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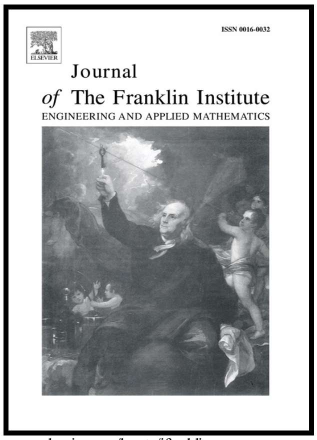

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PII: S0016-0032(15)30153-8
DOI: http://dx.doi.org/10.1016/j.jfranklin.2016.02.020
Reference: FI2550

To appear in: *Journal of the Franklin Institute*

Received date: 17 July 2015
Revised date: 11 December 2015
Accepted date: 1 February 2016

Cite this article as: Guoliang Chen, Jianwei Xia and Guangming Zhuang, Delay dependent stability and dissipativity analysis of generalized neural networks wit Markovian jump parameters and two delay components, *Journal of the Frankli Institute,* http://dx.doi.org/10.1016/j.jfranklin.2016.02.020

Delay-dependent stability and dissipativity analysis of generalized neural networks with Markovian jump parameters and two delay components ¶

Guoliang Chen* Jianwei Xia† Guangming Zhuang‡

Abstract

This paper focuses on the problem of delay-dependent stability and dissipativity analysis of generalized neural networks(GNNs) with Markovian jump parameters and two delay components. By constructing novel augmented Lyapunov-Krasovskii functional(LKF), using free-matrix-based inequality to estimate the derivative of Lyapunov function and employing the reciprocally convex approach to consider the relationship between the time-varying delay and its interval, some improved delay-dependent stability criteria and dissipativity criteria are established in terms of linear matrix inequalities. Moreover, the obtained criteria is extended to analyze the stability analysis of GNNs with two delay components and the passivity analysis of GNNs with one delay. Numerical examples are given to show the effectiveness and the significant improvement of the proposed methods.

Keywords: generalized neural networks, stability, dissipativity, Markovian jump parameters, free-matrix-based inequality, time delays

1 Introduction

The problem of neural networks has been widely investigated in the last decades due to their potential applications in many areas such as pattern recognition, static image processing, associative memory and combinatorial optimization, and so on [1, 2]. Meanwhile, as a class of hybrid systems, the Markovian jump systems provide a efficient way to model some practical systems. A great deal of practical systems with random changes, sudden out disturbances and the related internal system response can be efficiently transformed into a set of linear systems by a Markovian chain in a finite mode set. Therefore, lots of work on Markovian jump systems has been reported in literature [3–9]. Consequently, the practical and real neural networks with Markovian jump parameters differ from the typical ones, because it introduces random variations into the models and makes the neural networks' study more sense, much effort has been made to investigate the neural networks with Markovian jump parameters in recent years [10–16].

On the other hand, it has been well known that time delays are inevitable encountered in many practical systems and usually the main reason resulting in some complex dynamic behaviors such as oscillation, divergence, and even instability in practical systems. How to get less conservative results with maximum admissible upper bound of the time delay is the main target for delayed systems, and many efficient technique has been reported in the past few years. Generally, the technique can be classified into two types: one

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