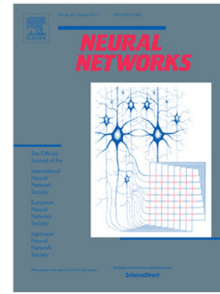


## Accepted Manuscript

Mittag-Leffler synchronization of fractional neural networks with time-varying delays and reaction–diffusion terms using impulsive and linear controllers

Ivanka Stamova, Gani Stamov



PII: S0893-6080(17)30199-5  
DOI: <http://dx.doi.org/10.1016/j.neunet.2017.08.009>  
Reference: NN 3808

To appear in: *Neural Networks*

Received date : 4 April 2017  
Revised date : 3 July 2017  
Accepted date : 25 August 2017

Please cite this article as: Stamova, I., Stamov, G., Mittag-Leffler synchronization of fractional neural networks with time-varying delays and reaction–diffusion terms using impulsive and linear controllers. *Neural Networks* (2017), <http://dx.doi.org/10.1016/j.neunet.2017.08.009>

This is a PDF file of an unedited manuscript that has been accepted for publication. As a service to our customers we are providing this early version of the manuscript. The manuscript will undergo copyediting, typesetting, and review of the resulting proof before it is published in its final form. Please note that during the production process errors may be discovered which could affect the content, and all legal disclaimers that apply to the journal pertain.

# Mittag-Leffler synchronization of fractional neural networks with time-varying delays and reaction-diffusion terms using impulsive and linear controllers

Ivanka Stamova<sup>a,\*</sup>, Gani Stamov<sup>b</sup>

<sup>a</sup>Department of Mathematics, University of Texas at San Antonio,  
San Antonio, Texas 78249, USA

<sup>b</sup>Department of Mathematics, Technical University of Sofia,  
8800 Sliven, Bulgaria

\*Corresponding author at: Department of Mathematics, University of Texas at San Antonio,  
San Antonio, Texas 78249, USA.  
E-mail: ivanka.stamova@utsa.edu

**Abstract.** In this paper, we propose a fractional-order neural network system with time-varying delays and reaction-diffusion terms. We first develop a new Mittag-Leffler synchronization strategy for the controlled nodes via impulsive controllers. Using the fractional Lyapunov method sufficient conditions are given. We also study the global Mittag-Leffler synchronization of two identical fractional impulsive reaction-diffusion neural networks using linear controllers, which was an open problem even for integer-order models. Since the Mittag-Leffler stability notion is a generalization of the exponential stability concept for fractional-order systems, our results extend and improve the exponential impulsive control theory of neural network system with time-varying delays and reaction-diffusion terms to the fractional-order case. The fractional-order derivatives allow us to model the long-term memory in the neural networks, and thus the present research provides with a conceptually straightforward mathematical representation of rather complex processes. Illustrative examples are presented to show the validity of the obtained results. We show that by means of appropriate impulsive controllers we can realize the stability goal and to control the qualitative behavior of the states. An image encryption scheme is extended using fractional derivatives.

**Keywords:** *Neural networks, Time delays, Reaction-diffusion terms, Impulsive control, Fractional derivatives, Mittag-Leffler synchronization*

Download English Version:

<https://daneshyari.com/en/article/4946558>

Download Persian Version:

<https://daneshyari.com/article/4946558>

[Daneshyari.com](https://daneshyari.com)