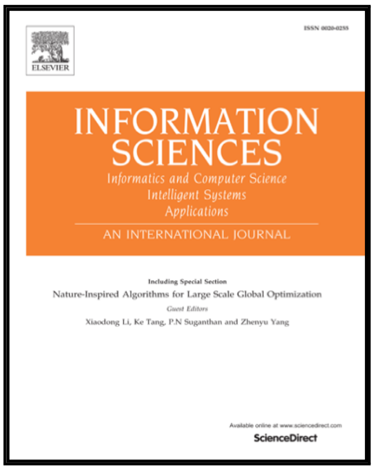

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Finite-time distributed event-triggered consensus control for multi-agent systems

Huaipin Zhang* Dong Yue† Xiuxia Yin‡ Songlin Hu§ Chun xia Dou¶

Abstract

In this paper, we study the finite-time distributed event-triggered consensus control for multi-agent systems. The controllers and the events are designed in a distributed manner, based only on local information. Compared with conventional asymptotic consensus, finite time consensus can reach consensus faster and have better disturbance rejection properties. Thus we propose a new nonlinear distributed control protocol to achieve finite-time consensus. Moreover, in order to realize the consensus control for multi-agent systems, only the communication between the agent and its local neighbours is needed, therefore,the designed control is essentially distributed. Two sufficient conditions are proposed to reach finite-time consensus for multi-agent systems with fixed and switching network topologies, respectively. Finally, two simulation examples are presented to demonstrate the effectiveness of the theoretical results.

Key words: event-triggered control, finite-time consensus, distributed control, multi-agent systems

1 Introduction

Recent years, we have witnessed great and growing interests in coordination problems of multi-agent systems among researchers from various disciplines [5, 8, 23, 32, 36, 44]. As a fundamental of distributed coordination control, consensus problems which refer to the group behaviors that all agents asymptotically reach a certain common agreement through a local distributed protocol have been widely studied. This is partly due to their broad applications in many areas including cooperative control of unmanned aerial vehicle [28, 45], formation control [13, 33], flocking of social insects [19, 31], swarm-based computing [15, 25], etc.

With the further study of consensus problems, we realize that consensus state and convergence speed are greatly crucial for the consensus of multi-agent systems. They indicate that where the multiple dynamic agents can reach and how quickly they reach, respectively. Many researchers have endeavored to study and to increase the convergence rate by enlarging the coupling strength, optimizing communication weights, and designing optimal network topology [6, 9, 18, 20, 34, 35]. [18, 20] studied ultrafast consensus problem in small-world networks. They founded that the second smallest eigenvalue of the graph Laplacian can qualified the convergence rate of the

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