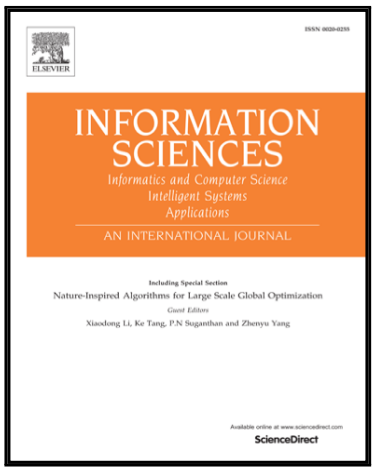

Robust Adaptive Hierarchical Insensitive Tracking Control of a Class of Leader-Follower Agents

Xiao-Zheng Jin, Shao-Fan Wang, Guang-Hong Yang, Dan Ye

PII: S0020-0255(17)30697-7
DOI: 10.1016/j.ins.2017.04.036
Reference: INS 12857

To appear in: *Information Sciences*

Received date: 18 July 2016
Revised date: 17 April 2017
Accepted date: 22 April 2017

Please cite this article as: Xiao-Zheng Jin, Shao-Fan Wang, Guang-Hong Yang, Dan Ye, Robust Adaptive Hierarchical Insensitive Tracking Control of a Class of Leader-Follower Agents, *Information Sciences* (2017), doi: 10.1016/j.ins.2017.04.036

Robust Adaptive Hierarchical Insensitive Tracking Control of a Class of Leader-Follower Agents

Xiao-Zheng Jin [*], Shao-Fan Wang [†], Guang-Hong Yang [‡] and Dan Ye [§]

Abstract

In this paper, the hierarchical insensitive tracking control problem is addressed for a class of uncertain leader-follower agents with disturbed networks and controller multiplicative coefficient variations. With a uniform coupling strength, the agents are supported to be coupled in a multi-layer network structure. Based on the structure, an adaptive compensation control strategy is constructed to ensure that the follower agents track the leader agent. Depending on the control strategy, the relationship among bounds of tracking errors, sizes of network disturbances and uncertainties of agents and controllers, as well as coupling strength is explicitly explored. On the basis of Lyapunov stability theory, it is shown that bounded tracking of the resulting adaptive networked agents can be reached, and tracking errors can be reduced as small as desired. The effectiveness of the proposed design is illustrated via a decoupled model of F-18 aircraft.

Keywords: Leader-follower agents, hierarchical insensitive tracking, adaptive control, disturbed networks, uncertainties.

1 Introduction

Tracking is a basic property of most of practical systems. In many kinds of networked large-scale systems, consensus of multi-agent systems, formation of leader-follower agents, synchronization of complex networks, and flocking and swarming in groups of agents can be considered as tracking-type behaviors. Under the role of networks in these systems, the tracking performance has been deeply influenced by some characteristic of networks such as topology structure and network coupling strength.

With the related researches about networks in the area of complex networks and multi-agent systems, it has been confirmed that topology structure plays a paramount role in

[*]Xiao-Zheng Jin is with the School of Electrical Engineering and Automation, HeFei University of Technology, HeFei, AnHui 230009, P. R. China. Corresponding author: jin445118@163.com

[†]Shao-Fan Wang is with the School of Electrical Engineering and Automation, HeFei University of Technology, HeFei, AnHui 230009, P. R. China. sfanwang@163.com

[‡]Guang-Hong Yang is with the College of Information Science and Engineering, Northeastern University, Shenyang, Liaoning, 110004, P. R. China. yangguanghong@ise.neu.edu.cn

[§]Dan Ye is with the College of Information Science and Engineering, Northeastern University, Shenyang, Liaoning, 110004, P. R. China. yedan@ise.neu.edu.cn