

STATE DEPENDENT VECTOR MEASURES AS FEEDBACK CONTROLS FOR IMPULSIVE SYSTEMS IN BANACH SPACES

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Abstract. In this paper we consider a general class of impulsive systems in infinite dimensional Banach spaces with controls which are state dependent vector measures. This class includes the classical model widely studied in the literature and also the model proposed recently by the author. We study the questions of existence and regularity properties of solutions for these models. Continuous dependence of solutions with respect to feedback control laws is discussed. The paper is concluded with some comments on open problems in the area.

Keywords. Vector measures, Feedback Controls, Impulsive Systems, Banach Spaces.

AMS (MOS) subject classification: 34G20, 34K30, 35A05, 35B30, 93C25.

1 Introduction

In response to an important remark due to Agarwall and Leela [1], in regards to the popular model for Impulsive systems widely used in the literature [3-5, 7-10], the present author proposed a general class of models [2] that include the classical model and more. This model was later used in the study of optimal controls where the controls are considered as vector measures. However these measures are independent of state and hence open loop. Our objective here is to study a more general class of impulsive systems which are subject to feed back controls modelled by state dependent vector measures. Consider the bounded interval $I \equiv [0, T]$ and let \mathcal{B} denote the sigma algebra of Borel subsets of the set I . Let E and F be any two Banach spaces with the corresponding (topological) duals E^* and F^* respectively. Let ν be a fixed bounded countably additive signed measure on \mathcal{B} . We consider the evolution equation in E driven by the signed measure ν as follows

$$dx(t) = Ax(t)dt + f(t, x(t))dt + g(t, x(t))\nu(dt), t > 0, \quad (1)$$

$$x(0) = x_0. \quad (2)$$

This is the general model for an impulsive system in a Banach space in which the jumps in the state are introduced through the signed measure ν . Clearly