

## ON FAST FACTORIZATION PIVOTING METHODS FOR SPARSE SYMMETRIC INDEFINITE SYSTEMS\*

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**Abstract.** This paper discusses new pivoting factorization methods for solving sparse symmetric indefinite systems. As opposed to many existing pivoting methods, our Supernode–Bunch–Kaufman (SBK) pivoting method dynamically selects  $1 \times 1$  and  $2 \times 2$  pivots and may be supplemented by pivot perturbation techniques. We demonstrate the effectiveness and the numerical accuracy of this algorithm and also show that a high performance implementation is feasible. We will also show that symmetric maximum-weighted matching strategies add an additional level of reliability to SBK. These techniques can be seen as a complement to the alternative idea of using more complete pivoting techniques during the numerical factorization. Numerical experiments validate these conclusions.

**Key words.** direct solver, pivoting, sparse matrices, graph algorithms, symmetric indefinite matrix, interior point optimization

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