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Some Results on Controllability for a Class of Non-Integer Order Differential Equations with Impulses

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Abstract: In this paper, we considered a class of impulsive fractional differential equations of order $1 < \alpha \leq 2$, in a Banach space. An associated integral equation is obtained by using the fractional integral and the cosine or sine family of linear operators. By using the measure of non-compactness and Mönch's condition, we prove that the problem under consideration is controllable. Abstract results are illustrated by an example in the last section.

Keywords: *controllability; non-integer order differential equation; impulsive condition; measure of non-compactness; Mönch's condition.*

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1 Introduction

Controllability is a fundamental concept in the theory of control dynamic systems, which plays an important role in the investigations and design of various kinds of control dynamic processes in finite and infinite dimensional spaces. An extensive study on controllability of various types of differential equations in abstract spaces has been done by many authors [2, 3, 5–8, 11–13]. In papers [2, 6, 9], the authors proved the results on controllability for second order control systems. Controllability of damped second order integrodifferential systems with impulses has been studied by Arthi and Balachandran [6].

The present work has been motivated by the work of Ravichandran and Baleanu [3], in which a control problem involving non-integer order (Caputo) derivatives is studied by using the measure of non-compactness and Mönch's condition. There are only few papers dealing with the study of controllability for a dynamic system with impulses. Impulse conditions describe the dynamics of a process in which discontinuous jumps occur. Such

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