Accurate Eigenvectors of Symmetric Tridiagonal Matrices (based on a joint research with Frederick Vincent)

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We will present new algorithms for computing eigenvector components of symmetric tridiagonal matrices to high relative accuracy. This is in contrast with the current state-of-the-art where the eigenvectors are computed to high norm accuracy and thus only the largest components are computed accurately with the tiny ones lost to roundoff. Our new algorithms are based on a recently (re-)discovered result which expresses the components of an eigenvector in terms of the eigenvalues of the matrix and the eigenvalues of certain submatrices. These eigenvalues can be computed relative accuracy using known methods for totally nonnegative matrices. The eigenvectors are always computed with known and guaranteed relative accuracy. When certain expected and typical relative gap conditions are met, these components are computed to high relative accuracy.