

UPDATING PRECONDITIONERS FOR SEQUENCES FROM COMPRESSIBLE FLOW

Philipp Birken, Andreas Meister

*Department of Analysis and Applied Mathematics, University of Kassel,
D-34132 Kassel, Germany,
e-mail: {birken, meister}@mathematik.uni-kassel.de*

joint work with

Jurjen Tebbens, Miroslav Tůma

*Institute of Computer Science, Academy of Sciences of the Czech Republic,
CZ-182 07 Prague 8, Czech Republic,
e-mail: {tebbens, tuma}@cs.cas.cz*

Keywords: nonsymmetric preconditioning, preconditioner updates, sequences of linear systems, compressible flow, finite volume methods

Abstract

This contribution illustrates the application of preconditioner updates as in [2] to model problems from compressible flow, that represent a broad range of typical sequences of nonsymmetric linear systems. There, a typical technique is freezing with periodic recomputation of ILU decompositions [3]. This can be improved by updating between refactorizations. In particular, the extension to block matrices is discussed, as well as different strategies for the adaptive choice of the update and the effect of renumbering on the performance of the new method, as in [1]. This is illustrated by theoretical results.

Acknowledgement: The work of the first two authors is supported by the German Science Foundation as part of the Sonderforschungsbereich SFB/TR TRR 30. The work of the second two authors is supported by the Program Information Society under project 1ET400300415 and by project number KJB100300703 of the Grant Agency of the Academy of Sciences of the Czech Republic.

References

- [1] P. BIRKEN, A. MEISTER, M. TŮMA AND J. TEBBENS, *Preconditioner updates applied to CFD model problems*, submitted to Applied numerical mathematics in 2007.
- [2] J. DUINTJER TEBBENS AND M. TŮMA, *Efficient preconditioning of sequences of non-symmetric linear systems*, to appear in SIAM J. Sci. Comput. in 2007.
- [3] A. MEISTER AND J. VÖMEL, *Efficient preconditioning of linear systems arising from the discretization of hyperbolic conservation laws*, Adv. Comput. Math., 14 (2001), pp.49–73.