An error analysis for rational Galerkin projection applied to the Sylvester equation

B. Beckermann
Department of Mathematics
University of Lille
Labo Painlevé UMR 8524, 59655 Villeneuve d'Ascq, France
bbecker@math.univ-lille1.fr

In this talk we suggest a new formula for the residual of Galerkin projection onto rational Krylov spaces applied to a Sylvester equation, and establish a relation to three different underlying extremal problems for rational functions. These extremal problems enable us to compare the size of the residual for the above method with that obtained by ADI. In addition, we may deduce several new a priori error estimates for Galerkin projection onto rational Krylov spaces, both for the Sylvester and for the Lyapunov equation.

References

[1] P. Benner, R.-C. Li, N. Truhar, *On the ADI method for Sylvester equations*, JCAM 233 (2009), pp. 1035–1045.

[2] V. Druskin, L. Knizhnerman and V. Simoncini, *Analysis of the rational Krylov subspace and ADI methods for solving the Lyapunov equation.* Technical report, Dipartimento di Matematica, Università di Bologna, 2010.

[3] D. Kressner, Ch. Tobler, *Krylov subspace methods for linear systems with tensor product structure*, SIAM Journal on Matrix Analysis and Applications 31 (2010), pp. 1688–1714.