COUPLED SYSTEMS OF FRACTIONAL ∇-DIFFERENCE BOUNDARY VALUE PROBLEMS

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Abstract. In this paper, we study the existence of solutions for a coupled system of two-point fractional ∇-difference boundary value problems of the form

\[
\begin{align*}
\nabla_{a+1}^{\alpha}u(t) + \nabla_{a+1}^{\beta}v(t) + f(t, v(t))g(t, u(t)) &= 0, \\
u(a+1) &= 0, \\
v(b+1) &= 0,
\end{align*}
\]

where \(1 < \alpha, \beta \leq 2\), \(t \in [a+2, b+1]_N = \{a+2, a+3, \ldots, b, b+1\}\), \(a, b \in \mathbb{Z}\) such that \(a \geq 0, b \geq 3\) and the functions \(f, g : [a+2, b+1]_N \times \mathbb{R} \rightarrow \mathbb{R}\) are continuous. Our analysis relies on the Green functions and the nonlinear alternative of Leray-Schauder and Krasnoselskii-Zabreiko fixed point theorems. At the end we give some numerical examples to illustrate the main results.


Keywords and phrases: discrete fractional calculus, boundary value problems, fixed point theorem, existence of solutions.

REFERENCES