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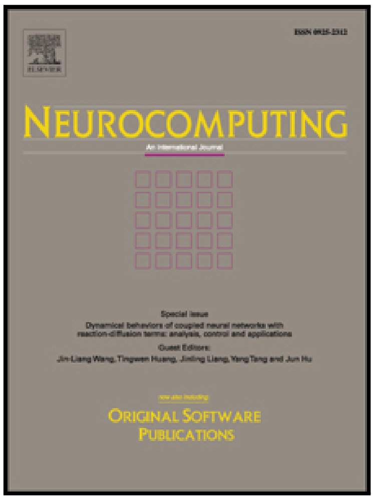

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Global asymptotic synchronization of nonidentical fractional-order neural networks

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Abstract

This paper investigates the global asymptotic synchronization problem of nonidentical fractional-order neural networks with Riemann-Liouville derivative. Firstly, by utilizing the properties of fractional calculus and fractional Lyapunov direct method, the novel properties about the fractional calculus and the asymptotic stability theorem of reducing the conservatism for the non-autonomous fractional-order system with Riemann-Liouville derivative are proposed. Furthermore, a neoteric feedback controller is presented to guarantee the global asymptotic synchronization of nonidentical fractional-order neural networks. Via using the proposed the asymptotic stability theorem and matrix inequality techniques, sufficient conditions for global asymptotic synchronization of fractional-order neural networks are presented. Finally, numerical examples are used to demonstrate the effectiveness of the proposed synchronization control scheme for nonidentical fractional-order neural networks.

Key words: Global synchronization; Fractional-order systems; Asymptotic stability; Fractional-order neural networks.

1 Introduction

Due to the rapid development of computer technology, not only the application of integer-order calculus has been extensively studied in [1-6] , but also fractional calculus has been widely applied in many fields, such as viscoelasticity [7], engineering [8], fluid mechanics [9], bioengineering [10], mathematics [11] etc. Compared with the integer-order differential, fractional-order differential shows the characteristic of memory that plays an important role in neural networks. Thereupon, the fractional-oredr differential can describe the materials or processes with memory property in neural networks better than integer-order differential. In particular, literature [12], first put forward chaos synchronization and proposed an approach to synchronize two identical chaotic systems with different initial conditions in 1990.

Recently, fractional-order neural networks (FNNs) have attracted the attention of many researchers. For instance, in [13-17], stability analysis of fractional-order systems was discussed. In [18], nonlinear dynamics and chaos in FNNs were considered. And in [19-23], the Mittag-Leffler stability of the FNNs was explored. Meanwhile, synchronization of two identical fractional-order systems be also attracted a large number of researchers attention. For example, in [24], quasi-uniform synchronization of fractional-order memristor-based neural networks with delay was studied. In [25], synchronizing chaotic systems using control based on a special matrix structure were discussed. Synchronization of two identical fractional-order chaotic systems was investigated by using linear error feedback control in [26]. In [27],

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