Jacobi-type Algorithm for Cosine-Sine Decomposition

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Abstract

Cosine-sine decomposition is defined for both, orthonormal matrices partitioned into 2×1 block matrix and for orthogonal matrices partitioned into 2×2 block matrix. We call these decompositions 2×1 CSD and 2×2 CSD, respectively. They display the connection between SVD's of the blocks of the matrix. Because of this connection, in the presence of small or close singular values, it is not trivial to compute decompositions accurately.

In this talk, we present a new method for computing the 2×1 CSD. The method runs two one-sided Jacobi SVD algorithms simultaneously, one for each block. These algorithms construct same sequence of transformations using information from both blocks. By doing so, the interconnection of two SVD's is maintained and the accuracy of the computed 2×1 CSD is achieved.

Additionally, we discuss how any accurate 2×1 CSD algorithm can be used to compute a 2×2 CSD.