ON THE EFFICIENT SOLUTION OF T-EVEN POLYNOMIAL EIGENVALUE PROBLEMS

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The polynomial eigenvalue problem $A(\lambda)u = 0$ for

$$A(\lambda) = \sum_{k=0}^{d} A_k \lambda^k, \; A_k \in \mathbb{R}^{n \times n}$$

with $A_k = A_k^T$ if k is even and $A_k = -A_k^T$ otherwise is considered. Such matrix polynomials have been named alternating or T-even. The eigenvalues of such matrix polynomials $A(\lambda)$ have a Hamiltonian eigenstructure; that is, the spectrum is symmetric with respect to both the real and the imaginary axis.

We discuss the numerical solution of T-even polynomial eigenvalue problems and show how a small part of the spectrum can be obtained using just $\mathcal{O}(n^3)$ arithmetic operations. For that purpose, we apply the EVEN-IRA algorithm proposed in [2] to a special structure-preserving linearization proposed in [1]. In this particular situation, the Arnolid iteration as a main part of the EVEN-IRA algorithm can be realized very efficiently.

References

[1] H. Faßbender and Ph. Saltenberger, *Block Kronecker ansatz spaces for matrix polynomials*, Linear Algebra and its Applications, 542 (2017), pp.118–148.

[2] V. Mehrmann, C. Schröder, and V. Simoncini, *An implicitly-restarted Krylov subspace method for real symmetric/skew-symmetric eigenproblems*, Linear Algebra and its Applications, 436 (2012), pp. 4070–4087.