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Jeffrey S Owall*, Patterson Office Tower 761, Department of Mathematics, University of Kentucky, Lexington, KY 40503. *A robust and flexible a posteriori error estimator in 3D*. Preliminary report.

Joint work with Michael Holst and Ryan Szypowski

We propose and offer effectivity analysis of an a posteriori error for tetrahedral linear Lagrange finite elements. The error estimate is based on the (provably inexpensive) computation of an approximate error function in an auxiliary space. We will provide an equivalence (up to oscillation terms) theorem of the true and approximate H^1 -error, which applies for piecewise smooth coefficients. A brief cost analysis will also be provided, as such estimators are sometimes believed to be too expensive. Finally, we will discuss a variety of applications of the approximate error function and of the general methodology, such as: functional error estimation, error estimation in other norms, error estimation for eigenvalue problems, and selection of auxiliary spaces in which to compute approximate error functions for different finite elements. Some aspects have been proven, and others are work in progress. (Received January 26, 2010)