrike Meier De Sterck, Hans Ruge, John

It is imperative for scientists and engineers of almost all fields to have the tools to determine numerical solutions to Partial Differential Equations (PDEs) efficiently and effectively. Adaptive solution techniques are heavily utilized to approximate many of these PDEs needing to concentrate computational efforts in some local regions. This presentation focuses on a methodology for adaptive local refinement such that, both error reduction and work are taken into account to determine what elements to refine. We strive to reach a certain approximation accuracy with the least amount of effort. The first-order system least squares (FOSLS) finite element methods complement the adaptive methodology, in that, it delivers a quick and effective local a posteriori error indication. The sequence of refined grids are solved in a full-multigrid context using algebraic multigrid. The combination of FOSLS, efficiency-based adaptive refinement, and AMG, result in a very powerful tool for numerical solutions of many PDEs.