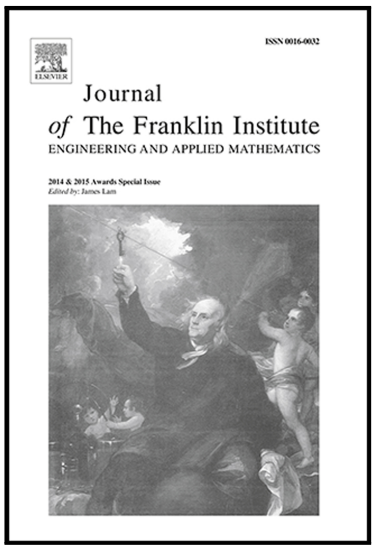


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PII: S0016-0032(17)30389-7
DOI: 10.1016/j.jfranklin.2017.08.016
Reference: FI 3099

To appear in: *Journal of the Franklin Institute*

Received date: 30 June 2016
Revised date: 13 June 2017
Accepted date: 3 August 2017

Please cite this article as: Xiwei Liu, Zhang Chen, Lingjun Zhou, Synchronization of coupled reaction-diffusion neural networks with hybrid coupling via aperiodically intermittent pinning control, *Journal of the Franklin Institute* (2017), doi: 10.1016/j.jfranklin.2017.08.016

# Synchronization of coupled reaction-diffusion neural networks with hybrid coupling via aperiodically intermittent pinning control

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**Abstract**

This paper investigates the complete synchronization for linearly coupled neural networks with time-varying delays and reaction-diffusion terms by using the aperiodically intermittent pinning control. The coupling matrix for the network can be asymmetric. Compared with state coupling in the synchronization literature, we design a novel distributed coupling protocol by using the reaction-diffusion coupling: spatial coupling, which can accelerate the synchronization process. This can be regarded as the main difference between this paper and previous works. Using the Lyapunov function and theories in the aperiodically intermittent control, we present some criteria for the complete synchronization with a static coupling strength. In this case, there is no constraint on the bound of time-varying delays, so it can be larger than the length of control span. On the other hand, we also consider the network with an adaptive coupling strength. In this case, the infimum of the control time span should be larger than the upper bound of time delay. Numerical simulations are given to show correctness of obtained results.

*Key words:* Synchronization, spatial coupling, time delays, aperiodic intermittent, reaction-diffusion

## 1. Introduction

Artificial neural networks and their applications ([1, 2]) have attracted many researches' interests, which are generally modelled by ordinary differential equations (ODEs). However, partial differential equations (PDEs) can describe real things or events more exactly. For example, when electrons are moving in asymmetric electromagnetic field, we cannot avoid the diffusion effect in neural networks (NNs); and in the chemical reactions, many complex patterns are generated by the reaction-diffusion

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