

EXISTENCE RESULTS FOR A NONLINEAR FRACTIONAL DIFFERENTIAL EQUATIONS WITH INTEGRAL BOUNDARY CONDITIONS ON THE HALF-LINE

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Abstract. By means of nonlinear alternative theorem of Leray-Schauder, some new results on the existence of positive solutions for a nonlinear fractional differential equations with integral boundary conditions on unbounded domain are established. The paper concludes with an illustrative example.

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REFERENCES

- [1] R. P. AGARWAL, M. MEEHAN, AND D. O'REGAN, *Fixed Point Theory and Applications*, **141**, Cambridge University Press, Cambridge, UK, (2001).
- [2] C. BAI, *Triple positive solutions for a boundary value problem of nonlinear fractional differential equation*, E. J. Qualitative Theory of Diff.Equ., **24**, (2008) 1–10.
- [3] C. BAI, *Positive solutions for nonlinear fractional differential equations with coefficient that changes sign*, Nonlinear Analysis., **64**, (2006), 677–685.
- [4] Z. BAI, H. LÜ, *Positive solutions for a boundary value problem of nonlinear fractional differential equations*, J. Math. Anal. Appl., **311**, (2005), 495–505.
- [5] M. BENCHOHA, J. HENDERSON, S. K. NTOYUAS, A. OUAHAB, *Existence results for fractional order functional differential equations with infinite delay*, J. Math. Anal. Appl., **338**, (2008), 1340–1350.
- [6] D. DELBOSCO, L. RODINO, *Existence and uniqueness for a nonlinear fractional differential equation*, J. Math. Anal. Appl., **204**, (1996) 609–625.
- [7] D. GUO, V. LAKSHMIKANTHAM, *Nonlinear Problems in Abstract Cone*, Academic Press, Saniego, 1988.
- [8] W. JIANG, *Solvability for fractional differential equations atresonance on the half line*, Applied Mathematics and Computation., **61**, (2014), 90–99.
- [9] A. A. KILBAS, H. M. SRIVASTAVA, J. J. TRUJILLO, *Theory and Applications of Fractional Differential Equations*, North-Holland Mathematics Studies, 204. Elsevier science B. V., Amsterdam, 2006.
- [10] M. A. KRASNOSEL'SKII, *Topological Methods in the Theory on Nonlinear Integral Equations, (English) Translated by A. H. Armstrong*, A Pergamon Press Book, MacMillan, New York, 1964.
- [11] S. LIANG, J. ZHANG, *Existence of three positive solutions of m-point boundary value problems for some nonlinear fractional differential equations on an infinite interval*, Computers and Mathematics with Applications., **61**, (2011), 3343–3354.
- [12] Y. LIU, *Existence and unboundedness of positive solutions for singular boundary value problems on half-line*, Applied Mathematics and Computation., **144**, (2003), 543–556.
- [13] Y. LIU, B. AHMAD, R.P. AGARWAL, *Existence of solutions for a coupled system of nonlinear fractional differential equations with fractional boundary conditions on the half-line*, Advances in Difference Equations., **2013**, 46, (2013).

- [14] I. PODLUBNY, *Fractional Differential Equations*, Academic Press, San Diego, 1999.
- [15] A. SAADI, M. BENBACHIR, *Positive solutions for three-point nonlinear fractional boundary value problems*, E. J. Qualitative Theory of Diff. Equ., **3**, (2011), 1–19.
- [16] A. SAADI, A. BENMEZAI, M. BENBACHIR, *Positive solutions for three-point nonlinear fractional semi-positone boundary value problems*, PanAmerican Mathematical Journal., **22**, 4, (2012), 41–57.
- [17] A. SAADI, A. BENMEZAI, *Positive solutions for three-point nonlinear singular semi-positone fractional boundary value problems*, Journal of Advanced Research in Dynamical and Control Systems., **5**, 1, (2013), 1–17.
- [18] X.SU, S. ZHANG, *Unbounded solutions to a boundary value problem of fractional order on the half-line*, Computers and Mathematics with applications., **61**, (2011), 1079–1087.
- [19] L. ZHANG, B. AHMAD, G. WANG, R. P. AGARWAL, M. AL-YAMI AND W. SHAMMAKH , *Non-local integrodifferential boundary value problem for nonlinear fractional differential equations on an unbounded domain*, Abstract and Applied Analysis., Volume(2013), Article ID 813903, (2013), 5 page.
- [20] G. WANG, A. CABADA AND L. ZHANG, *An integral boundary value problem for nonlinear differential equations of fractional order on an unbounded domain*, J. Integral Equations Appl., **26**, 1, (2014), 117–129.