Stability of Nonautonomous Neutral Variable Delay Difference Equation

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Abstract: This paper studies the stability of a class of nonautonomous neutral delay difference equation. The case of several variable delays is mainly considered, and the sufficient conditions of uniform stability and uniform asymptotical stability are obtained. Some results with a constant delay in the literature are extended and improved.

Keywords: Nonautonomous; neutral difference equations; stability.

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1 Introduction

Consider the nonautonomous neutral variable delay difference equation

$$\Delta(x(n) - cx(n-k)) + f(n, x(n-l_1(n)), \ldots x(n-l_m(n))) = 0, \quad n \in N,$$

where $c \in (-1, 1)$; $k \in N$; $\{l_i(n)\}$ is a positive integer sequence and satisfies $l_i(n) \leq l$, $i = 1, \ldots, m$, $n \in N$; $l$ is a given positive integer, $f(n, x_1, \ldots x_m): N \times R^m \to R$, and $f(n, 0, \ldots 0)$ satisfies $f(n, x_1, \ldots x_m) \equiv 0$, $n \in N$.

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