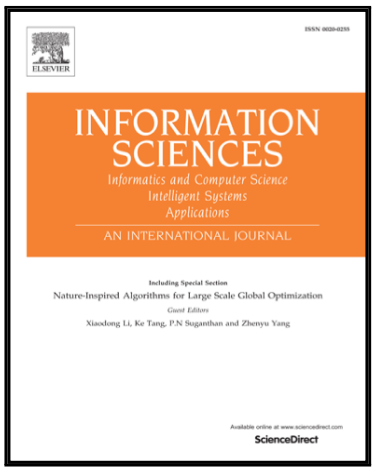

Design of state estimator for BAM fuzzy cellular neural networks with leakage and unbounded distributed delays

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Design of state estimator for BAM fuzzy cellular neural networks with leakage and unbounded distributed delays

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Abstract

In this paper, the state estimation problem is studied for the bidirectional associative memory (BAM) fuzzy cellular neural networks (FCNNs) with delays, where the delays include leakage and unbounded distributed delays. The problem addressed is to estimate the neuron states, through available output measurements, such that for all admissible leakage and unbounded distributed delays, the dynamics of the estimation error is globally asymptotically stable. A delay-dependent linear matrix inequality (LMI) criterion for the existence of the estimator is proposed by using the Lyapunov-Krasovskii functional method. In addition, the unknown gain matrix is determined by solving a delay-dependent LMI. Finally, numerical examples and simulations are provided to illustrate the effectiveness of the theoretical results.

Keywords: State estimator, Fuzzy cellular neural networks, Leakage delay, Linear matrix inequalities, Homeomorphism mapping

1. Introduction

In recent years, neural networks (NNs) have been successfully applied to various fields such as signal processing, associative memories, pattern recognition among others [5, 22]. Various NN models, such as cellular neural networks (CNNs), Hopfield-type NNs and bidirectional associative memory (BAM) NNs, have been extensively investigated [9, 11, 15, 36]. Concurrently, the state estimation problem for NNs with delays has also received much attention [23, 29, 34, 48, 50]. Recently, the state estimation problem for NNs with multiple time delays has been investigated by using the Lyapunov-Krasovskii functional, a convex polyhedron method and with a linear matrix inequality (LMI) technique[41]. Li et al. [33] have also analyzed the state estimation for uncertain Markovian jump NNs with mixed

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