ON THE CONVERGENCE OF A
NEW RAYLEIGH QUOTIENT METHOD WITH
APPLICATIONS TO LARGE EIGENPROBLEMS[*]

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Abstract. In this paper we propose a variant of the Rayleigh quotient method to compute an eigenvalue and corresponding eigenvectors of a matrix. It is based on the observation that eigenvectors of a matrix with eigenvalue zero are also singular vectors corresponding to zero singular values. Instead of computing eigenvector approximations by the inverse power method, we take them to be the singular vectors corresponding to the smallest singular value of the shifted matrix. If these singular vectors are computed exactly the method is quadratically convergent. However, exact singular vectors are not required for convergence, and the resulting method combined with Golub–Kahan–Krylov bidiagonalization looks promising for enhancement/refinement methods for large eigenvalue problems.

Key words. Rayleigh quotient method, singular value decomposition, large eigenproblem.

AMS subject classifications. 15A42, 65F15, 65H15.

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