

Structured matrix polynomials and their sign characteristics: classical results and recent developments

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The sign characteristic is an invariant associated with particular eigenvalues of structured matrices, matrix pencils, or matrix polynomials. The concept of sign characteristic arises in different forms in many scientific fields, and is essential for the stability analysis in Hamiltonian systems or the perturbation behaviour of eigenvalues under structured perturbations. We will start by discussing the sign characteristics of Hermitian matrix polynomials, and show how to extend its definition to eigenvalues at infinity. We will discuss applications of the sign characteristic in particular in control systems, in the solution of structured inverse polynomial eigenvalue problems and in the characterization of special structured matrix polynomials such as overdamped quadratics, hyperbolic and quasidefinite matrix polynomials.

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