# Existence results of a singular fractional differential equation with perturbed term

[1]Rym Bourguiba, [1,2]Faten Toumi

[1]Monastir, Tunisia, [2]Kairouan, Tunisia

This paper is devoted to the study of the following nonlinear fractional differential equation with perturbed term

$$\begin{cases} D^{\alpha}u(t) + \mu a(t)f(t,u(t)) - q(t) = 0, \ \text{ in } \ (0,1), \\ u(0) = u'(0) = \cdots = u^{(n-2)}(0) = 0, \quad u(1) = \lambda \displaystyle\int_0^1 u(s)ds, \end{cases}$$

depending on the real parameter $\mu > 0$, where $n \in \mathbb{N}$, $n \geq 3$, $n-1 < \alpha \leq n$, $0 < \lambda < \alpha$, $D^{\alpha}$ denotes the Reimann-Liouville derivative of order $\alpha$. The function $a$ is continuous nonnegative on $(0,1)$ and it is allowed to be singular at $t = 0$ and/or $t = 1$. The function $f$ is in $\mathcal{C}([0,1] \times [0,+\infty), [0,+\infty))$. The perturbed term $q : (0,1) \to [0,+\infty)$ is measurable function and satisfies some properties detailed below. Throughout our nonlinearity may change sign. In this work various existence and multiplicity results for positive solutions are derived depending of different values of the parameter $\mu$. Some illustrative examples are also discussed.

**2010 Mathematics Subject Classification:** 34A08, 34B18, 35G60.

## References

[1] R. Bourguiba, F. Toumi, O. K. Wannassi, *Existence and nonexistence results for a system of integral boundary value problems with parametric dependence* (submitted).

[2] A. Cabada, Z. Hamdi, *Multiplicity Results for Integral Boundary Value Problems of Fractional Order with Parametric Dependence*, Fractional Calculus and Applied Analysis 18.1, (2015), 223–237.

[3] X. Zhang, L. Liu, Y. Wu, *Multiple positive solutions of a singular fractional differential equation with negatively perturbed term*, Mathematical and Computer Modelling, 55 , (2012), 1263–1274.