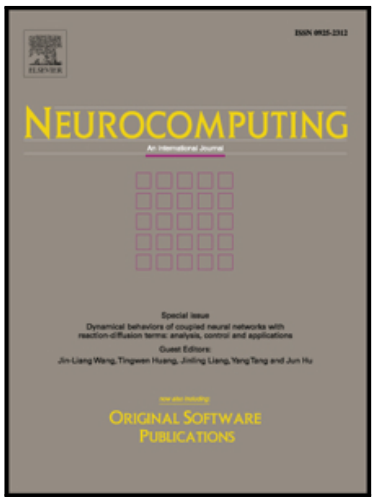

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Global $\mu-$stability of quaternion-valued neural networks with non-differentiable time-varying delays

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Abstract

In the paper, the quaternion-valued neural networks (QVNNs) with non-differentiable time-varying delays are considered. Firstly, by using the method of plural decomposition, we decompose the QVNNs into two complex-valued neural networks. Some sufficient criteria in linear matrix inequality (LMI) form are derived to guarantee the existence and uniqueness of the equilibrium point for considered QVNNs by using the homeomorphism mapping principle of complex domain. Secondly, based on applying the free weighting matrix method and constructing appropriate Lyapunov-Krasovskii functional, several conditions are established in LMIs to ensure the the global $\mu-$stability of QVNNs. Finally, by employing the Predictor-Corrector Approach, two numerical examples are provided to show the feasibility and availability of the obtained result.

Keywords: Global $\mu-$stability; Quaternion-valued neural networks; Linear matrix inequality; Equilibrium point; Time-varying delays

I. Introduction

The nonlinear systems are ubiquitous in the real world [1]- [9]. As one of the most important nonlinear systems, the real-valued neural networks (RVNNs) have been widely used in signal processing, pattern recognition, associative memory, optimal control, secure communication, engineering computing and other fields, and have received much attention [10]- [20]. Although RVNNs have been applied on many fields, they have limitations. For example, in the practical application such as electromagnetic processing, ultrasonic wave, quantum wave and light physical system, it is necessary to deal with complex data. Therefore, the complex-valued neural networks (CVNNs) emerge. CVNNs have complex-valued connection weight, state, activation function and output which can directly deal with complex-valued data. As a consequence, the stability of CVNNs have received extensive attention [21]- [37].

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