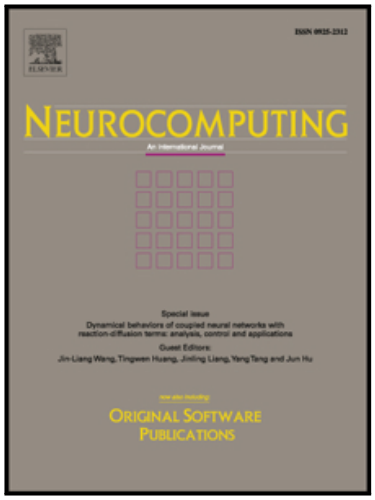
Communicated by: Prof. Y. Liu

Accepted Manuscript



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PII: S0925-2312(17)30698-7
DOI: 10.1016/j.neucom.2017.04.028
Reference: NEUCOM 18361

To appear in: *Neurocomputing*

Received date: 24 October 2016
Revised date: 25 February 2017
Accepted date: 12 April 2017

Please cite this article as: Wei Wang, Chi Huang, Jinde Cao, Fuad E. Alsaadi, Event-triggered Control for Sampled-data Cluster Formation of Multi-agent Systems, *Neurocomputing* (2017), doi: 10.1016/j.neucom.2017.04.028

Event-triggered Control for Sampled-data Cluster Formation of Multi-agent Systems

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Abstract

The sampled-data cluster formation is proposed and considered for nonlinear multi-agent systems. The cluster formation problem, which is try to make all the agents divided into separated groups and each of the group realize distinct complement formation. Formation control protocol is constructed based on the event-triggered sampled-data method. Since the event condition for each agent is designed by using its own sampling information and latest transmitted information of it's neighbors, the event condition can be intermittently examined at constant sampling instants. A sufficient condition is given to solve the cluster formation problem both for fixed and switching topology. Finally, the effectiveness of the control mechanism are demonstrated by numerical examples.

Keywords: cluster formation, multi-agent system, event-triggered sampling

1. Introduction

In the past decades, cooperative control of multi-agent systems [1–3] has attracted increasing attention from many research and application fields, such as mathematics, social science, physics and biology. Cooperative control of multi-agent systems aim to motivate the system to realize prescribed collective behaviors by design a control mechanism for each agent. Formation [4, 5] is one of the most important and fundamental issue in the research of multi-agent systems, the objective of which is to design distributed controllers for the multi-agent systems such that agents form and maintain pre-specified relative positions and orientations with each other.

Recently, formation control has been investigated as an important topic due to its widely applications to unmanned aerial vehicles [6, 7], autonomous underwater vehicles [8, 9], multi-robot systems [10, 11], and so on. Several control methods have been applied in the existing literatures, such as leader-follower approaches [12–14], behavioral methods [10], and virtual structure approaches [7]. There are many studies of formation both for first-order and high-order schemes for linear systems. Liu et al. [15] studied finite-time formation for linear first-order system. Time-varying formation control for first-order and time-varying output formation control for high-order linear swarm systems have be studied in [16] and [17], respectively. Zhang et al. provided a necessary and sufficient

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