Orthogonal similarity transformation of a symmetric matrix into a diagonal-plus-semiseparable one with free choice of the diagonal

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It is well-known how any symmetric matrix can be transformed into a similar tridiagonal one [1, 2]. This orthogonal similarity transformation forms the basic step for various algorithms. For example if one wants to compute the eigenvalues of a symmetric matrix, one can first transform it into a similar tridiagonal one and then compute the eigenvalues of this tridiagonal matrix.

Very recently an algorithm was developed for transforming an arbitrary symmetric matrix, via orthogonal similarity transformations into a similar semiseparable one [3]. This reduction to semiseparable form, can be used, similarly like in the tridiagonal case as a basic step for calculating for example the eigenvalues.

In this talk, we repeat the former similarity transformations into tridiagonal and semiseparable form and present a new algorithm which reduces, by means of orthogonal similarity transformations, symmetric matrices into similar diagonal-plus-semiseparable ones, with a free choice of the diagonal [4].

By numerical experiments, we compare the accuracy of the three reduction algorithms and show that they all asymptotically have the same complexity. Finally we illustrate that special choices of the diagonal for the reduction into diagonal-plus-semiseparable form, create a specific convergence behavior.

keywords: Orthogonal similarity transformation, symmetric matrix, tridiagonal matrix, semiseparable matrix, diagonal-plus-semiseparable matrix.

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