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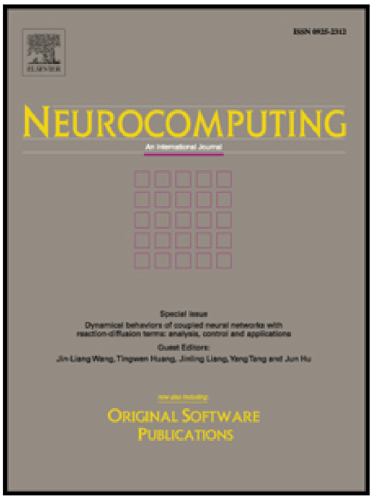

Global asymptotic stability of impulsive fractional-order complex-valued neural networks with time delay

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Global asymptotic stability of impulsive fractional-order complex-valued neural networks with time delay

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Abstract

In this paper, global asymptotic stability of impulsive fractional-order complex-valued neural networks with time delay is considered. By employing contraction mapping principle, comparison theorem and inequality scaling skills, several sufficient conditions to ensure the existence, uniqueness and global asymptotic stability of the equilibrium point for the considered neural networks are established. A numerical example illustrates the validity and feasibility of the obtained result.

Keywords: Fractional-order complex-valued neural networks; Equilibrium point; Impulsive effects; Global asymptotic stability

I. Introduction

The development history of the theory of fractional calculus has more than three hundred years [1]. As an extension of the integer-order calculus, the fractional calculus has its unique advantages, such as merits of memory and hereditary properties [2]. Since practical problems are described more accurately by fractional-order derivatives than integer-order derivatives, so that they are valuable in various fields of science and engineering [3]. In the past decades, stability analysis of various classes of neural networks has been extensively investigated since they have been successfully applied to some practical engineering problems such as signal processing, pattern classification, associative memory design and control and optimization. Recently, several integer-order calculus systems such as neural networks, stochastic nonlinear systems, systems with linear equality constraints, discrete time-varying systems have been investigated [4]- [14]. Some researchers applied fractional calculus on neural networks and put forward fractional-order neural networks (FNNs) [15]. Many results about dynamic behaviors of FNNs have been discussed, such as stability analysis, synchronization analysis, chaos and hyperchaos, for example, see [16]- [24], and the references therein.

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