UPDATING OF PRECONDITIONERS FOR LARGE, SPARSE, NONSYMMETRIC LINEAR SYSTEMS

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Abstract

Many applications such as computational fluid dynamics, structural mechanics or numerical optimization ask for solving sequences of linear systems. If the computation of efficient preconditioners for the individual linear systems of the sequence is expensive, updating previous preconditioners can be very beneficial. This has been done for large and sparse systems, among others, by recycling subspaces in the context of Krylov subspace methods [4], with small rank updates in case of applying Quasi-Newton methods [2] or by means of diagonal updates for SPD systems arising from parabolic PDE's [1].

In this contribution we explain our extension of the approach from [1] to general nonsymmetric systems which was proposed in [3]. In addition, we address several issues that cannot be found in [3]: Theoretical results about the influence of diagonal dominance on the quality of our updates, block-wise implementation, new criteria for adaptive choice of update types, reordering of unknowns in finite volume discretization and the consequences for update performance, more general permutation strategies.

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