Anisotropic adaptive finite elements for an elliptic and a non linear problem

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As an extension of what presented in [1], an elliptic problem $\nabla \cdot (\mu \nabla u) = f$ with strongly varying diffusion coefficient $\mu > 0$ is considered. Anisotropic adaptive error estimates, being independent of the mesh size, aspect ratio, the data f and μ, will be presented.
The nonlinear problem $-\nabla \cdot ((\mu + |\nabla u|^{p-2})\nabla u) = f$, which is a modified version of the p-Laplacian problem presented in [2] with μ positive, will then be discussed and an anisotropic error indicator introduced.
Numerical results confirming theoretical predictions will be discussed and an adaptive algorithm having the goal to reduce CPU time controlling the accuracy, will be also presented.
Finally an industrial application related to aluminium electrolysis will be discussed.

Références

[1] M. Picasso, Adaptive finite elements with large aspect ratio based on an anisotropic error estimator involving first order derivatives, Comput. Methods Appl. Mech. Eng., 196 (2006), No. 1-3, pp. 14-23.

[2] W. Liu, and N. Yan, Quasi-norm local error estimators for p-Laplacian. Siam J. Numer. Anal. Vol. 30, No. 1, pp. 100-127 (2001).

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