Dynamics of Continuous, Discrete and Impulsive Systems
Series **A:** *Mathematical Analysis* **9 (2002)** 599-606

AN EXISTENCE THEOREM FOR SECOND ORDER FUNCTIONAL DIFFERENTIAL INCLUSIONS

Mouffak Benchohra

Département de Mathématiques
Université de Sidi Bel Abbès
BP 89, 22000 Sidi Bel Abbès, Algérie
e-mail: benchohra@yahoo.com

Dedicated to Professor C. Corduneanu for his 73rd birthday

Abstract. In this paper we investigate the existence of solutions on a compact interval to second order initial value problems for a class of functional differential inclusions in Banach spaces. We shall rely on a fixed point theorem for condensing maps due to Martelli.
AMS (MOS) Subject Classifications: 34A60, 34G20, 34K10.

1 Introduction

Existence of solutions on compact intervals for functional differential equations has received much attention in recent years, we refer for instance to the books of Erbe, Qingai and Zhang [4] and Henderson [5], the survey paper of Ntouyas [13], the paper of Hristova and Bainov [6], Nieto, Jiang and Jurang [12] and Liz and Nieto [10] and the references cited therein. The methods used are usually the topological transversality of Granas [3] and the monotone iterative method combined with upper and lower solutions [8].

In this paper we shall prove a theorem which assures the existence of solutions defined on the a compact real interval for the initial value problem (IVP for short) of the second order functional differential inclusion

$$y'' \in F(t, y_t), \quad t \in J = [0, T] \tag{1.1}$$

$$y_0 = \phi, \ y'(0) = \eta \tag{1.2}$$

where $F : J \times C(J_0, E) \longrightarrow 2^E$ (here $J_0 = [-r, 0]$)) is a bounded, closed, convex valued multivalued map, $\phi \in C(J_0, E)$, $\eta \in E$, and E is a real Banach space with the norm $|.|$.

For any continuous function y defined on the interval $J_1 = [-r, T]$ and any $t \in J$, we denote by y_t the element of $C(J_0, E)$ defined by

$$y_t(\theta) = y(t + \theta), \quad \theta \in J_0.$$

Here $y_t(.)$ represents the history of the state from time $t-r$, up to the present time t.