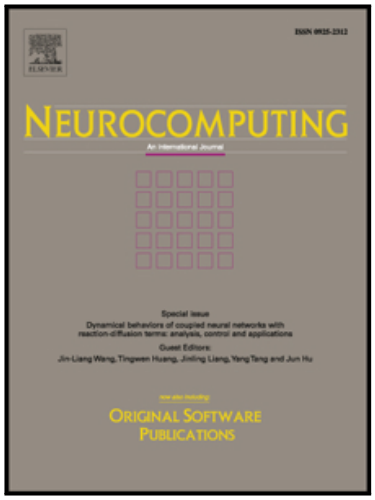
Communicated by Prof. Y. Liu

Accepted Manuscript



Exponential synchronization of stochastic time-delayed memristor-based neural networks via distributed impulsive control

Bo Zhang, Feiqi Deng, Shengli Xie, Shixian Luo

PII: S0925-2312(18)30076-6
DOI: 10.1016/j.neucom.2018.01.051
Reference: NEUCOM 19253

To appear in: *Neurocomputing*

Received date: 1 August 2017
Revised date: 9 November 2017
Accepted date: 19 January 2018

Please cite this article as: Bo Zhang, Feiqi Deng, Shengli Xie, Shixian Luo, Exponential synchronization of stochastic time-delayed memristor-based neural networks via distributed impulsive control, *Neurocomputing* (2018), doi: 10.1016/j.neucom.2018.01.051

Exponential synchronization of stochastic time-delayed memristor-based neural networks via distributed impulsive control

Bo Zhang[a], Feiqi Deng[b,*], Shengli Xie[a,**], Shixian Luo[b]

[a]*School of Automation, Guangdong University of Technology, and Guangdong Key Laboratory of IoT Information Technology, Guangzhou 510006, China*
[b]*Systems Engineering Institute, South China University of Technology, Guangzhou 510640, China*

Abstract

The issue of exponential synchronization of stochastic time-delayed memristor-based neural networks via distributed impulsive control is considered. Based on the characteristics of memristor, the corresponding drive and response stochastic memristor-based neural networks with distributed impulsive control input are established. Then the synchronization error system is gained by using the concept of synchronization and stochastic differential inclusion theory. Through the generalized impulsive delay differential inequality technique, the criteria to guarantee that the error system is exponentially mean square stable, namely that the drive and response systems achieve the exponential synchronization is acquired. At last, the numerical simulation verifies the effectiveness of the obtained theoretical results.

Keywords: Stochastic memristor-based neural networks; Distributed impulsive control; Differential inclusion

1. Introduction

The memristor, which was postulated as the fourth fundamental circuit element according to symmetry principle, was proposed for the first time by Chua in 1971 [1], and the other three are resistor, capacitor and inductor respectively. Then Chua further presented the concept of memristive system in 1976 [2], but there had been few breakthroughs about the research of memristor since then. Until a practical memristor device depending upon TiO_2 thin films was implemented by Hewlett-Packard Labs [3], the investigation about memristor had caught much attention. Due to the special properties of memristor, it has a lot of potential applications in many fields, such as artificial intelligence computer [4], new memory [5–7], secure communication [8–11], analog circuit [12, 13], etc. In addition, memristors are also used in artificial neural networks to act as synapses to simulate the human brain [14, 15].

*Corresponding author.
**Corresponding author.
Email addresses: acd5fg@aliyun.com (Bo Zhang), aufqdeng@scut.edu.cn (Feiqi Deng), shlxie@gdut.edu.cn (Shengli Xie), shixianluo@126.com (Shixian Luo)