

Incremental Condition Estimation with Inverse Triangular Factors

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A popular procedure for condition estimation was proposed in a 1990 paper by Bischof. The approximate condition numbers of the factors of a triangular decomposition are obtained in an incremental way from the principal submatrices. The approximation for the current principal submatrix relies on an approximate left singular vector constructed without accessing the columns or rows of smaller principal submatrices. This makes the procedure relatively inexpensive and particularly suited when a triangular matrix is computed one column or row at a time. In 2002, Duff and Vömel came up with a similar strategy based on approximate *right* singular vectors and recommended its use for sparse matrices.

In this talk we will demonstrate and give a theoretical explanation for the fact that the second technique, based on right singular vectors, gives in general better estimates of the maximal singular value of dense matrices. Furthermore, we show how this can be exploited when the inverse of the triangular matrix is available. In this case we obtain an incremental condition estimator which is significantly better than either the original or the modified 2002 technique.