STRUCTURED POLYNOMIAL EIGENPROBLEMS
RELATED TO TIME-DELAY SYSTEMS[*]

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Abstract. A new class of structured polynomial eigenproblems arising in the stability analysis of time-delay systems is identified and analyzed together with new types of closely related structured polynomials. Relationships between these polynomials are established via the Cayley transformation. Their spectral symmetries are revealed, and structure-preserving linearizations constructed. A structured Schur decomposition for the class of structured pencils associated with time-delay systems is derived, and an algorithm for its computation, which compares favorably with the QZ algorithm, is presented along with numerical experiments.

Key words. Polynomial eigenvalue problem, palindromic matrix polynomial, quadratic eigenvalue problem, even matrix polynomial, structure-preserving linearization, matrix pencil, structured Schur form, real QZ algorithm, spectral symmetry, Cayley transformation, involution, time-delay system, delay-differential equation, stability analysis.

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