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GLOBAL ROBUST DISSIPATIVITY OF INTERVAL NEURAL NETWORKS WITH BOTH VARIABLE AND UNBOUNDED DELAYS

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Abstract. In this paper, the concepts of robust dissipativity and global exponential robust dissipativity are introduced, and the problems of the robust dissipativity and global exponential robust dissipativity are discussed for interval neural networks with both variable and unbounded delays. Several sufficient conditions are given for checking the robust dissipativity and global exponential robust dissipativity of the addressed neural networks. These results improve and extend the previous results for dissipativity in the literature. An example is provided to demonstrate the usefulness of the proposed results.

Keywords. Robust dissipativity; global exponential robust dissipativity; neural networks; variable delays; unbounded delays.

AMS (MOS) subject classification: 34D20; 93D30

1 Introduction

In the recent years, various neural networks have been extensively investigated and successfully applied to a variety of areas such as signal processing, pattern recognition, associative memory and combinatorial optimization [1]. In such applications, the qualitative analysis of the dynamical behaviors is a necessary step for the practical design of neural networks.

In hardware implementation, time delays occur due to finite switching speed of the amplifiers and communication time. The existence of time delay may lead to some complex dynamic behaviors such as oscillation, divergence, chaos, instability or other poor performance of the neural networks [2]. Therefore, the study of dynamical behaviors with consideration of time delays becomes extremely important to manufacture high quality neural networks [3]. Many results on dynamical behaviors such as stability, periodicity, convergency and boundedness have been obtained for neural networks with delays, for example, see [1-23] and references therein.

On the other hand, uncertainties are unavoidable in modeling neural networks due to modeling errors and parameter fluctuation during their implementation. Such parameter uncertainties may also result in instability and