Dynamics of Continuous, Discrete and Impulsive Systems
Series **A:** *Mathematical Analysis* **17 (2010)** 619-637
 http://www.watam.org

COEXISTENCE AND EXTINCTION IN COMPETITIVE SYSTEMS WITH IMPULSES

Benedetta Lisena

Dipartimento di Matematica
Universitá degli studi di Bari, Italy
email : lisena@dm.uniba.it

Abstract. In this article we consider a three dimensional competitive Lotka-Volterra system with periodic coefficients and impulses. We provide sufficient conditions for the global stability of a positive periodic solution. Furthermore we investigate the extinction of one species and the asymptotic behaviour of the surviving ones.

Keywords. Lotka-Volterra System; Impulsive Effect; Periodic Solution; Extinction.

AMS (MOS) subject classification: 34D05, 34C25, 34D23, 34K45.

1 Introduction

Impulsive effects exist widely in many evolution processes in which their states are changed abruptly at certain moments of time. Adequate mathematical models of these processes are the so-called systems with impulses. Applications of impulsive differential equations occur in a large variety of phenomena. In mathematical biology such type of equations have been introduced to investigate the dynamics of interacting populations living in a common environment. The purpose of this paper is to discuss Lotka-Volterra models for three coexisting species. We suppose that the species compete for the same resources and the environmental parameters are periodic.
During the last two decedes, traditional competitive systems have been studied extensively ([2],[6],[7],[10]). These models can be expressed as follow

$$u_i'(t) = u_i(t)\left[a_i(t) - \sum_{j=1}^{N} b_{ij}(t)\, u_j(t)\right], \quad i = 1, 2, .., N\ . \tag{1.1}$$

If at certain time t_k, some short-time perturbations occur, the solutions $u_i(t)$ may present some jumps at each t_k. Therefore, in order to describe such situation accurately by system (1.1), we need to modify the above model by adding impulses.
Recently impulsive equations have been introduced in population dynamics to investigate the existence of periodic solutions, the asymptotic stability, the persistence and extinction of the involved species ([1],[5],[8],[9],[11]).