Meerbergen, K.
K.U.Leuven, Department of Computer Science

The solution of a nonlinear eigenvalue problem using polynomial eigenvalue solvers

Date, Time, Room to be filled in later by organizers

Polynomial eigenvalue problems are often solved by transforming them to a Companion-like form. This is a linear eigenvalue problem of larger size that can be solved by methods for linear eigenvalue problems. For the quadratic eigenvalue problem, this idea led to the SOAR and Q-Arnoldi methods. In this talk, we consider extensions of these methods for the solution of non-linear eigenvalue problems. The non-linear operator is approximated by a polynomial. The associated polynomial eigenvalue problem is then solved by the shift-and-invert Arnoldi method. The degree of the polynomial is not fixed beforehand but dynamically adapted and equal to the iteration number of the Arnoldi method. This allows for a flexible and automatic choice of the degree. We discuss various choices of polynomial approximations, stopping criteria and restarting strategies. The storage cost of the iteration vector is proportional to the square of the iteration count. We discuss techniques to reduce this cost.
This contribution is joint work with Elias Jarlebring and Wim Michiels (K.U.Leuven, Belgium).

Heike Faßbender
Technische Universität Braunschweig, Germany

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