TEMPLE UNIVERSITY
Department of Mathematics

Applied Mathematics and Scientific Computing Seminar

Room 617 Wachman Hall

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Efficient inexact Rayleigh quotient iteration and its connections to the Jacobi-Davidson method

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Abstract.

We study inexact Rayleigh quotient iteration (IRQI) for computing a simple interior eigenpair of the generalized eigenvalue problem $Av = \lambda Bv$, providing new insights into three aspects of a special type of preconditioners with "tuning" for the efficient solution of the shifted linear systems arising in this algorithm. We first show that full asymptotic convergence rates of IRQI can be achieved, if the shifted linear systems are solved by a Krylov subspace method with a tuned preconditioner to a moderately small fixed tolerance. We also discuss the equivalence of the inner solves of IRQI and the single-vector Jacobi-Davidson method. A flexible GMRES (FGMRES) algorithm with a special configuration in the first inner step is proposed to simplify the use of tuning, and is shown to be as efficient as GMRES with the tuned preconditioner. The success of this FGMRES is also explained by its connection to the Jacobi-Davidson method.