

# Accurate computation of the SVD and spectral decomposition of definite matrices

## Točno računanje SVD dekompozicije i spektralne dekompozicije definitnih matrica

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March 5, 2006

### Abstract

In this tutorial talk we outline the principles behind the design of the new Jacobi-type algorithm for accurate computation of the SVD and diagonalization of positive definite matrices.

The new (serial) algorithm outperforms the best previous implementations of the Jacobi SVD algorithm with factor as big as ten! In case of computing the full SVD it outperforms the QR algorithm (SGESVD from LAPACK) and, depending on the distribution of the spectrum, it comes close the currently fastest *divide and conquer* SGESDD code from LAPACK. It is important to note that this efficiency is not traded for numerical accuracy. This means that the new algorithm is currently the fastest known algorithm capable of reaching numerical stability guaranteed by the state of the art perturbation theory.

Moreover, the new algorithm can run in the "classical mode" of accuracy and in the cases of matrices with low numerical rank, for which only the dominant singular triplets are of interest (which is very often the case in applications of the SVD), it can even outperform the SGESDD procedure from LAPACK.

As a result of this development, the new algorithms will be included in the next release of the LAPACK library.

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