Quadratic Convergence of Scaled Iterates by Diagonalization Methods

It is known that in the relative perturbation theory of eigenvalues and eigenvectors, as well as of singular values and singular vectors, scaled matrices of the form $D_1 H D_2$ with diagonal D_1 and D_2 play important role. Most often $D_1 = D_2$ or one of the matrices D_1 or D_2 is identity. Norms of scaled matrices, together with relative gaps in the spectrum or in the set of singular values, appear in bounds for the relative distances between diagonal elements and the corresponding eigenvalues or singular values. The same quantities appear in bounds for the angles between eigenspaces of relatively close matrices. Therefore, there is a need for new measures of convergence for eigenvalue diagonalization processes.

The aim of this presentation is to give an overview of the new quadratic convergence results for diagonalization processes for Hermitian and J-Hermitian matrices as well as for Kogbetliantz method for triangular matrices. In all obtained results, the initial matrices are scaled diagonally dominant. Symmetric scaling and relative gaps are used in the assumptions and in the estimates. Some of the results have important application in connection with stopping criterion of one-sided SVD methods. We also discuss accuracy of Kogbetliantz method.

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