Topological structure of solution sets for impulsive differential inclusions in Fréchet spaces

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ABSTRACT

In this paper, we consider the existence of solutions as well as the topological and geometric structure of solution sets for first-order impulsive differential inclusions in some Fréchet spaces. Both the initial and terminal problems are considered. Using ingredients from topology and homology, the topological structures of solution sets (closedness and compactness) as well as some geometric properties (contractibility, acyclicity, AR and R_δ) are investigated. Some of our existence results are obtained via the method of taking the inverse system limit on noncompact intervals.

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1. Introduction

Differential equations with impulses were considered for the first time by Milman and Myshkis [1] and this was then followed by a period of active research which culminated in the monograph by Halanay and Wexler [2]. Many phenomena and evolution processes in physics, chemical technology, population dynamics, and natural sciences may change state abruptly or be subject to short-term perturbations (see for instance [3–5] and the references therein). These perturbations may be seen as impulses. Impulsive problems arise also in various applications in communications, chemical technology,