



## SMITH FORMS OF PALINDROMIC MATRIX POLYNOMIALS\*

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**Abstract.** Many applications give rise to matrix polynomials whose coefficients have a kind of reversal symmetry, a structure we call palindromic. Several properties of scalar palindromic polynomials are derived, and together with properties of compound matrices, used to establish the Smith form of regular and singular  $T$ -palindromic matrix polynomials over arbitrary fields. The invariant polynomials are shown to inherit palindromicity, and their structure is described in detail. Jordan structures of palindromic matrix polynomials are characterized, and necessary conditions for the existence of structured linearizations established. In the odd degree case, a constructive procedure for building palindromic linearizations shows that the necessary conditions are sufficient as well. The Smith form for  $*$ -palindromic polynomials is also analyzed. Finally, results for palindromic matrix polynomials over fields of characteristic two are presented.

**Key words.** Compound matrix, Elementary divisors, Invariant polynomials, Jordan structure, Matrix pencil, Matrix polynomial, Palindromic matrix polynomial, Smith form, Structured linearization.

**AMS subject classifications.** 65F15, 15A18, 15A21, 15A54, 15A57.

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