

Prescribing the behavior of the GMRES method and the Arnoldi method simultaneously.

In this talk we first show that the Ritz values generated in the subsequent iterations of the Arnoldi method can be fully independent from the eigenvalues of the input matrix. We will give a parametrization of the class of matrices and starting vectors generating prescribed Ritz values in all iterations. This result can be seen as an analogue of the parametrization that closed a series of papers by Arioli, Greenbaum, Pták and Strakoš (published in 1994, 1996 and 1998) on prescribing GMRES residual norm curves and spectra. In the second part of the talk we show, using the first part, that any GMRES convergence history is possible with any Ritz values in all iterations, provided we treat the GMRES stagnation case properly. We also present a parametrization of the class of matrices and right hand sides generating prescribed Ritz values and GMRES residual norms in all iterations.

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