

Adaptive Wavelet Methods for Stokes and Maxwell's Equations

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The numerical solution of Stokes and Maxwell's equations is still a challenging problem. Due to the mixed character of the Stokes system, trial and test spaces for velocity and pressure have to be chosen in conventional methods with some care in order to satisfy the Ladyshenskaja-Babuška-Brezzi (LBB) condition. We show that an adaptive wavelet-based method converges asymptotically optimal (also with optimal complexity) for any choice of conforming wavelet trial bases. Numerical results are shown.

While in the Stokes problem a constraint on the velocity is imposed in terms of the divergence operator, the variational formulation of Maxwell's equations involve the curl-operator and is posed in $H(\text{curl})$. We show different wavelet realizations, all leading to a well-conditioned system which is also robust with respect to all involved parameters (such as physical constants or time steps).

The presented results are obtained by joint work with Stephan Dahlke (Marburg), Wolfgang Dahmen (Aachen), Torben Klint (Kopenhagen) and Jürgen Vorloeper (Aachen).