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Optimization of Passive Systems

We present algorithms to compute the extremal value of a real parameter for which a given rational transfer function of a linear time-invariant system remains passive. This quantity is linked to finding a realization of a rational transfer function such that its passivity radius is maximized. We begin by adapting the Hybrid Expansion-Contraction (HEC) algorithm, originally proposed for approximating the H-infinity norm of large-scale systems, to a generic setting which we call a root-max problem. By then showing how our passivity optimization problem is also a root-max problem, we use the HEC algorithm to develop new globally convergent algorithms with faster local convergence and higher reliability than earlier techniques.

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