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A Structured Condition Number for Self-adjoint Polynomial Matrix Equations with Applications in Linear Control ⋆

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Abstract

Based on the classic definition of condition number, a structured condition number is proposed for a class of self-adjoint polynomial matrix equations. The explicit formula of the structured condition number is derived with applying newly defined linear operators. The structured condition number can be applied to some important polynomial matrix equations, including the continuous-time algebraic Riccati equation (CARE), the discrete-time algebraic Lyapunov equation (DALE), etc. Compared with the state-of-the-art condition numbers for CARE and DALE, the newly proposed structured condition number can measure the sensitivity of the solution better, which is validated by numerical examples.

Key words: Self-adjoint polynomial matrix equation; Structured condition number; Linear operator; CARE; GDALE.

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