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triangular form, Cholesky factorization,  
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*A survey of direct methods for sparse  
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Systems for direct methods for  
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Davis June 9, 2016 All of the following  
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Davis, Rajamanickam, and Sid-  
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Systems 2016, pp. 383-566, with one additional reference: the survey paper ...

*References for direct methods for  
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All sparse linear solvers belong to one of two families: iterative (also called matrix-free) or direct algorithms.

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Iterative solvers access system matrix  $A$  only by evaluating its products  $A \cdot x$  (or  $A' \cdot x$  with trial vectors  $x$  provided by the solver. Direct solvers work with explicit representation of  $A$  and perform some sparse triangular factorization ( Cholesky or LU with pivoting ), followed by solution of

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Systems equips readers with the working knowledge required to use sparse solver packages and write code to interface applications to those packages. The book also explains how MATLAB performs its sparse matrix computations.

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Sparse direct solvers are recommended for large 3D finite element models such as multi-story buildings, shell structures, and solid structures. The sparse method involves solving the linear equation

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Systems  $K * x = b$  or the equation system of eigenvalue problems  $K * x - \lambda * B * x = 0$ . The direct sparse solvers (SPDS) are efficient computational techniques based on decomposition of the matrix  $K = L * U$  with a considerably less number of matrix elements different from zero.

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Iterative methods for solving general, large sparse linear systems have been gaining popularity in many areas of scientific computing. Until recently, direct solution methods were often



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Systems preferred to iterative methods in real applications because of their robustness and predictable behavior.

## *Iterative Methods for Sparse Linear Systems*

We have provided a brief but concise overview of some of the most

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promising and typical direct and iterative methods for solving large sparse linear systems, including preconditioning techniques for the Krylov subspace iteration methods, and pointed out possible connections between linear solvers and matrix preconditioners.

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*Motivations and realizations of Krylov  
subspace methods ...*

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July 1980; DAIMI Report Series 9(123)  
DOI: 10.7146/dpb.v9i123.6541. ...

Direct methods for sparse linear  
systems have been developed, e.g., in

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Matrices*

The strategies adopted for solving such systems can be broadly classified into two categories: direct methods [ 1] and iterative methods [ 2

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Systems  
]. For relatively small system sizes, direct methods such as QR decomposition and LU factorization are generally the preferred approaches.

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SPARSE STRETCHING FOR LEAST-SQUARES PROBLEMS

SA1605 within a conjugate gradient method using an incomplete factorization preconditioner combined with the factorization of a dense matrix of size equal to the number of dense rows. Here, we revisit the idea of matrix stretching for

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handling dense rows. Stretch- ing aims to split each of the rows of  $A$

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