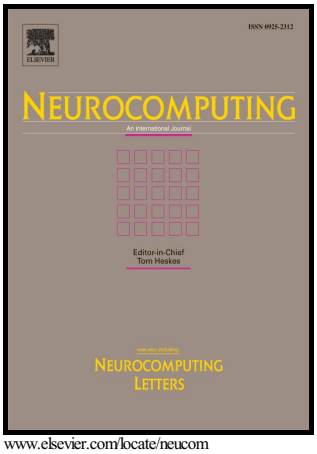

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Dual delay-partitioning approach to stability analysis of generalized neural networks with interval time-varying delay [1]

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Abstract

This paper is concerned with improved delay-dependent stability criteria for generalized neural networks (GNNs) with interval time-varying delay. A dual delay-partitioning approach is introduced to partition the delay intervals $[0, \tau_a]$ and $[\tau_a, \tau_b]$ into different multi-segments separately. A newly augmented Lyapunov-Krasovskii functional (LKF) with triple integral terms is constructed by dual–partitioning the delay in integral terms, in which the relationships between the augmented state vectors are fully taken into account. The Wirtinger-based integral inequality and Peng-Park's integral inequality are employed to effectively handle the cross-product terms occurred in derivative of the LKF. Therefore, less conservative results can be achieved in terms of e_s and LMIs. Finally, two numerical examples are included to show that the deduced criteria are less conservative than existing ones.

Keywords: Generalized neural networks (GNNs); Stability analysis; Lyapunov-Krasovskii functional (LKF); Interval time-varying delay; Delay-partitioning approach.

1. Introduction

It is well known that the back-propagation neural networks and optimization type neural networks can be modeled as static neural networks (SNNs), whereas Hopfield neural networks, bidirectional associative memory neural networks and cellular neural networks are classified as local field neural networks (LFNNs) [1]. In [2], the generalized neural networks (GNNs) model containing the SNNs and LFNNs as special cases was first introduced. Thus, it is enough to study the stability of GNNs instead of both LFNNs and SNNs. In recent years, much effort has been made in stability analysis of GNNs model [1, 2, 5–7, 17]. During the implementation of artificial neural networks (NNs), time delays are inevitably introduced due to the finite switching speed of amplifiers and the inherent communication time between the neurons [18, 19], which might cause oscillation, divergence, and even instability [19–29]. Therefore, the stability of the delayed neural networks (DNNs) has received considerable attention [1, 2, 5–7, 12–17, 30, 31]. The stability criteria of DNNs are generally classified into two categories, delay-independent ones [12–16] and delay-dependent ones [1, 2, 5–7, 17, 30, 31]. The delay-dependent stability conditions are usually less conservative than

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