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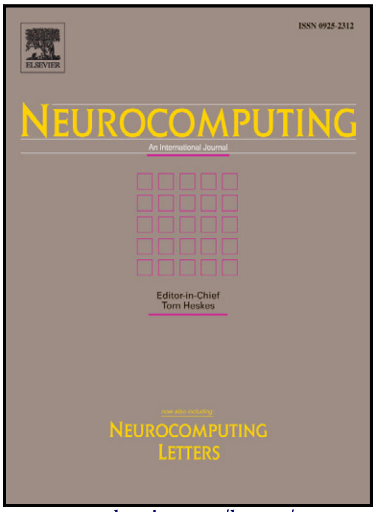

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Improved Passivity Analysis for Neural Networks with Markovian Jumping Parameters and Interval Time-Varying Delays¶

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Abstract

The problem of passivity analysis for neural networks with markovian jumping parameters and interval time-varying delays is investigated in this paper. By constructing a novel Lyapunov-Krasovskii functional based on the complete delay-decomposing idea and using reciprocally convex technique, some improved delay-dependent passivity criteria are established in terms of linear matrix inequalities. Numerical examples are also given to show the effectiveness of the proposed methods.

Keywords: Neural networks, Passivity, Interval time-varying delays, Markovian jumping parameters

1 Introduction

The problem of neural networks has been widely investigated in the last decades due to their potential applications in many areas such as pattern recognition, static image processing, associative memory and combinatorial optimization[1, 2]. It is known that stability is one of the most important properties for the designed neural networks. Meanwhile, time delays are inevitable encountered in many practical systems and usually the main reason resulting in instability, therefore, increasing attention has been focused on the problem of stability analysis for neural networks with time delays, and a great deal of related delay-independent and delay-dependent criteria have been reported in recent literature, see, e.g., [3, 4, 5, 6, 7, 8, 9, 10, 11, 12, 13] and the references therein. Furthermore, as a powerful tool for analyzing the stability of systems, passivity theory has also considerable backgrounds in many control fields, for example, chaos control and synchronization [14], fuzzy control[15] and signal processsing[16]. Naturally, increasing attention has been focused on the passivity analysis for neural networks with time-varying delays[17, 18, 19, 20, 21] in recent years.

On the other hand, as an important kind of hybrid systems, markovian jump systems were firstly introduced by Krasovskii and Lidskii in[22]. This class systems have significant advantage in modeling many practical dynamic systems, such as manufacturing systems, networked control systems, economics systems, fault-tolerant control systems. And a great of work has been reported for markovian jumping systems in recent literature[23, 24]. Especially, a novel fault-tolerant control method for Markovian jump stochastic systems was introduced in [24] and the results can be well applied to the real application systems. At the same time, considerable effort has been focused on the dynamics analysis for neural

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