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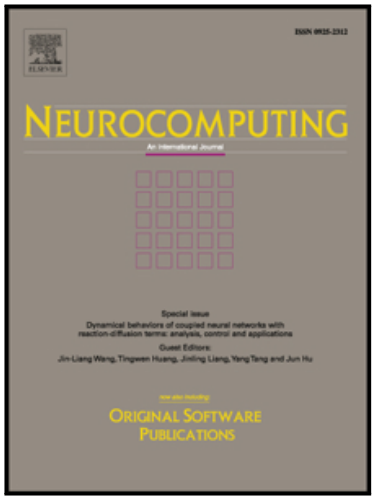

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Sampled-data state estimation for delayed memristive neural networks with reaction-diffusion terms: Hardy-Poincarè inequality

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Abstract

The purpose of this paper is to design a sampled-data state estimator to better estimate the delayed reaction-diffusion memristive neural networks. To tackle with the effect caused by the reaction-diffusion terms, a new agency of Hardy-Poincarè inequality was introduced, which proposed a more accurate estimation. In addition, based on Lyapunov function, robust analysis method, some brand-new solvability criteria are presented, which rest upon the size of the delays, the sampling period as well as the regional feature of the reaction-diffusion region. Finally, two numerical examples are exploited to show the effectiveness of the derived LMI-based conditions.

Keywords: Memristor; Sampled-data; State estimation; Reaction-diffusion terms ; Linear matrix inequality (LMI)

1. Introduction

In 1971, L. O. Chua postulated the memristor as the fourth basic circuit element [1], which reasoned from the fact that there are six different mathematical relations connecting pairs of the four fundamental circuit variables: ccurrent i, voltage v, charge q and magnetic flux φ. Few years later, based on the nonlinear relationship between charge and flux, the idea of memristor has been successfully applied to memristive systems and devices [2]. From then on, the concept of memristor sparked a global attention in a series of works. In late 2008, a two-terminal titanium dioxide nanoscale device that exhibited memristive characteristics were unveiled, which was recognized as the first real-life realization of the so-called missing fourth circuit element and thus ignited renewed interest in memristors [3].

The resistance of the memristor was determined by the relation between charge q and magnetic flux φ, i.e., $d\varphi = Mdq$, which implies its resistance (Memristance) M are controlled by

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