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Adaptive Multilevel AMG for Sequences of Problems with Gradually Changing Random Coefficients

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In this talk we present an adaptive algebraic multigrid method based on [Brezina M, Vassilevski P. Smoothed aggregation spectral element agglomeration AMG: SA 8722; 961;AMGe. Large-Scale Scientific Computing, 8th International Conference, LSSC 2011, Sozopol, Bulgaria, June 6-10th, 2011. Revised Selected Papers. Lecture Notes in Computer Science, vol. 7116, Springer, 2012; 315] and [Kalchev D, Ketelsen C, Vassilevski P. Adaptive algebraic multigrid for sequence of problems with slowly varying random coefficients. Submitted 2012;]. The target is to efficiently solve large sequences of problems. To this purpose, already built hierarchies of spaces are reused and adapted so that efficient algebraic multilevel preconditioners are quickly constructed for nearby problems. The main considered application is the solution of linear systems arising in Markov chain Monte Carlo simulations of subsurface flow with uncertainty in the conductivity field. A set of numerical experiments demonstrate the efficiency of the method for the targeted application.

This work was performed under the auspices of the U.S. Department of Energy by Lawrence Livermore National Laboratory under Contract DE-AC52-07NA27344.

KEYWORDS: iterative methods; multigrid; algebraic multigrid; adaptive algebraic multigrid; Monte Carlo; Markov chain Monte Carlo; subsurface flow