Dynamics of Continuous, Discrete and Impulsive Systems
Series **A:** *Mathematical Analysis* **13 (2006)** 575-586

EXISTENCE AND STABILITY OF PERIODIC SOLUTIONS TO TIME-VARYING CELL NEURAL NETWORKS WITH DELAYS †

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Abstract. This paper aims to study the existence and global stability of the periodic solutions to time-varying cell neural networks (CNN) with delays. By employing the Lyapunov function and inequality analysis method, the solution to this kind of delay CNN is proved to be bounded and therefore the existence criteria for its periodic solution is established. Moreover, by using Razumikhin technique, the globally exponential stability for this kind of CNN are also established. Finally, one example is given to illustrate our results.

Keywords. CNN, Periodic solution, Razumikhin technique, Globally exponential stability, Delay.

1 Introduction

Time delays occur commonly in artificial neural networks in hardware implementation due to finite switching speeds of the amplifiers and often result in the instability and oscillation. Therefore, the quanility analysis of neural networks with time-delays is very important from both theoretical and network design point of view. In recent years, global stability criteria of neural networks with constant time delays have been established such as literatures [4-12]. However, in many practical neural networks with time-delays, delays are time-varying and it is difficult to obtain their function formula, or they are known to be bounded. Moreover, many neural networks have some complex behaviors such as periodic solutions and chaos, etc. The quanility analysis of such complex behaviors are less investigated up to now.
Razumikhin technique has been applied successfully to solve the problem of asymptotical stability of systems with time-delay, (see [1-3, 14-15] and references therein). Recently, in [14], the authors have established the Razumikhin-type globally exponential stability for general neural networks. The aim of this paper is to investigate the existence and global stability problems of the periodic solutions for time-varying CNN with delays by using the results obtained in [14]. The remaining part of this paper consists of five sections. In Section 2, we describe the time-varying CNN with delays. In Section 3, we establish existence theorem of the periodic solutions to CNN. In Section

†Research supported by Science Foundation of Ministry of Education Chongqing City.