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EXPONENTIAL SYNCHRONIZATION OF DELAYED CELLULAR NETWORKS WITH IMPULSES

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Abstract. In this paper, the problem of exponential synchronization for a class of time-delay cellular neural networks with impulses is investigated. Using the drive-response concept, a control law is derived to achieve the state synchronization of two identical cellular neural networks. Moreover, we derive sufficient exponential synchronization conditions for the cellular neural networks with impulses via the Lyapunov stability method, the Halanay inequality lemma and the Young inequality lemma. The synchronization conditions are easy to verify and rely on the connection matrix in the driven networks and the suitable designed controller gain matrix in the response networks.

Keywords. Cellular neural networks, exponential synchronization, impulse, time-delay, Halanay inequality, Young inequality.

AMS (MOS) subject classification: 34A37; 92B20; 93D09

1 Introduction

Cellular neural networks (CNNs) was first proposed by Chua and Yang [1-2]. A cellular neural network is a massively parallel computing architecture made of simple processing elements which are locally connected. A number of applications of CNNs have emerged, which include solving certain optimization problems, detecting speed of moving objects, processing of moving images, speed detection of moving objects, and in pattern classification [3-4]. Nowadays, some authors pay attention to the exponential synchronization of neural networks [5-6]. Chaos synchronization [7, 9] has been investigated for a decade, for which many effective methods have been presented [7-16]. In 1990, Pecora and Carroll [7] addressed the synchronization of chaotic systems using a drive-response conception. The idea is to use the output of the drive system to control the response system so that they oscillate in a synchronized manner. Recently, the synchronization of coupled chaotic systems has been received considerable attention in the last decade due to its potential applications in creating secure communication system [17].

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