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Matrix renumbering ILU: An effective algebraic multilevel ILU preconditioner for sparse matrices. (English) [Zbl 0937.65057](#)

SIAM J. Matrix Anal. Appl. 20, No. 4, 1007-1026 (1999).

The authors start with a review of different versions of ILU preconditioning techniques. The main result of the paper consists in the generalization of the the so-called nested grid ILU (NGILU) proposed in an earlier paper. Whereas the NGILU was mainly restricted to structured grids, the new method that is called matrix renumbered ILU (MRILU) applies to a wider class of problems including algebraic systems arising from the finite element discretization of partial differential equations on unstructured grids. The algorithmic structure of the MRILU method is basically identical to the ILU factorization algorithm.

The essential ingredients of the new algorithm are the ordering and the dropping that are both based on the size of the entries of the matrix. There is no rigorous analysis of the new preconditioning technique. However, the numerical results reported in the paper show that the RMILU preconditioning yields at least almost mesh-independent convergence rate for many practically interesting problems including indefinite and nonsymmetric problems.

Reviewer: [U.Langer \(Linz\)](#)

MSC:

- [65F35](#) Numerical computation of matrix norms, conditioning, scaling
- [65N06](#) Finite difference methods for boundary value problems involving PDEs
- [65N30](#) Finite element, Rayleigh-Ritz and Galerkin methods for boundary value problems involving PDEs
- [65F50](#) Computational methods for sparse matrices
- [65F10](#) Iterative numerical methods for linear systems

Cited in **18** Documents

Keywords:

matrix renumbered ILU preconditioning; multilevel methods; dropping strategies; Krylov-subspace methods; finite element; ILU factorization algorithm; numerical results; convergence

Software:

[BiCGstab](#); [DRIC](#); [BILUM](#)

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