On Boundary Value Problems of Fractional Differential Equations Involving Stieltjes Derivatives

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Abstract : Differential equations of fractional order have proved to be important tools to describe many physical phenomena and have been used in diverse fields such as engineering, mathematics as well as other applied sciences. On the other hand, the theory of differential equations involving the Stieltjes derivative (SD) with respect to a non-decreasing function is a new class of differential equations and has many applications as a unified framework for dynamic equations on time scales and differential equations with impulses at fixed times. The aim of this paper is to investigate the existence, uniqueness, and generalized Ulam-Hyers-Rassias stability (UHRS) of solutions for a boundary value problem of sequential fractional differential equations (SFDE) containing (SD). This study is based on the technique of noncompactness measures (MNCs) combined with Monch-Krasnoselski fixed point theorems (FPT), and the results are proven in an appropriate Banach space under sufficient hypotheses. We also give an illustrative example. In this work, we introduced a class of (SFDE) and the results are obtained under a few hypotheses. Future directions connected to this work could focus on another problem with different types of fractional integrals and derivatives, and the (SD) will be assumed under a more general hypothesis in more general functional spaces.

Keywords : SFDE, SD, UHRS, MNCs, FPT

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