
Overlapping Schwarz Preconditioner for Fourth Order Multiscale Elliptic Problems

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In this paper a domain decomposition parallel preconditioner for the 4th order multiscale elliptic problem in 2D with highly heterogeneous coefficients is constructed. The problem is discretized by the conforming C^1 reduced Hsieh-Touh-Tocher (HCT) macro element. The proposed preconditioner is based on a the classical overlapping Schwarz method and is constructed using an abstract framework of the Additive Schwarz Method. The coarse space consists of multiscale finite element functions associated with the edges, and is enriched with functions based on solving carefully constructed generalized eigenvalue problems locally on each edge. The convergence rate of the Preconditioned Conjugate Method of our method is independent of the variations in the coefficients for sufficient number of eigenfunctions in the coarse space.

Keywords: Fourth Order Problem, Finite Element Method, Domain Decomposition Method, Additive Schwarz Method, Abstract Coarse Space.