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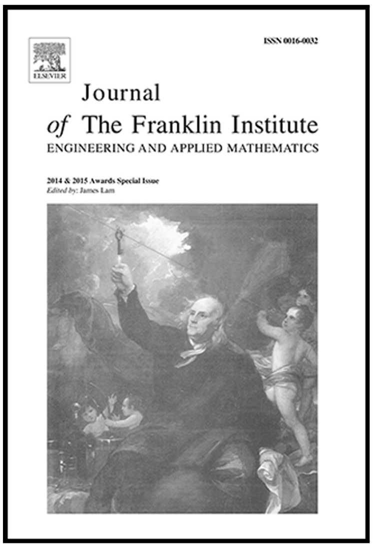

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Adaptive Finite-time Consensus of a Class of Disturbed Multi-agent Systems

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Abstract

In this paper, the finite-time exponential consensus problem is addressed for a class of multi-agent systems against some disturbed factors, which include system uncertainties, communication perturbations, and actuator faults. All disturbed factors are supposed to be influenced by internal and external effects of systems. The internal effects are described in terms of dependency on the system states, while the external actions are restricted by constant bounds. To obtain the information of the rate of dependency on the states and constant bounds, an adaptive mechanism is designed to estimate the rate and bounds. Based on these estimates, a distributed adaptive sliding mode controller is constructed to eliminate the effects of those disturbed factors. Then exponential consensus of the closed-loop adaptive multi-agent system is achieved within a finite time based on Lyapunov stability theory. The efficiency of the developed adaptive consensus control strategy is verified by a coupled system with four F-18 aircrafts of decoupled longitudinal model.

Keywords: Uncertain multi-agent systems; exponential consensus; finite-time control; actuator faults; perturbed communications.

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