Non-instantaneous Impulsive Riemann-Liouville Fractional Differential Systems: Existence and Controllability Analysis in Banach Spaces

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Abstract

The article is dedicated towards the study of fractional-order non-linear differential systems with non-instantaneous impulses involving Riemann-Liouville derivatives with fixed lower limit and appropriate integral type initial conditions in Banach spaces. First, mild solution of the system is constructed and subsequently, its existence is proven using Banach's fixed point theorem. Then, results of approximate controllability are established using the concept of fractional semigroup and an iterative technique. Suitable examples are given in the end supporting the methodology along with pointing out corrections in examples presented in previous articles.

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