



Study of the Existence of Extremal Solutions for Differential Inclusions with Nonlocal Integral Boundary Conditions

Y. Khouni^{1*} and M. Denche²

¹ Faculty of Nature and Life Sciences, University of Batna 2, 53 Road of Constantine, Fesdis, Batna - 05078, Algeria.

² Differential Equations Laboratory, Faculty of Exact Sciences, Brothers Mentouri University, Constantine 1, 25000 Constantine, Algeria.

Received: April 27, 2024; Revised: February 4, 2025

Abstract: In the present paper, we have studied some existence results for extremal solutions for differential inclusions with nonlocal integral boundary conditions, under certain monotonicity assumption. The existence of solutions is obtained via some well known fixed point theorems. An illustrative example is given at the end of this paper.

Keywords: differential inclusions; fixed point theorems; minimal and maximal solutions; nonlocal integral conditions.

Mathematics Subject Classification (2020): 34A60, 34K09, 70K75, 70K99.

1 Introduction

There are many problems in applied mathematics, control theory, nonlinear dynamics, as well as economical systems, Hamiltonian systems and mechanical problems, in which one needs to study the differential inclusions

$$x'(t) \in F(t, x(t)),$$

where $F(.,.)$ is a multivalued function, see for instance [6, 20].

In recent years, many authors have investigated the existence of absolutely continuous solutions for the initial value problems of multivalued differential equations, under

* Corresponding author: <mailto:y.khouni@univ-batna2.dz>