

1077-65-2705

James J Brannick, Yao Chen* (chen_y@math.psu.edu) and **Ludmil T Zikatanov**. *On the construction of optimal piece-wise constant coarse spaces in algebraic multigrid method.*

We consider aggregation based two-level and multilevel methods for solving linear systems with symmetric positive (semi)-definite matrices. In a two-level setting we define the coarser space to be the space of functions that are piece-wise constants with respect to the aggregation. We then devise an algorithm to optimize the shape of the aggregates so that we have faster convergence rate. The algorithm utilizes a measure which is optimized locally in order to reshape the aggregates. The measure depends on the smoother used in the two-level method.

This aggregation algorithm has the potential to work with any smoother and does not use test vectors to guide the aggregation as other coarsening methods do. We present several numerical tests on the solutions of the discretized elliptic PDEs with anisotropic coefficients. The numerical tests include both two level and multilevel methods and clearly show the robustness of the algorithm. At the end we also discuss parallel implementations of such algorithm in both communication cost and computational cost (number of flops). This is a joint work with James Brannick and Ludmil Zikatanov. (Received September 22, 2011)