Mathematics > General Mathematics

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Positive solution of Hilfer fractional differential equations with integral boundary conditions

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In this article, we have interested the study of the existence and uniqueness of positive solutions of the first-order nonlinear Hilfer fractional differential equation

$$D_{0^+}^{\alpha,\beta}y(t) = f(t, y(t)),\ 0 < t \leq 1,$$

% with the integral boundary condition %

$$I_{0^+}^{1-\gamma}y(0) = \lambda \int_0^1 y(s)ds + d,$$

% where $0 < \alpha \leq 1$, $0 \leq \beta \leq 1$, $\lambda \geq 0$, $d \in$ and $D_{0^+}^{\alpha,\beta}$, $I_{0^+}^{1-\gamma}$ are fractional operators in the Hilfer, Riemann-Liouville concepts, respectively. In this approach, we transform the given fractional differential equation into an equivalent integral equation. Then we establish sufficient conditions and employ the Schauder fixed point theorem and the method of upper and lower solutions to obtain the existence of a positive solution of a given problem. We also use the Banach contraction principle theorem to show the existence of a unique positive solution. \ The result of

existence obtained by structure the upper and lower control functions of the nonlinear term is without any monotonous conditions. Finally, an example is presented to show the effectiveness of our main results.

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