Convergence of Discrete–Time Neural Networks with Delays*

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To Professor Zhicheng Wang on the occasion of his retirement

Abstract. An LMI (Linear Matrix Inequality) approach and an embedding technique are employed to derive some sufficient conditions for the global exponential stability of discrete-time neural networks with time-dependent delays and constant parameters. For networks with time-dependent parameters but constant delays, by using the property of internally chain transitive sets, it is shown that these conditions are also sufficient for the convergence of the networks.

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1. Introduction

When a neural network is updated discretely, the model describing the network is in the form of system of difference equations (See, e.g., Hopfield [6]). Also, in numerical simulations and practical implementation of a continuous-time neural network, discretization is needed, which leads again to a system of difference equations. Therefore, it is of both theoretical and practical importance to study the dynamics of discrete-time neural networks.

Recently, there has been increasing interest in the effects of delays on neural dynamics of continuous-time networks. See, for example, [1, 13, 14, 18]. It has been