Abstract

In this paper, we study the stability of the zero equilibrium and the occurrence of flip bifurcation of the following system of difference equations:

$$x_{n+1} = a_1 \frac{y_n}{b_1 + y_n} + c_1 \frac{x_n e^{k_1 - d_1 x_n}}{1 + e^{k_1 - d_1 x_n}},$$

$$y_{n+1} = a_2 \frac{z_n}{b_2 + z_n} + c_2 \frac{y_n e^{k_2 - d_2 y_n}}{1 + e^{k_2 - d_2 y_n}},$$

$$z_{n+1} = a_3 \frac{x_n}{b_3 + x_n} + c_3 \frac{z_n e^{k_3 - d_3 z_n}}{1 + e^{k_3 - d_3 z_n}}$$

where a_i, b_i, c_i, d_i, k_i, for $i = 1, 2, 3$, are real constants and the initial values x_0, y_0 and z_0 are real numbers. We study the stability of this system in the special case when one of the eigenvalues is equal to -1 and the remaining eigenvalues have absolute value less than 1, using center manifold theory.