ON SOME A POSTERIORI ERROR ESTIMATION RESULTS FOR THE METHOD OF LINES

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In the 1990's, the subject of a posteriori error estimation with the finite element method and adaptive solution procedures started its very rapid development. Many results for the solution of linear and nonlinear elliptic partial differential equations were reached and first results for the solution of nonlinear parabolic partial differential equations were published.

We present some basic results from this field and this time period, and continue to contemporary results and future prospects of this approach.

Recently we witness a rapidly increasing use of the *hp*-FEM which is due to the well-established theory and increasingly mature software resources. For *hp*-FEM, however, the conventional error estimates (in the form of a single number per element) are not enough. Namely, there are numerous options how a higher-order element can be *hp*-refined.

Thus *hp*-adaptivity requires estimates of higher order derivatives of the error or another information from which the shape of the error (as a function of d spatial variables) can be reconstructed. We mention several ways to the approximation of the shape of the error and discuss their parallelization and scalabity.

We also refer to some published numerical results and their accuracy.

References

[1] I. Babuška and T. Strouboulis: The Finite Element Method and Its Reliability. Oxford, Clarendon Press 2001.
[2] P. Šolín: Partial Differential Equations and the Finite Element Method. Hoboken, NJ, John Wiley & Sons 2006.
[3] P. Šolín, K. Segeth, and I. Doležel: Higher-Order Finite Element Methods. Boca Raton, FL, Chapman & Hall/CRC 2004.