Alpay, Daniel; Lewkowicz, Izchak

Quantitatively hyper-positive real functions. (English) Zbl 1467.93235

Summary: Hyper-positive real, matrix-valued, rational functions are associated with absolute stability (the Lurie problem). Here, quantitative subsets of hyper-positive functions, related through nested inclusions, are introduced. Structurally, this family of functions turns out to be matrix-convex and closed under inversion.

A state-space characterization of these functions through a corresponding Kalman-Yakubovich-Popov Lemma, is given. Technically, the classical linear matrix inclusions, associated with passive systems, are here substituted by quadratic matrix inclusions.

MSC:
93D05 Lyapunov and other classical stabilities (Lagrange, Poisson, $L^p$, $l^p$, etc.) in control theory
93B52 Feedback control
93B20 Minimal systems representations

Keywords:
absolute stability; convex invertible cones; electrical circuits; feedback loops; positive real functions; hyper-positive real functions; K-Y-P lemma; matrix-convex set; state-space realization

Full Text: DOI arXiv

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[13] Lewkowicz, I., Passive linear discrete-time systems: characterization through structure, See · Zbl 1454.93097


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