A POSTERIORI ERROR ESTIMATOR COMPETITION FOR 2ND-ORDER PARTIAL DIFFERENTIAL EQUATIONS

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Five classes of up to 13 a posteriori error estimators compete in three second-order model cases, namely the conforming and nonconforming first-order approximation of the Poisson-Problem plus some conforming obstacle problem. Braess considers Lagrange multipliers and some resulting auxiliary equation to view the a posteriori error control of the error in the obstacle problem as computable terms plus errors and residuals in the auxiliary equation. Hence all the former a posteriori error estimators apply to this benchmark as well and lead to surprisingly accurate guaranteed upper error bounds. This approach allows an extension to more general boundary conditions and a discussion of efficiency for the affine benchmark examples. The Luce-Wohlmuth and the least-square estimators win the competition in several computational benchmark problems. Novel equilibration of nonconsistency residuals and novel conforming averaging error estimators win the competition for Crouzeix-Raviart nonconforming finite element methods. Our numerical results provide sufficient evidence that guaranteed error control in the energy norm is indeed possible with efficiency indices between one and three. Furthermore, accurate error control is slightly more expensive but pays off in all applications under consideration while adaptive mesh-refinement is

sufficiently pleasant as accurate when based on explicit residual-based error estimates. Details of our theoretical and empirical ongoing investigations will be found in the papers quoted below.

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