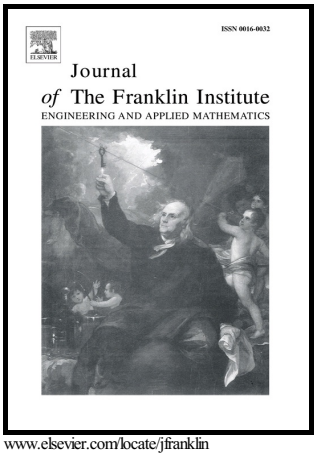

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Asymptotic synchronization for stochastic memristor-based neural networks with noise disturbance

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Abstract: In this paper, globally asymptotical synchronization for stochastic memristor-based neural networks with random noise disturbance is investigated. Under the framework of differential inclusions theory and set-valued maps, a state feedback controller and an adaptive updated law are designed by constructing a suitable Lyapunov functional. By using itô formula and some significant inequality techniques, sufficient conditions for the global synchronization of the stochastic memristor-based neural networks which are more general are obtained. Finally, numerical simulations are provided to illustrate the theoretical results.

Keywords: Memristor, global synchronization, noise disturbance, stochastic neural networks.

1 Introduction

In 1971, Chua firstly introduced the memristor as the fourth ideal electrical circuit element besides the resistor, capacitor and inductor to describe the relationship between electric charge and magnetic flux in [1]. Until 2008, the Hewlett-Packard research team [2] successfully obtained a practical memristor device. Because the memristor has many distinct properties, such as nanoscale, low energe dissipation and the memory ability, increasing research from different branches of science and application fields pay more attention to memristor. It has been shown that memristors can be proposed to work as synaptic weights in artificial neural networks in [3]. Due to these properties, memristor can replace resistor to model a new neural network that is memristor-based neural networks (MNNs) which simulate the human brain [4]. The studies of MNNs would benefit many practical applications such as neural learning circuits [5], associative memories [6], new classes of artificial neural systems [7], and so on.

Recently, synchronization or anti-synchronization of memristor-based neural networks have received great attention because of their potential applications such as secure communication, information science and biological technology [8]. But the networks are not always able to synchronize by themselves. Then, various effective control