Original article

Exponential lag synchronization for delayed fuzzy cellular neural networks via periodically intermittent control

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Abstract

In this paper, lag synchronization for a class of delayed fuzzy cellular networks is investigated. By utilizing inequality technique, Lyapunov functional theory and the analysis method, some new and useful criteria of lag synchronization for the addressed networks are derived in terms of p-norm under a periodically intermittent controller. Finally, an example with simulation is given to show the effectiveness of the obtained results.
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1. Introduction

At present, cellular neural networks (CNN) have been extensively investigated both in theory and applications since it was proposed by Chua and Yang [2,3]. However, in mathematical modeling of real world problems, the uncertainty or vagueness is unavoidable. In order to take vagueness into consideration, fuzzy theory is considered as a suitable tool. Based on traditional CNN, the fuzzy cellular neural networks (FCNN) were first introduced by Yang and Yang [28,29], which integrate fuzzy logic into the structure of traditional CNN and maintain logic connectedness among cells. Meanwhile, many studies have been revealed that FCNN is a useful paradigm for image processing problems, which is a cornerstone in image processing and pattern recognition. Therefore, the dynamical analysis of FCNN is important and interesting from both theoretical and applied points of view.

In implementation of FCNN such as in the process of moving images, time delays are unavoidable encountered in the signal transmission among the neurons due to the finite switching speed of neurons and amplifiers, which will affect the stability of the neural system and may lead to some complex dynamic behaviors, such as instability, chaos, oscillation or other performance of the neural network. Therefore, in order to make full use of their advantages and restrain even eliminate their disadvantages, the controlling issue with regard to the delayed neural networks seems so crucial for researchers even all people.

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