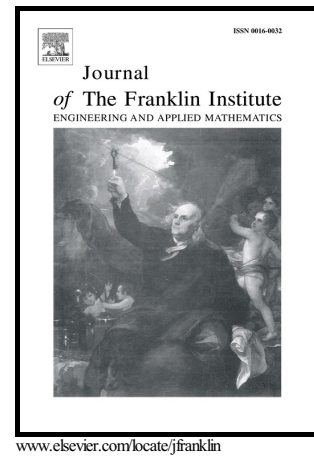


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Consensus of second-order multi-agent systems with nonlinear dynamics via edge-based distributed adaptive protocols

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Abstract: This paper investigates the distributed consensus problem of second-order multi-agent systems with nonlinear dynamics for both the cases leaderless and with a leader. First, based only on local information of the network structure, a new type of distributed adaptive consensus protocol is proposed, namely, the edge-based adaptive protocol which assigns a time-varying coupling weight to each edge in the communication. The coupling gains can be chosen randomly in the protocol and the consensus of second-order multi-agent systems can be reached without satisfying any additional conditions. Moreover, the leader-follower consensus problem in multi-agent systems with updated control gains is studied. To remove the limitation of coupling gains, a fully distributed adaptive protocol is designed. Under the proposed protocol, the leader-follower consensus can be also achieved without satisfying any additional conditions. Finally, two examples are presented to illustrate the theoretical analysis.

Key words: Second-order consensus; Adaptive control; Multi-agent systems; Leader-follower consensus

1 Introduction

In the past decades, distributed cooperative control for multi-agent systems has received significant research from various scientific communities, such as mathematics, physics, biology, engineering, and the systems and control community. It has broad applications in many areas including rendezvous [1,2], formation control [3–5],

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