A rational Krylov method based on Newton and/or Hermite interpolation for the nonlinear eigenvalue problem

In this talk we present a new rational Krylov method for solving the nonlinear eigenvalue problem (NLEP):

$$A(\lambda)x = 0.$$

The method approximates $A(\lambda)$ by polynomial Newton and/or Hermite interpolation. It uses a companion-type reformulation to obtain a linear generalized eigenvalue problem (GEP). This GEP is solved by a rational Krylov method, where the number of iteration points is not fixed in advance. As a result, the companion form grows in each iteration. The number of interpolation points is dynamically chosen. Each iteration requires a linear system solve with $A(\sigma)$ where σ is the last interpolation point. We illustrate the method by numerical examples and compare with residual inverse iteration. We also give a number of scenarios where the method performs very well.

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