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CONTROLLABILITY OF SECOND-ORDER IMPULSIVE DIFFERENTIAL AND INTEGRODIFFERENTIAL EVOLUTION SYSTEMS WITH NONLOCAL CONDITIONS

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Abstract. In this paper we establish the controllability results for certain types of second-order evolution systems in Banach spaces under the combination of nonlocal and impulsive conditions.

Keywords. Controllability, Second order evolution systems, Impulsive differential and integrodifferential equations, Nonlocal conditions.

AMS (MOS) subject classification: 93B05, 34A37.

1 Introduction

The dynamical systems are often classified into two categories of either continuous time or discrete time systems. These two dynamic systems are widely studied in population models and neural networks, yet there is somewhat a new category of dynamical system, which is neither continuous time nor purely discrete time; these are called dynamical systems with impulses [4, 39]. Recently the impulsive differential equations have been studied by several authors. This is due to the fact that many real phenomena and processes in mechanics, biology, physics, chemistry, biotechnology, etc.(see Refs.[16, 28, 38]) are characterized by the situation that at certain instants in time, the system parameters (e.g. displacement, velocities) undergo rapid changes. The duration of these changes is often neglected and it is assumed that the changes are represented by parameter jumps. One of natural tools for mathematical modeling and simulation of such phenomena is the theory of impulsive differential equations. This theory has started in the 1990s (see [27]) and today it covers various kind of problems which are motivated by numerous applications.

The study of abstract nonlocal semilinear initial value problems was initiated by Byszewski [5, 6]. Since it is demonstrated that the nonlocal problems have better effects in applications than the classical ones, differential equations with nonlocal problems have been studied extensively in the literature. For example, it is used to determine the unknown physical parameters in some inverse heat conduction problems [10]. The study of atomic reactors