

Accepted Manuscript

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PII: S0020-0255(18)30630-3
DOI: <https://doi.org/10.1016/j.ins.2018.08.025>
Reference: INS 13869



To appear in: *Information Sciences*

Received date: 16 May 2018
Revised date: 5 July 2018
Accepted date: 8 August 2018

Please cite this article as: Fuyi Qu , Shaocheng Tong , Yongming Li , Observer-Based Adaptive Fuzzy Output Constrained Control for Uncertain Nonlinear Multi-Agent Systems#, *Information Sciences* (2018), doi: <https://doi.org/10.1016/j.ins.2018.08.025>

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Observer-Based Adaptive Fuzzy Output Constrained Control for Uncertain Nonlinear Multi-Agent Systems*

Fuyi Qu, Shaocheng Tong* and Yongming Li

College of Science, Liaoning University of Technology,

Jinzhou, Liaoning, 121001, P. R. China

Abstract: In this paper, consensus control problem is studied for uncertain nonlinear multi-agent systems with output constraint. Fuzzy logic systems (FLSs) and fuzzy state observer are employed to approximate unknown nonlinear functions and estimate unmeasured states, respectively. Barrier Lyapunov Function (BLF) is introduced to handle with the problem of output constraint. By combining adaptive backstepping and dynamic surface control (DSC) technique, a distributed adaptive fuzzy output feedback control scheme is proposed. It is proved that the semi-globally uniformly ultimately boundedness (SGUUB) of all the signals in the closed-loop can be guaranteed and all followers' outputs can be well synchronized to the leader's output while maintaining consensus tracking errors to be bounded. The simulation example is provided to show the effectiveness of the presented control method.

Keywords: Fuzzy adaptive control, nonlinear multi-agent systems, fuzzy state observer, output constrained, dynamics surface control

1. Introduction

Consensus is one of the basic problems in the cooperative control of multi-agent systems (MASs), which contains multiple followers and one leader. There exists an active leader or a virtual leader, who only provides command to a small portion of the followers. Its aim is to make

*This work was supported in part by the National Natural Science Foundation of China under Grant 61773188.

†Corresponding author. Tel.: +86-416-4198002; Fax: +86-416-4199415. E-mail: jztongsc@163.com.

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