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DELAY-DISTRIBUTION-DEPENDENT STABILITY CRITERIA FOR NEURAL NETWORKS WITH TIME-VARYING DELAYS

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Abstract. This paper investigates the delay-probability-distribution-dependent stability problem for a class of neural networks with time-varying delays. The probabilistic delay satisfies a certain probability distribution. By introducing a stochastic variable with a Bernoulli distribution, the neural networks with random time delays is transformed into one with deterministic delays and stochastic parameters. Based on the Lyapunov-Krasovskii functional, a novel delay-probability-distribution-dependent sufficient condition in the form linear matrix inequality (LMI) such that delayed neural networks are globally asymptotically stable in the mean square. Numerical examples are given to illustrate the effectiveness of the proposed method.

Keywords. Delay-probability-distribution-dependent, Linear matrix inequality, Lyapunov-Krasovskii functional, Hopfield neural networks.

AMS (MOS) subject classification: 34K20, 92B20.

1 Introduction

In the past two decades, there has been an increasing interest in the study of neural networks since they found extensive applications in various areas such as signal processing, pattern recognition, static image processing, associative memory and combinatorial optimization [3, 6]. In practice, time delays are frequently encountered in dynamical systems and are often a source of instability and oscillations. Therefore, the issue on the stability analysis of neural networks with time delay has received great attention during the past years and a number of remarkable results have been proposed, including both delay-dependent and delay-independent, see for example ([19, 20, 11, 13, 12, 18, 23, 15, 4, 17, 10, 2, 7, 8, 9, 14, 16, 21, 25]). It is well known that delay-dependent results are generally less conservative than

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