A Posteriori Error Estimates for h- and hp-Adaptive Mixed Finite Elements

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In this talk, we present a posteriori error estimates and adaptivity of h- and hp-adaptive finite elements for mixed and mixed-hybrid methods, which are based on the introduction of flux or stress fields as additional unknowns in $H(\mathrm{div})$-spaces. In particular, we consider the Poisson problem and the obstacle problem, which lead to a variational equation and a variational inequality, respectively. The estimates rely on the use of post-processing reconstructions of the potential in H^1 and, in the case of the obstacle problem, on the introduction of a certain Lagrange multiplier which is associated with the obstacle constraints. Two approaches of error control are discussed: In the first approach, the post-processing reconstruction is explicitly computed, whereas in the second approach, a reconstruction is applied which does not require an explicit computation. The latter enables the direct use of the discrete potential instead of its reconstruction, which significantly improves the error estimation. The applicability of the estimates is demonstrated in several numerical experiments, in which efficiency indices and convergence rates of h- and hp-adaptive schemes are studied.

References:

[1] J. Petsche, A. Schröder, A posteriori error control and adaptivity of hp-finite elements for mixed and mixed-hybrid methods, Computers and Mathematics with Applications (2017), http://dx.doi.org/10.1016/j.camwa.2017.05.032

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