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Lagrange Stabilization of Pendulum-like Systems: A Pseudo H-infinity Control Approach

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This paper studies the Lagrange stabilization of a class of nonlinear systems whose linear part has a singular system matrix and which have multiple periodic (in state) nonlinearities. Both state and output feedback Lagrange stabilization problems are considered. The paper develops a pseudo H-infinity control theory to solve these stabilization problems. In a similar fashion to the Strict Bounded Real Lemma in classic H-infinity control theory, a Pseudo Strict Bounded Real Lemma is established for systems with a single unstable pole. Sufficient conditions for the synthesis of state feedback and output feedback controllers are given to ensure that the closed-loop system is pseudo strict bounded real. The pseudo H-infinity control approach is applied to solve state feedback and output feedback Lagrange stabilization problems for nonlinear systems with multiple nonlinearities. An example is given to illustrate the proposed method.

Subjects: **Systems and Control (cs.SY)**; Optimization and Control (math.OC)

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