TEMPLE UNIVERSITY
Department of Mathematics

Applied Mathematics and Scientific Computing Seminar

Room 617 Wachman Hall

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Efficient inner solves for inexact Rayleigh quotient iteration and their connections to the simplified Jacobi-Davidson method

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Abstract.

We study inexact Rayleigh quotient iteration (RQI) for generalized eigenvalue problems, with focus on efficient solution of the shifted linear systems that arise in this algorithm. We show that locally cubic and quadratic convergence of inexact RQI can be achieved for Hermitian and non-Hermitian problems, respectively, if the shifted linear systems are solved by a generic Krylov subspace method with a special "tuned" preconditioner to a reasonably small fixed tolerance. We then refine the equivalence results of the inner solves of inexact RQI and inexact simplified Jacobi-Davidson method where a preconditioned full orthogonalization method is used as the inner solver. We also provide some new perspectives on the tuning strategy, and propose two alternative inner solvers where tuning needs not be used. One of these alternatives, a flexible GMRES algorithm with a special configuration in the first inner step, can be comparable in efficiency to GMRES with the tuned preconditioner.