

AMG Solvers for $H(\text{curl})$ Problems

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In this presentation, we first review a number of auxiliary space based preconditioners for the second order definite and semi-definite Maxwell problems discretized with the lowest order Nedelec finite elements. We discuss and illustrate with numerical results our parallel solver (AMS) in HYPRE (the solver library developed in CASC) which implements the most promising of these methods; namely, the ones derived from the Hiptmair-Xu (HX) auxiliary space decomposition.

Secondly, we report on a new class of interpolation mappings for use in algebraic multigrid (AMG). The procedure is general in that it applies to s.p.d. finite element discretization problems that include scalar and vector elliptic PDEs, and it can be adapted to the time-domain Maxwell (definite $H(\text{curl})$) problems. It can also be viewed as an extension of previously proposed vector-fitting interpolation procedures and can be used in adaptive AMG cycles. We illustrate the performance of the new interpolation matrices on a number of test problems.

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