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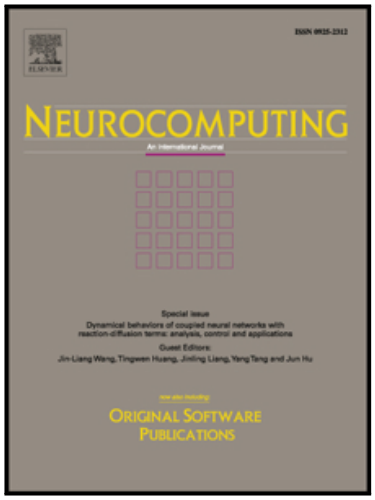

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Global μ-stability of quaternion-valued neural networks with mixed time-varying delays

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Abstract

In this paper, the problem of global μ-stability for quaternion-valued neural networks with time-varying delays and unbounded distributed delays is investigated. To avoid the non-commutativity of quaternion multiplication, the quaternion-valued neural networks is decomposed into two complex-valued systems. By employing the homomorphic mapping principle, a sufficient condition for the existence and uniqueness of equilibrium point of the considered quaternion-valued neural networks is proposed in the form of linear matrix inequality (LMI) in complex-valued domain. Further, the appropriate Lyapunov-krasovkii functional is constructed in the Hermitian quadratic form, and sufficient condition to ensure the global μ-stability of the equilibrium point is obtained by using inequality technique. Finally, two numerical examples with simulations are provided to verify the effectiveness of the obtained results.

Keywords: Quaternion-valued neural networks; Linear matrix inequality; Time-varying delays; Unbounded distributed delays; Global μ-stability

I. Introduction

In the study of artificial intelligence, a large number of nonlinear systems are involved [1]- [8]. As one of the most important nonlinear systems, neural networks have been paid much attentions over the past three decades by reason of their applicability in many fields such as signal processing, pattern recognition, associative memory, optimal control, confidential communication, engineering calculation and other fields [9]- [12]. In these practical applications, the primary problem is to analyze the stability of the networks [13]. As with many practical systems, time delays inevitably exist in the signal transmission among neurons. Time delays can cause poor system performance such as oscillation, instability and bifurcation [14]- [21]. Therefore, when investigating stability of neural networks, possible time delays should be taken into account [22]. In recent years, a large amount of results on stability of delayed neural networks have been reported [22]- [28].

Although real-valued neural networks (RVNNs) have been applied in many fields, they have limitations [29]. For instance, in applications such as optoelectronics, speech synthesis, and information flow, we need to deal with the complex-valued signals [30]. Thus complex-valued neural network arises at the historic moment [31]. In

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