ROCKY MOUNTAIN
JOURNAL OF MATHEMATICS
Volume 38, Number 4, 2008

EXISTENCE OF ALMOST PERIODIC SOLUTIONS FOR IMPULSIVE CELLULAR NEURAL NETWORKS

GANI TR. STAMOV

ABSTRACT. In this paper we present results on the existence of almost periodic solutions for impulsive neural networks. By means of estimated for the Cauchy matrix sufficient conditions for existence and exponential stability of these equations are obtained.

1. Introduction. Many physical systems are characterized by the fact that at certain moments of time they experience a sudden change of their state. These systems are subject to short-term perturbations which are often assumed to be in the form of impulses in the modeling process. Adequate mathematical models of such processes are the impulsive differential equations in the form

$$\begin{cases} \dot{x}(t) = F(t, x(t)) & t \neq \tau_k, \\ \Delta x(t) = x(t+0) - x(t-0) = I_k(x(t)) & t = \tau_k,\ k \in \mathbf{Z}, \end{cases}$$

where t belongs to the interval $J \subset \mathbf{R}$, $F : J \times \mathbf{R}^n \to \mathbf{R}^n$, the sequence $\{\tau_k\}$ has no finite accumulation point and $I_k : \mathbf{R}^n \to \mathbf{R}^n$.

The theory of these differential equations goes back to the works of Mil'man and Myshkis [**7**]. In recent years impulsive differential equations have been intensively researched (see the monographs of Samoilenko and Perestyuk [**8**] and Lakshmikantham et al. [**6**]). Recently, some qualitative properties (oscillation, asymptotic behavior and stability) are investigated by several authors, see [**3, 9**].

In this paper we obtain some sufficient conditions to ensure that for Hopfield neural networks, see [**5**], with distributed delays and impulses at fixed moments of time where there exist unique almost periodic solutions. It is well known that neural networks have successful applications in many fields such as optimization, associative memory, signal and image processing.

2000 AMS *Mathematics subject classification.* Primary 34K45, 34B37.
Keywords and phrases. Almost periodic solution; impulsive neural networks.
Received by the editors on October 26, 2004, and in revised form on March 12, 2006.

DOI:10.1216/RMJ-2008-38-4-1271