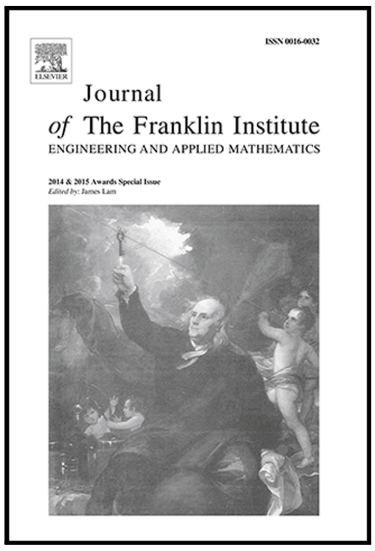

Robust synchronization of discontinuous Cohen-Grossberg neural networks: pinning control approach

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PII: S0016-0032(18)30378-8
DOI: 10.1016/j.jfranklin.2018.05.048
Reference: FI 3485

To appear in: *Journal of the Franklin Institute*

Received date: 13 August 2017
Revised date: 9 February 2018
Accepted date: 26 May 2018

Please cite this article as: Dongshu Wang, Lihong Huang, Robust synchronization of discontinuous Cohen-Grossberg neural networks: pinning control approach, *Journal of the Franklin Institute* (2018), doi: 10.1016/j.jfranklin.2018.05.048

Robust synchronization of discontinuous Cohen-Grossberg neural networks: pinning control approach [1] [2] [3]

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Abstract

In this issue, the robust synchronization for a class of uncertain Cohen-Grossberg neural networks is studied, in which neuron activations are modelled by discontinuous functions(or piecewise continuous functions). Pinning state-feedback and adaptive controllers are designed to achieve global robust exponential synchronization and global robust asymptotical synchronization of drive-response-based discontinuous Cohen-Grossberg neural networks. By applying the theory of non-smooth analysis theory and the method of generalized Lyapunov functional, some criteria are given to show that the coupled discontinuous Cohen-Grossberg neural networks with parameter uncertainties can realized global robust synchronization. Some examples and numerical simulations are also shown to verify the validity of the proposed results.

Keywords: Robust synchronization, Parameter uncertainty, Discontinuous neuron activation, Pinning state-feedback controller, Pinning adaptive controller.

1 Introduction

Cohen-Grossberg neural networks (CGNNs) have crucial application perspective in various fields since the pioneering work of Cohen and Grossberg in 1983 [1], such as parallel computation, pattern recognition, signal and image processing. These applications heavily rely on the stability and synchronization dynamical behaviors of CGNNs. So far, there are many works focusing on the problems of stability and synchronization of CGNNs [2-5]. Notably, those works are only discussing the CGNNs that the neuron activations are modelled by continuous, Lipschitz continuous, even to be smooth functions.

Discontinuous neural networks are very important in practice, particularly for neural networks with discontinuous neuron activations. In fact, discontinuous neuron activations are very important hypothesis for dealing with neural networks with very-high gains [6]. Recently, neural networks with discontinuous neuron activations, which has attracted much attention due to its crucial application perspective in a large number of interesting engineering tasks [7-9]. Up to now, many important and interesting synchronization dynamical behaviors of coupled discontinuous neural networks have been developed, such as quasi-synchronization [10], finite-time synchronization [11,12] and global exponential synchronization [13-18]. However, there are few works considered the synchronization of discontinuous CGNNs [19]. Note that, the problem of synchronization control for neural networks has been one of hot research issues since the pioneering work of Pecora and Carroll [20]. It has received great attention due to its potential applications, such as secure communication, biological systems and information science [21-25]. Hence, it is very interesting to study the synchronization of discontinuous CGNNs.

Moreover, it is worthy to point out that all those works about the synchronization of discontinuous neural networks have to add controllers to each neuron. Generally, it is too costly and impractical for dealing with large-scale discontinuous neural networks. Pinning control strategy, as an effective and

[1]This research was supported by the National Natural Science Foundation of China (11501221, 11771059), the Natural Science Foundation of Fujian Province (2015J01584), the Cultivation Program for Outstanding Young Scientific Talents of the Higher Education Institutions of Fujian Province in 2016, the Promotion Program for Young and Middle-aged Teacher in Science and Technology Research of Huaqiao University (ZQN-YX301, ZQN-PY401). Part of this work was conducted when the first author was visiting the Central South University, and the authors would like to thank Xianhua Tang (tangxh@mail.csu.edu.cn) for his some constructive comments.

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