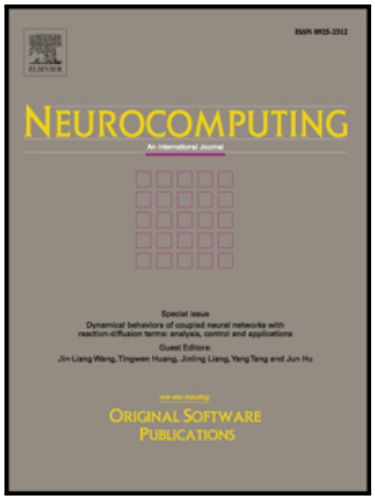
Communicated by Prof. Zidong Wang

Accepted Manuscript



A modified distributed optimization method for both continuous-time and discrete-time multi-agent systems

Dong Wang, Dong Wang, Wei Wang, Yurong Liu, Fuad E. Alsaadi

PII: S0925-2312(17)31511-4
DOI: 10.1016/j.neucom.2017.09.016
Reference: NEUCOM 18874

To appear in: *Neurocomputing*

Received date: 16 July 2017
Revised date: 5 September 2017
Accepted date: 5 September 2017

Please cite this article as: Dong Wang, Dong Wang, Wei Wang, Yurong Liu, Fuad E. Alsaadi, A modified distributed optimization method for both continuous-time and discrete-time multi-agent systems, *Neurocomputing* (2017), doi: 10.1016/j.neucom.2017.09.016

A modified distributed optimization method for both continuous-time and discrete-time multi-agent systems

Dong Wang*[a], Dong Wang[a], Wei Wang[a], Yurong Liu[b,c], Fuad E. Alsaadi[c]

[a]*School of Control Science and Engineering, Dalian University of Technology, Dalian 116024, P. R. China;*
[b]*Department of Mathematics, Yangzhou University, Yangzhou, P. R. China;*
[c]*Communication Systems and Networks (CSN) Research Group, Faculty of Engineering, King Abdulaziz University, Jeddah, Saudi Arabia.*
**Corresponding author. Email:dwang@dlut.edu.cn*

Abstract

This paper discusses the distributed optimization problem for the continuous-time and discrete-time multi-agent systems. For such a problem, each agent possesses a local convex cost function only known by itself and all the agents converge to the optimizer of the sum of the local cost function through estimating the optimal states of the local cost function and exchanging states information between agents. Sufficient conditions for convergence to the optimizer of the continuous-time and discrete-time algorithms are provided by making use of the Lyapunov method. We also obtain the least convergence rate for the modified algorithm. Moreover, numerical simulations are supplied to testify the results we present.

Keywords: Multi-agent systems; Cost function; Convex optimization; Convergence rate; Lyapunov method.

1. Introduction

Distributed coordination problem for multi-agent systems has drew much attention because of its wide application in consensus [1, 2, 3], tracking [4, 5, 6], containment [7, 8, 9], formation control [10, 11] and neural network [12, 13]. Optimization problem is also a hot spot which researchers have concentrated on for a long time. It is natural to combine the above two problems and the distributed optimization problem is proposed. It is generally formulated as follows. Each agent possesses a local cost function