Prescribed-time consensus for multi-agent systems using finite switching time-varying gain

Yinsheng Li[1], Bing Wang[1], and Yuquan Chen[1]

[1]Hohai University College of Energy and Electrical Engineering

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Abstract

In this paper, the prescribed-time consensus problem of multi-agent systems with finite control gain is investigated. A novel control Lyapunov function (CLF) framework for prescribed-time stability is developed by using the time space deformation approach. For both leaderless and leader-following prescribed-time consensus, new switching time-varying gain-based protocols are proposed, in which, the infinite time-varying control gain is turned off before the prescribed time and the global finiteness of control gain is thus guaranteed. It is mathematically proved that the agents equipped with the proposed protocols can achieve less conservative prescribed-time consensus in both leaderless cases and leader-following cases, on the basis of the developed CLF framework. The superiority of the proposed prescribed-time protocols in terms of consensus accuracy, control energy consumption, and control peak value is demonstrated through comparison simulations using illustrative examples.

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