Hindawi Publishing Corporation
Abstract and Applied Analysis
Volume 2014, Article ID 369328, 2 pages
http://dx.doi.org/10.1155/2014/369328

Editorial

Finite-Time Control and Estimation for Complex and Practical Dynamical Systems

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Received 15 July 2014; Accepted 15 July 2014; Published 22 December 2014

If a stable system is actuated by energy (Lyapunov function), the energy will be automatically attenuated in infinite time. The state will finally converge to the equilibrium point. But the trajectory of the state is not constrained. However, in the finite-time stability, the system state would be bounded in finite-time interval. The bounds of the state are prescribed. Thus, the finite-time stability has a great application potential for systems in which large values of the state are not acceptable. In spite of the extensive and successful applications of finite-time stability in automatic control and estimation areas, the capability to handle complex systems such as delayed systems, fuzzy systems, and singularly perturbed systems needs to be further expanded.

The aim of this special issue is to document the up-to-date status of work on control systems design by finite-time techniques via a collection of original high-quality papers. Of particular interest is the fact that the papers in this special issue are devoted to the new concept development of the finite-time technique and the applications of these new concepts to control and estimation problems of complex systems. Topics include, but are not limited to, (1) finite-time boundedness (theoretical and mathematical development); (2) finite-time approaches to networked control and estimation (limited communication capacity, distributed control and filtering, and priority scheduling); (3) finite-time delayed systems, stability, stabilization, control, and filtering; (4) finite-time modeling, analysis, and design of fuzzy systems and switched systems; (5) finite-time stochastic systems; and (6) practical applications of finite-time systems.

We have solicited a lot of submissions to our special issue from different institutes and countries. Based on the peer-review results, 18 submissions have been selected to appear in the final publication, which cover finite-time control theory for different kinds of setups, adaptive and nonlinear control, and control applications.

Though there are considerable results on the finite-time theory, the finite-time control theory needs to be further developed to incorporate the requirements of new applications. In the work entitled "*Resilient finite-time controller design of a class of stochastic nonlinear systems*" by Z. Yan, the definition of finite-time annular domain stability for stochastic nonlinear systems is introduced. An algorithm named double-parameters search is proposed to solve matrix inequalities and obtain the controller gain. In another work entitled "*Finite-time observer based cooperative tracking control of networked Lagrange systems*" by G. Chen and Q. Lin, with a leader-follower structure, the cooperative tracking control problem is investigated. A distributed adaptive fuzzy tracking control protocol is developed based on estimated velocity information of the leader. Numerical simulation results are provided to show both the stability and the robustness to external disturbances. X. Zhou et al. study the finite-time chaos control of a permanent magnet synchronous motor system in the work "*Finite-time chaos control of*