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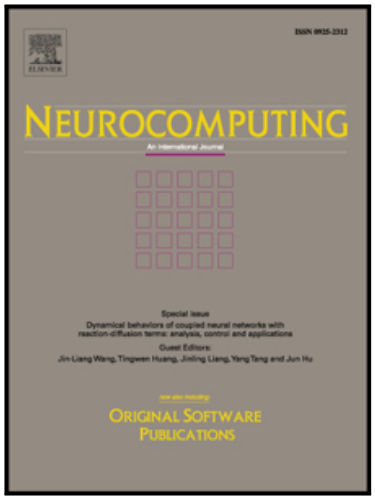

Exponential synchronization of discrete-time impulsive dynamical networks with time-varying delays and stochastic disturbances

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Exponential synchronization of discrete-time impulsive dynamical networks with time-varying delays and stochastic disturbances

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Abstract: In this paper, based on the discrete-time delayed impulsive system theory, exponential synchronization of discrete-time complex networks with both time-varying delays and stochastic disturbances is investigated. By applying an iterative Lyapunov function in combination with the linear matrix inequality (LMI) technique, a new synchronization criterion based on topology matrices and impulsive conditions is developed. Some numerical simulations are provided to verify the theoretical results.

Keywords: discrete-time network; exponential synchronization; impulsive control; time-varying delay; stochastic disturbance

1 Introduction

Since the discoveries of the small-world property [1] and scale-free feature [2] in complex networks, the notion of network science has attracted more and more attention from scientific and engineering communities. In the past decade, great progress has been made on complex networks, for example, regarding modelling and statistical analysis, epidemics and rumors spreading, big-data diagnosis on complex networks, dynamics and evolution patterns, control and synchronization, various applications of complex networks, and so on.

Synchronization, as an interesting collective behavior in a complex dynamical network, is receiving increasing research endeavor due to its frequent occurrence and broad applications in natural as well as manmade systems. Some recent advances on network synchronization have been reported in [3]-[18]. In the earlier years, most research focused on the synchronization of continuous-time networks with or without delays. In [10], the sampled-data synchronization problem was formulated as an exponential mean-square stabilization problem for a class of dynamical networks, which involve both multiple probabilistic interval delays and sector-bounded nonlinearities. In [11], the synchronization of a complex dynamical network was investigated by pinning a small portion of nodes, instead of controlling all the nodes. Thereafter, the impulsive control method has also been widely utilized to control and synchronize complex networks [12]-[18]. It guarantees stability and synchronizability of complex networks by sending

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