

Multilevel Spectral Domain Decomposition Methods

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Abstract

Overlapping domain decomposition methods with spectral coarse spaces are introduced in the framework of subspace correction methods and extended to multiple coarse levels enabling massive scaling of these methods to supercomputers. Convergence of these methods is proven to be independent of coefficient variation for a discontinuous Galerkin discretization of the elliptic model problem including full tensors. With respect to the number of levels theory predicts exponential dependence on the number of levels while practical results suggest only a quadratic dependence. Numerical results are presented for highly heterogeneous problems with up to 16384 subdomains.

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