

Algorithms for Fast Graph Partitioning and Applications to Preconditioning

David Fritzsche* Andreas Frommer† Daniel B. Szyld*

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Abstract

The PABLO family is a collection of algorithms for fast graph partitioning, suitable for obtaining block based preconditioners like block Gauss-Seidel for the solution of linear systems; see [3], [1], and [2]. A new member of this family, called UPABLO (Unsymmetric PArametrized Block Ordering), based on different graph models is presented. Whereas the traditional PABLO algorithms are all based on the directed graph of a matrix, UPABLO considers instead its bipartite graph. The relationship between the bipartite graph and the hypergraph of a matrix will be explored. Furthermore, UPABLO can be combined with previous work on adding overlap to an existing non-overlapping partitioning. We present a complexity analysis of our algorithms. Numerical experiments prove that adding some overlap is usually very beneficial. Moreover, the results of extensive numerical tests will be presented to show how UPABLO-based preconditioners perform and how their performance compare to XPABLO-based preconditioners.

References

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*Department of Mathematics, Temple University, Philadelphia, PA 19122-6094, {fritzsche,szyld}@temple.edu.

†Faculty of Mathematics and Science, Bergische Universität Wuppertal, D-42097 Wuppertal, Germany, frommer@math.uni-wuppertal.de

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