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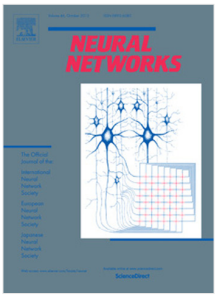

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An Improved Stability Result for Delayed Takagi-Sugeno Fuzzy Cohen-Grossberg Neural Networks

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Abstract

This work proposes a novel and improved delay independent global asymptotic stability criterion for delayed Takagi-Sugeno (T-S) fuzzy Cohen-Grossberg neural networks exploiting a suitable fuzzy-type Lyapunov functional in the presence of the nondecreasing activation functions having bounded slopes. The proposed stability criterion can be easily validated as it is completely expressed in terms of the system matrices of the fuzzy neural network model considered. It will be shown that the stability criterion obtained in this work for this type of fuzzy neural networks improves and generalizes some of the previously published stability results. A constructive numerical example is also given to support the proposed theoretical results.

Keywords : Cohen-Grossberg Neural Systems, Stability Analysis, Fuzzy Theory, Time Delays.

1 Introduction

Recently, various dynamics of Cohen-Grossberg neural networks (CGNNs) given in [1] were considerably investigated because of the useful applications of these networks in the areas regarding pattern recognition, optimization, control problems, signal processing, associative memory and parallel computation. If neural networks are designed to solve special types of engineering problems related to the areas of optimization, image processing and control systems,then, these neural network are desired to asymptotically converge to a unique equilibrium point. In other words, in such applications, this neural system needs to be globally asymptotically stable. Therefore, global stability property of Cohen-Grossberg neural systems is important and it should be given a particular attention. When a neural system is intended to be electronically implemented, time delays will inference because of transmission process among the neurons, which might turn a stable neural network into a neural network with having some complex dynamical behaviors. Since time delays are indispensable, the analysis of the intended dynamics of such neural networks must be carried out by taking time delays into account, in which case, one needs to involve these time delays in the systems of equations of this neural network. In other words, stability of such neural networks must be established with involving the delays in the mathematical expression of the system. When reviewing the past literature, it can found out that many researchers have focused on establishing novel criteria for global asymptotic stability of the equilibrium point for delayed Cohen-Grossberg

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