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BEHAVIOR OF TWO-DIMENSIONAL COMPETITIVE SYSTEM OF NONLINEAR RATIONAL RECURSIVE SEQUENCE

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Abstract. We investigated the solutions of the fractional system of difference equations

$$H_{n+1} = \frac{H_{n-5}}{\pm 1 \pm H_{n-5}\, L_{n-2}}\ ,\ L_{n+1} = \frac{L_{n-5}}{\pm 1 \pm L_{n-5}\ H_{n-2}}, \tag{1}$$

with the initials $H_{-5}, H_{-4}, H_{-3}, H_{-2}, H_{-1}, H_0, L_{-5}, L_{-4}, L_{-3}, L_{-2}, L_{-1}$ and L_0 such that $H_{-5}\ L_{-2} \neq \pm 1, H_{-4}\ L_{-1} \neq \pm 1\ , H_{-3}\ L_0 \neq \pm 1, H_{-2}\ L_1 \neq \pm 1, H_{-1}\ L_2 \neq \pm 1, H_0\, L_3 \neq \pm 1, L_{-5}\, H_{-2} \neq \pm 1\ , L_{-4}\, H_{-1} \neq \pm 1\ , L_{-3}\, H_0 \neq \pm 1, L_{-2}\, H_1 \neq \pm 1, L_{-1}\, H_2 \neq \pm 1$,and $, L_0\ H_3 \neq \pm 1$. Moreover, we studied local and global stability, periodicity and boundedness of solutions.

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1 Introduction

Difference equations have wide applications in various engineering and science disciplines.

A system of equations

$$\begin{aligned} H_{n+1} &= f(H_n, L_n), \\ L_{n+1} &= g(H_n, L_n), \end{aligned} \tag{2}$$

where , $n = 0, 1, ..., (H_0, L_0) \in R,\ R \subset \mathbb{R}^2,\ (f, g) : R \to R\ \ f, g$ are function is *competitive* if $f(x, y)$ is non-decreasing in x and non-increasing in y; and $g(x; y)$ is non-increasing in x and non-decreasing in y.

Elsayed [4] studied the system

$$H_{n+1} = \frac{H_{n-1}}{\pm 1 \pm L_n\ H_{n-1}},\ L_{n+1} = \frac{L_{n-1}}{\pm 1 + H_n\ L_{n-1}}.$$