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PERMANENCE AND EXTINCTION IN A NONAUTONOMOUS T-PERIODIC COMPETITIVE LOTKA-VOLTERRA SYSTEM[1]

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Abstract. A nonautonomous T-periodic competitive Lotka-Volterra system is considered in this paper. For $r \leq n$, sufficient conditions on the coefficients are provided to guarantee that r of the species in the system are permanent while the remaining $n-r$ are driven to extinction. It is shown that this result is an improvement of that in Ahmad and Montes de Oca [Appl. Math. Comput. **90**, (1998) 155-166].

Keywords. Lotka-Volterra system; Permanence; Extinction; Attractivity; Periodic solution.

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1 Introduction

We consider a nonautonomous Lotka-Volterra system of differential equations

$$\dot{x}_i(t) = x_i(t)\left[b_i(t) - \sum_{j=1}^{n} a_{ij}(t)x_j(t)\right], \qquad i = 1, \cdots, n, \quad n \geq 2, \tag{1}$$

where $x_i(t)$ represents the population size of the ith species at time t, $b_i(t)$, $i = 1, \cdots, n$, and $a_{ij}(t)$, $i, j = 1, \cdots, n$, are continuous and T-periodic, $a_{ii}(t) > 0$, $i = 1, \cdots, n$, and $a_{ij}(t) \geq 0$, $i \neq j$, $i, j = 1, \cdots, n$, for $t \in (-\infty, +\infty)$, $\dot{x}_i(t) = \frac{d}{dt}x_i(t)$. Assume

$$\bar{b}_i = \frac{1}{T}\int_0^T b_i(s)ds > 0, \quad i = 1, \cdots, n. \tag{2}$$

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