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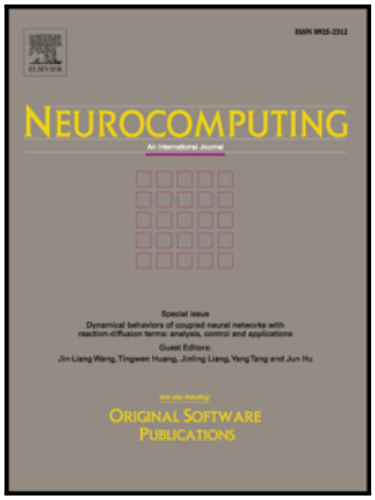

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Global mean square exponential stability of stochastic neural networks with retarded and advanced argument

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Abstract

This paper focuses on the global mean square exponential stability of stochastic neural networks with retarded and advanced argument. By employing the theory of differential equations with piecewise constant argument of generalized type, several sufficient conditions in form of algebraic inequalities are proposed to ensure the existence and uniqueness of solution. Considering that the piecewise alternately retarded and advanced argument exists, we estimate dynamic effect of system status in the current time and in the deviating function. Theoretical analysis of global mean square exponential stability is carried out by the stability theory of stochastic differential equations. Finally, numerical examples are exploited to illustrate the effectiveness of the results established.

Keywords: Stochastic neural networks; Retarded and advanced argument; Mean square exponential stability

1. Introduction

In the past decades, neural networks have received much attention for their immense applications in various areas such as pattern classification, associative memory, image processing, optimization and signal processing, and so forth. Such extensive applications are almost based on dynamical properties of neural networks in theory. Therefore, the theoretical investigation about neural networks is important. Some excellent results about dynamical behaviors for different kinds neural networks have already been reported in [1-13].

Nonlinear control systems with retarded and advanced argument, which combine the properties of both continuous and discrete systems, represent a kind of hybrid dynamical systems [14-26]. Actually, in real life, the current decisions or present behaviors always rely heavily on the past and future messages, for example, economic systems, expert systems and biological systems. Such past and future messages can be modeled as a general piecewise alternately retarded and advanced argument. From the nonlinear dynamic point of view, complex system with retarded and advanced argument indicates that a differential-difference system shares a mixed dynamical behavior, which is induced by deviating function [22]. Many different dynamics properties have been drafted. Akhmet et al. [18-20] establish stability criteria for neural network system with retarded and advanced argument by the second Lyapunov method. Furthermore, Bao et al. [21] investigate the problem of robust stability for interval fuzzy Cohen-Grossberg neural networks with retarded and advanced argument. In [22], output convergence of fuzzy neurodynamic system with retarded and advanced argument is analyzed and its application in analog associative memory is examined. Whereas, control systems

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