Dynamics of Continuous, Discrete and Impulsive Systems
Series **A:** *Mathematical Analysis* **12 (2005)** 607-619

THE STABILITY FOR A DELAY LOGISTIC EQUATION WITH PIECEWISE CONSTANT ARGUMENT

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Abstract. In this paper we give sufficient conditions for the uniform stability and the globally asymptotic stability of the delay logistic equation with piecewise constant argument

$$y'(t) = r(t)y(t)\left[1 - \frac{y([t-\tau])}{K}\right], \quad t \geq \tau,$$

where $[\cdot]$ denotes the greatest integer function, $r : [\tau, \infty) \to [\tau, \infty)$ is a continuous function, τ is a nonnegative integer, and K is a positive constant.

Keywords. Logistic equation, piecewise constant argument, uniform stability, globally asymptotic stability, delay.

AMS (MOS) subject classification: 34K20

1 Introduction and main results

In this paper, we consider a delay logistic equation with piecewise constant argument

$$y'(t) = r(t)y(t)\left[1 - \frac{y([t-\tau])}{K}\right], \quad t \geq \tau, \tag{1.1}$$

with the initial condition

$$y(0) = y_0 > 0, y(-j) = y_{-j} \geq 0, j = 1, 2, \cdots, \tau, \tag{1.2}$$

where $[\cdot]$ denotes the greatest integer function, τ is a nonnegative integer, K is a positive constant and $r : [T, \infty) \to [\tau, \infty)$ is a positive continuous function.

When $\tau = 0$, (1.1) reduces to the following logistic equation with piecewise constant argument

$$y'(t) = r(t)y(t)\left[1 - \frac{y([t])}{K}\right], \quad t \geq 0, \tag{1.3}$$

which has been studied by Matsunaga, Hara and Sakata [1]. In [1], the authors gave the following result: