ON THE STABILITY OF INTERVAL FUZZY NEURAL NETWORKS WITH TIME-VARYING DELAYS

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Abstract. In the paper, we obtain an exponentially robust stability criterion for interval fuzzy neural networks with time-varying delays by using Lyapunov-Krasovskii functional with the differential inequality and LMI techniques. It is easily verifiable, so it is useful in the practical design fuzzy neural networks.

Keywords. Neural networks, fuzzy, delay, robust stability

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1   Introduction

In the past decade, the dynamics of neural networks, especially the stability of neural networks, have been extensively investigated [1-3, 5-24] because of their important applications in various areas such as pattern recognition and combinatorial optimization. At the same time, T. Yang et al. [25-27] introduced fuzzy neural networks which combine the fuzzy logic with the traditional neural networks. Fuzzy neural networks could be used in image processing and pattern recognition. In practice, the stability of fuzzy neural networks is very important as that of traditional neural networks. T. Yang et al. [25-27] have investigated the existence and uniqueness of the equilibrium point and the stability of fuzzy neural networks without any delays. Realistic modelling of many large neural networks with non-local interaction inevitably have connection delays which naturally arise as a consequence of finite information transmission and processing speeds among the neurons. Thus, it is natural to consider delayed neural networks. Instability of the delayed neural networks could be caused by time-delays, so lots of deep investigations have been done on the stability of delayed neural networks. Liu et al. [22] have investigated fuzzy neural networks with time-varying delays and Huang et al. [13,14] have investigated the stability of fuzzy neural networks with diffusion term and distributed delay.