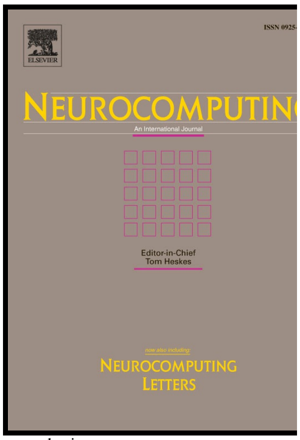

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PII: S0925-2312(15)01315-6
DOI: http://dx.doi.org/10.1016/j.neucom.2015.08.088
Reference: NEUCOM16075

To appear in: *Neurocomputing*

Received date: 4 May 2015
Revised date: 7 July 2015
Accepted date: 31 August 2015

Impulsive controller design for exponential synchronization of delayed stochastic memristor-based recurrent neural networks [1]

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Abstract: In this paper, impulsive synchronization of stochastic memristor-based recurrent neural networks with time delay is studied. One can find that the memristive connection weights have a certain relationship with the stability of the system. Based on the drive-response concept, the stochastic differential inclusions theory and the Lyapunov functional method with the impulsive delay differential inequality technique was established to guarantee the impulsive synchronization of memristor-based recurrent neural networks with stochastic effects. The obtained sufficient conditions can be checked easily by Linear Matrix inequalities (LMI) Control Toolbox in MATLAB. Finally, a numerical example is given to illustrate the effectiveness of the theoretical results.

Keywords: Memristor, Stochastic neural networks, Time delays, Exponential Synchronization, Impulsive control.

1 Introduction

In electromagnetism or circuit theory one learns that there are three fundamental circuit elements, namely the capacitor (first realized in 1745), the resistor (1828) and the coil (1831) and the fourth element is called the memristor. When Maxwell declared his well-known and enormously authoritative equations some decades later, it became understandable these three elements were direct consequences of this theory that unifies electricity and magnetism. However, in 1971 a infantile circuit theorist, Chua argued from hypothetical justification that there should be also a fourth circuit element that was equally fundamental as the other three [1]. He gave this element the name memristor since it, under certain conditions, acts as a resistor with memory, i.e. the resistance is dependent on the physical history. In the years following Chua's work, the memristor concept was left quite alone until the birth of nanotechnology some years ago when a group at the Hewlett-Packard (HP) lab managed to construct a physical component acting as a memristor [2, 3]. However, the existing memristive neural networks which many researchers had constructed have been found to be computationally restrictive. In this circumstances, the applicability of these memrisive neural networks in this area have only limited success, which motivates our present study.

Time-delay systems are frequently encountered in neural networks, where a time delay is often a source of instability and oscillations. In implementations of artificial neural networks, time delays are

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