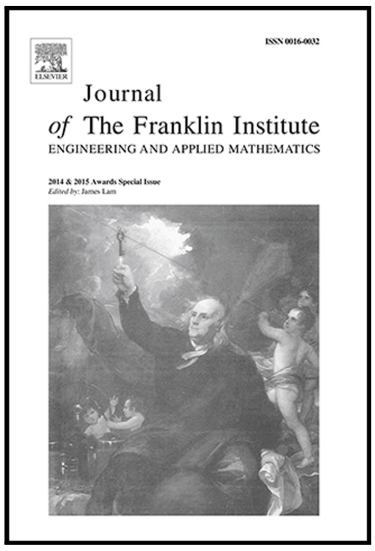

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Sliding-mode consensus algorithms for disturbed second-order multi-agent systems

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Abstract

In this paper, both leaderless and leader-follower consensus problems for a class of disturbed second-order multi-agent systems are studied. Based on integral sliding-mode control, sliding-mode consensus protocols are proposed for leaderless and leader-follower multi-agent systems with disturbances, respectively. Firstly, for leaderless second-order multi-agent systems, a sliding-mode consensus protocol is proposed to make the agents achieve asymptotic consensus. Secondly, for leader-follower second-order multi-agent systems, a finite-time sliding-mode consensus protocol is designed to make the agents achieve consensus in finite time. Both kinds of consensus protocols inherit the anti-disturbance performance and robustness of sliding-mode control and require less communication information. Finally, two numerical simulations are given for leaderless and leader-follower second-order multi-agent systems to validate the efficiency of the proposed consensus protocols.

Keywords: disturbed multi-agent systems, consensus, anti-disturbance control, sliding-mode control, finite-time control

1 Introduction

Since people presented the concept of multi-agent systems from the migration of birds, distributed cooperative control for multi-agent systems has attracted increasingly attention because of its better robustness, economy and flexibility compared with traditional centralized control. Multi-agent systems have wide applications [1–5] in practice such as unmanned air vehicles [1,2], formation control of multiple mobile robots [3,4] and so on.

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