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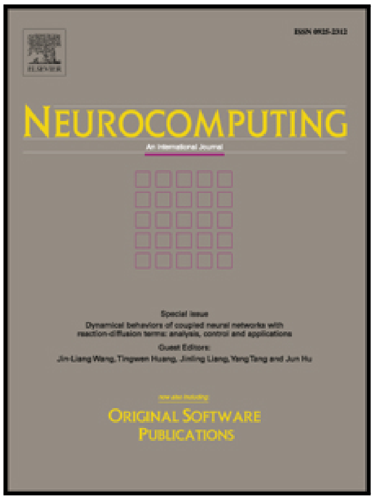

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State estimation of complex-valued neural networks with two additive time-varying delays

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Abstract

This paper aims at the problem on state estimation of complex-valued neural networks with two additive time-varying delays. Via selecting appropriate Lyapunov-Krasovskii functionals and utilizing reciprocally convex approach and applying matrix inequality technique to analysis, a delay-dependent sufficient condition is derived in the form of linear matrix inequalities (LMIs) to estimate the neuron state with some observed output measurements so as to guarantee the global asymptotic stability of the error-state system. A numerical example is provided to illustrate the feasibility of the obtained result.

Index Terms

Complex-valued neural networks; additive time-varying delays; state estimation; linear matrix inequality

I. Introduction

During the few past decades, study on neural networks has attracted more and more considerable attention because of their successful applications in many areas such as combinatorial optimization, signal processing, associative memory, affine invariant matching and pattern recognition [1]. In such applications, the research on stability is a primary task in the design of neural networks [2]. What is noteworthy is that time delay is often encountered in dynamical systems [3]- [6], and is one main source leading to instability, oscillation, or other poor performance [7]. In consequence, the issue of stability problem for neural networks with time delays attracts many researchers and a lot of meaningful stability criteria have been established, for example, see [7]- [11], and references therein.

It is worth noting that the above stability results are all talked about systems with one single delay in the state. Generally speaking, when it refers to reality, signals transmitted from one point to the next would experience the networks' some segments. During this process, since the variable network transmission conditions, there might occurs several different types of successive delays [12]. For example, in a state-feedback networked control, the physical plant, controller, sensor and actuator are distributed at different positions which leads to during the signals transmission process, two additive time-varying delays will appear: one from sensor to controller and the other from controller to actuator. Due to the networks transmission conditions, the related two time-varying delays generally have different properties. On account of this principle, a novel model for neural network with two additive time-varying delays was presented in [13], and an original criterion to assure that the neural networks is asymptotically

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