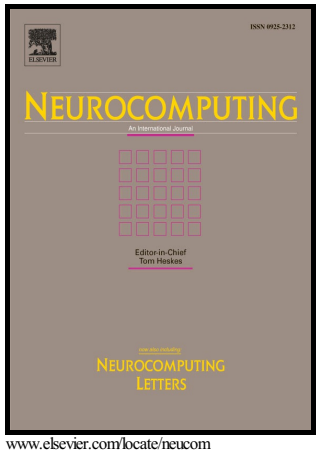

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New global asymptotic stability of discrete-time recurrent neural networks with multiple time-varying delays in the leakage term and impulsive effects*

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Abstract

This paper investigates the problem of discrete-time stochastic recurrent neural networks with multiple time-varying delays in the leakage terms and impulses. A new set of sufficient conditions are obtained by constructing an appropriate Lyapunov-Krasovskii functional combining with linear matrix inequality technique and free weighting matrix method. The obtained delay-dependent stability conditions are expressed in terms of linear matrix inequalities and it can be solved via some available software packages. Up to now, the asymptotic stability problem is studied for discrete-delay in the leakage terms. For the first time in our paper, we have considered distributed delays and impulses for such kind of networks. In addition, we have provided a numerical example to demonstrate the effectiveness of our obtained stability results for the theoretical section.

Keywords. *Leakage delay, asymptotic stability, recurrent neural network, delay-dependent, linear matrix inequality, impulse, time-varying delay.*

1 Introduction

In the past few years, the stability issues of recurrent neural networks (RNNs) has been extensively studied due to their wide applications in a variety of areas including such as pattern recognition, associative memory and combinational optimization and fixed point computations (see, e.g. Mandic & Chambers, 2001;Cao & Wang, 2003, 2004, 2005; Yu, 2004; Liu et al., 2006 and the references therein). Hence the dynamical behaviors (e.g. stability, instability, periodic oscillatory and chaos) of the neural networks are known to be crucial in such applications. Neural networks are often classified into two categories that is continuous-time and discrete-time. Recently, there have been many nice works on the continuous-time neural networks (Liu et al. 2006, Sami et al. 2009, Wang et al. 2005 and

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