Boğaziçi
MATH COLLOQUIUM

Interpolatory Subspace Frameworks for Nonlinear Eigenvalue Problems

Emre Mengi

Koç University

Abstract:

We consider a nonlinear eigenvalue problem that involves finding the points where a matrix-valued function depending on a complex parameter in a meromorphic way is singular. Included in our setting are polynomial, rational and delay eigenvalue problems as special cases. Our main concern is the setting when the matrix-valued function is large. Whereas the classical subspace projection ideas such as Krylov subspace methods first linearize the nonlinear eigenvalue problem then project the linear eigenvalue problem, we propose a subspace framework that directly projects the nonlinear eigenvalue problem to small subspaces leading to small nonlinear eigenvalue problems of the same kind. The projection subspaces are formed so as to attain Hermite interpolation properties between the original large and projected small eigenvalue problems. The eigenvalues of the projected problems converge to the eigenvalues of the large problem rapidly at least at a quadratic rate with respect to the subspace dimension due to these interpolation properties.

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