

Robust multilevel preconditioning of quadratic FE discretizations of anisotropic elliptic problems

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Abstract. This talk discusses the construction of multilevel preconditioners based on approximate block factorization for quadratic finite element (FE) discretizations of anisotropic elliptic problems.

Robustness with respect to non-grid-aligned anisotropy is obtained as a result of the interplay between the following components: (a) an additive Schur complement approximation attained via the assembly of exact Schur complements of local (stiffness) matrices associated with a covering of the entire domain by overlapping subdomains; (b) a global block smoother, such as a block Jacobi or a block Gauss-Seidel iteration; (c) the use of an augmented coarse grid enhancing the efficiency of the smoother on the coarse level(s).

The presented two-grid analysis and the performed numerical experiments with a nonlinear algebraic multilevel iteration (AMLI) method indicate the robust performance of this class of preconditioners.