

# Preconditioner Updates for Sequences of Nonsymmetric Linear System

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When the computation of efficient preconditioners for individual linear systems of a sequence is expensive, significant reduction of costs can be achieved by updating previous preconditioners. For large and sparse systems, this has been done, among others, by recycling subspaces when using a Krylov subspace method [3], by means of small rank updates when applying Quasi-Newton methods [2] or with diagonal updates for SPD systems arising from parabolic PDE's [1].

In this contribution we consider sequences of any type of nonsymmetric systems by generalizing the approach from [1]. We show that we can define efficient updates by considering specific approximations of the difference between the system matrices [4]. The talk envisages to address both these approximations as well as permutation techniques that can make the approximations even more accurate.

## References

- [1] M. Benzi and D. Bertaccini. Approximate inverse preconditioning for shifted linear systems. *BIT Numer. Math.*, 43:231-244, 2003.
- [2] L. Bergamaschi, R. Bru, A. Martinez, and M. Putti. Quasi-Newton preconditioners for the inexact Newton method. In *Abstract book of the 2005 International Conference On Preconditioning Techniques*, Atlanta, May 19-21, 2005.
- [3] M.L. Parks, E. de Sturler, G. Mackey, D.D. Johnson, and S. Maiti. Recycling Krylov subspaces for sequences of linear systems. Technical Report UIUCDCS-R-2004-2421, University of Illinois, 2004.
- [4] J. Duintjer Tebbens, M. Tůma. Preconditioner Updates for Solving Sequences of Large and Sparse Nonsymmetric Linear Systems, submitted to *SIAM J. Sci. Comput.*