SUPERCONVERGENCE AND A POSTERIORI ERROR ESTIMATION

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ABSTRACT

Superconvergence has been one of the active research topics in the finite element community because it yields a cheap way of improving the accuracy of the computed finite element approximation $u_h$. The most common form of superconvergence is the supercloseness between (1) $u_h$ and some interpolation of the exact solution $u$ or (2) $u_h$ and $u$ at special points of each element. In this talk we introduce the well-known superconvergence result for the linear triangular finite element method of second order elliptic equations and discuss how it is utilized in a posteriori error estimation. A posteriori error estimation plays a central role in adaptive mesh refinement by providing a computable quantity which estimates the error $\|u - u_h\|$ (with respect to some norm $\| \cdot \|$) in terms of the computed finite element solution $u_h$ and the known data. The best result we can obtain is that $\eta$ is asymptotically exact, namely, $\eta/\|u - u_h\| \to 1$ as the mesh size $h$ goes to 0. We investigate some popular error estimators with this property both theoretically and numerically.

REFERENCES