

Preconditioning By Incomplete Factorizations And Approximate Inverses

Miroslav Tuma

Institute of Computer Science, Academy of Sciences of the Czech Republic, Czech Republic
tuma@cs.cas.cz

In this talk we will deal with the construction of robust preconditioners for iterative methods. In particular, we are interested in algebraic procedures for computing incomplete factorizations. We will concentrate on the approaches that explicitly use approximate inverse factorizations.

Incomplete factorizations represent a class of algebraic preconditioners which is important from both theoretical and practical points of view. Important general ways for increasing robustness of the incomplete factorizations include, for example, matrix pre-processings and reorderings, modifications of factors and multilevel approaches. Nevertheless, here we would like to get new preconditioners rather by *new formulation* of the factorization algorithms than by means of the above-mentioned techniques.

In particular, we will describe new algorithms which compute both direct and inverse incomplete factors of A at the same time. The order of computation of intermediate quantities in this algorithm may enable to monitor conditioning of these factors, and, in addition, the algorithm can be combined with various dropping schemes throughout the incomplete factorization. In the simplest case we get the factorization of the system matrix A via $(I - A^{-1})^{-1}$ -orthogonalization [1]. In our talk we will also consider extensions of the published algorithm as well as some additional insight.

Reference

- [1] R. Bru, J. Marín, J. Mas, and M. Tuma. Balanced incomplete factorization. *SIAM J. Sci. Comput.*, 30(2008), 2302-2318.