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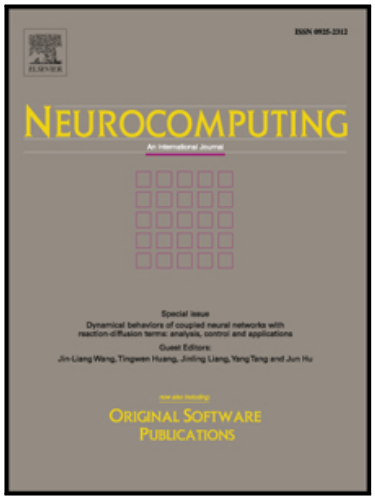

Group tracking control of second-order multi-agent systems with fixed and Markovian switching topologies

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Group tracking control of second-order multi-agent systems with fixed and Markovian switching topologies

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Abstract: This paper studies the group consensus tracking issues of discrete time second-order multi-agent systems (MASs) with directed fixed and Markovian switching topologies, respectively. For MASs with m leaders, we first introduce a method to divide the whole MASs into m subgroups. Based on the subgroup-divided method, the condensation directed graph $\mathbb{G}$ of the communication topology of the whole MASs becomes a directed acyclic graph (DAG). Then, for MASs with fixed/Markovian switching topology, some sufficient/necessary and sufficient group consensus tracking criteria are established. Finally, simulation examples are given to illustrate the effectiveness of our results.

Keywords: Multi-agent systems (MASs);subgroup-divided method; group tracking; Markovian switching topologies

1 Introduction

In the past decades, the collective behaviours of autonomous individuals have received more and more researchers' attention from many fields, such as physics, biology and engineering. MAS has become a representative that is used to describe and analyse complex interconnecting behaviours among individuals. Consensus has become a fundamental and important problem, where appropriate protocols and algorithms are to be designed such that a group of agents can converge to a consistent value [1–5]. Finite-time consensus [6–8], tracking control [9], group consensus [10], etc. can be regarded as generalized subjects from consensus and received more attention.

In practical engineering application, the whole MASs often need to be divided into two or more subgroups due to the assignment of different tasks, geographical location and so

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