Dynamics of Continuous, Discrete and Impulsive Systems
Series **B:** *Algorithms and Applications* **11 (2004)** 783-797

GLOBAL EXPONENTIAL STABILITY OF TIME-VARYING DELAY NEURAL NETWORKS VIA RAZUMIKHIN TECHNIQUE †

Bin Liu[1,2] and Xinzhi Liu[2,3]

[1]Department of Information and Computation Science
Zhuzhou Institute of Technology, Zhuzhou 412008, China
[2]Department of Control Science and Engineering
Huazhong University of Science and Technology, Wuhan 430074, China
[3]Department of Applied Mathematics
University of Waterloo, Waterloo, Ontario, Canada N2L 3G1

Abstract. By employing Razumikhin technique, this paper establishes some Razumikhin type theorems for globally exponential stability of functional differential systems. It then presents, based on these Razumikhin-type theorems, some delay-independent and delay-dependent algebraic criteria for global exponential stability of time-varying delay neural networks, which include, as special cases, the time-varying delay Hopfield neural networks (HNN), bidirectional associative memory (BAM), and cell neural networks (CNN). The new stability criteria improve upon several results appeared in the literature. To demonstrate the differences and features of the new stability criteria, several examples are discussed.
Keywords. Razumikhin technique, Neural networks, Globally exponential stability, Lyapunov exponent, Time-varying delay.

1 Introduction

It is well-known that neural networks have been successfully used in associative memories, optimization solvers, signal and image processing, artificial intelligence, and so on. Such applications link heavily with the stability

†Research supported by National Natural Science Foundation of China (60274007), and Post Doctoral Foundation of China, and the Young Program of Ministry of Education of Hunan Province, and NSERC-Canada. The second author was on leave from the University of Waterloo, Waterloo, Canada.