FULLY AUTOMATIC hp-ADAPTIVITY FOR MAXWELL EQUATIONS

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I will present an extension of our automatic hp-adaptive strategy for elliptic problems, to the case of time-harmonic Maxwell equations. The strategy produces a sequence of hp meshes that deliver exponential convergence for both regular and singular solutions.
The overall logic and strategy is the same as for the elliptic problems. Given a (coarse) mesh, we construct the next optimal (coarse) mesh by maximizing the rate of decrease of the projection-based interpolation error of the fine mesh solution. The fine mesh is obtained from the coarse mesh through a uniform, global hp-refinement, i.e. each element is broken into four (2D, eight in 3D) smaller elements, and the order of approximation p is raised by one.
I will focus on the following technical details:

- different projection-based interpolation procedures;
- recursive and non-recursive implementations of the interpolation and mesh optimization procedures;
- optimal interpolation error estimates;
- the algorithm determining the optimal hp-refinements.

The discussion will be illustrated with several two-dimensional examples.

References

[1] L. Demkowicz, "hp-Adaptive Finite Elements for Time-Harmonic Maxwell Equations", in Proceedings of LMS Durham Symposium on Computational Methods for Wave Propagation in Direct Scattering, Durham, England, July 15-25 2002, Oxford Press, in print.