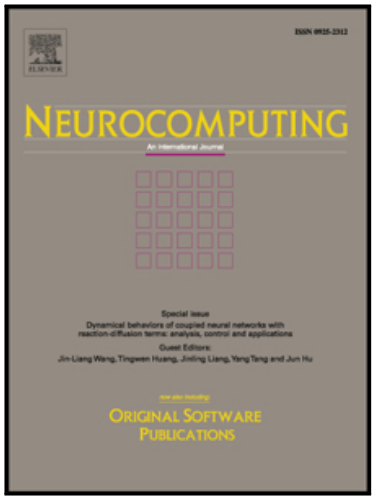
Communicated by Hongli Dong

Accepted Manuscript



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PII: S0925-2312(17)31161-X
DOI: 10.1016/j.neucom.2017.06.033
Reference: NEUCOM 18632

To appear in: *Neurocomputing*

Received date: 6 March 2017
Revised date: 6 May 2017
Accepted date: 9 June 2017

Please cite this article as: Yan Liu, Guang-Hong Yang, Xiao-Jian Li, Event-triggered fault detection observer design for affine fuzzy systems, *Neurocomputing* (2017), doi: 10.1016/j.neucom.2017.06.033

Event-triggered fault detection observer design for affine fuzzy systems

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Abstract

This paper is concerned with the event-based fault detection observer design problem for a class of discrete-time nonlinear networked control systems with output saturation. The system is represented by the T-S affine fuzzy models, and it is assumed that the premise variables of these models are not necessarily measurable. Different from the existing results, an adaptive event-triggered mechanism is introduced to reduce the burden of communication by judging whether the measured data should be transmitted. Based on the piecewise Lyapunov function and free-weighting matrices technique, the design conditions are given in terms of linear matrix inequalities, which can ensure the residual is sensitive to faults. Finally, a numerical example verifies the validity of the proposed method.

Keywords: Affine fuzzy systems, adaptive event-triggered scheme, fault detection observer, piecewise Lyapunov function.

1. Introduction

In practical engineering plants, due to the development of advanced techniques and increasing complexity of the industrial processes, control systems are often expected with high reliability and safety. Therefore, fault detection (FD)[1]-[3] and fault-tolerant control [4]-[6], which are considered as effective methods to improve the reliability of the control systems, have been widely researched in the last few decades. As a result, a large body of FD approaches have emerged in the existing literature, such as [7]-[11]. Among the existing FD methods, the observer/filter-based approach is accepted as an useful one. By defining a residual evaluation function and comparing it with a predefined threshold, this method can effectively detect the fault signals and successfully

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