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H_∞ finite-time control for switched nonlinear discrete-time systems with norm-bounded disturbance. (English) Zbl 1214.93043

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Summary: Finite-time stability concerns the boundedness of system during a fixed finite-time interval. For switched systems, finite-time stability property can be affected significantly by switching behavior; however, it was neglected by most previous research. In this paper, the problems of finite-time stability analysis and stabilization for switched nonlinear discrete-time systems are addressed. First, sufficient conditions are given to ensure a class of switched nonlinear discrete-time system subjected to norm bounded disturbance finite-time bounded under arbitrary switching, and then the results are extended to H_∞ finite-time boundedness of switched nonlinear discrete-time systems. Finally based on the results on finite-time boundedness, a state feedback controller is designed to H_∞ finite-time stabilize a switched nonlinear discrete-time system. A numerical design example is given to illustrate the proposed results within this paper.

MSC:

93B36 H^∞-control
93C10 Nonlinear systems in control theory
93C55 Discrete-time control/observation systems

Keywords:

finite-time stability; stabilization for switched nonlinear discrete-time systems; H_∞ finite-time boundedness; state feedback controller

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