Exponential Stability of a Class of Neural Networks with Time-Varying Delay

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Dedicated to Professor Zhicheng Wang on the occasion of his retirement.

Abstract. Global exponential stability for a class of cellular neural networks (CNNs) with time-varying delay is considered. By using the method of Lyapunov Krasovskii functional and linear matrix inequality (LMI) technique, some sufficient conditions for global exponential stability of CNNs are obtained. The conditions presented here are related to the size of delay. An example is given to illustrate the feasibility of our results.

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1. Introduction

Cellular Neural Network (CNN) was introduced by Chua and Yang [1]. Applications of CNN in physical systems include connected component detection, hole filling, optimization, associative memories, pattern recognition, and signal processing [2]. However, in order to deal with moving images, one must introduce the time delay in signal transmission among the cells. This leads to the model of CNN with delay (DCNN) [3]. It is well known that time delay may cause instability, divergent oscillation in many systems. In recent years, the stability of DCNN has become an important topic of theoretical studies. As a result, many sufficient conditions ensuring