An Adaptive GMsFEM for High-Contrast Flow Problems

Guanglian Li[1] Eric T. Chung[2] Yalchin Efendiev[3]

In this paper, we derive an a-posteriori error indicator for the Generalized Multiscale Finite Element Method (GMsFEM) framework. This error indicator is further used to develop an adaptive enrichment algorithm for the linear elliptic equation with multiscale high-contrast coefficients. We consider two kinds of error indicators where one is based on the L^2-norm of the local residual and the other is based on the weighted H^{-1}-norm of the local residual where the weight is related to the coefficient of the elliptic equation. We show that the use of weighted H^{-1}-norm residual gives a more robust error indicator which works well for cases with high contrast media. The convergence analysis of the method is given. This is a joint work with Dr. Eric T. Chung (CUHK) and Dr. Yalchin Efendiev (TAMU).

[1] Institute for Numerical Simulation, University of Bonn, Wegelerstr. 6, 53115 Bonn, Germany, lotusli0707@gmail.com

[2] Chinese University of Hong Kong, eric.t.chung@gmail.com

[3] Texas A&M University, College Station, yalchinrefendiev@gmail.com