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Nonlinear First-Order Differential Inclusion with a Nonlocal Condition

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- (1) Differential inclusion
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- (3) Fixed point

Abstract

In this paper, we will establish the existence of solutions to following systems of first-order differential inclusions

$$\left(\phi(x(t))\right)' \in F(t, x(t))$$

With nonlinear differential operator, satisfying nonlocal condition $x(\eta) = a \in R^n$, where $\phi: R^n \rightarrow R^n$ is a homeomorphism and $F: [0, T] \times R^n \rightarrow 2^{R^n}$ is lower semicontinuous with nonempty compact decomposable values.

We will rely on the selection theorem developed by Bressan and Colombo to deal with the decomposable (possibly nonconvex) values of F [1], this result allows us to extract an appropriate single-valued selection with good measurability/regularity properties [2].

We apply a topological degree fixed point theorem [3, 4] to guarantee the existence of at least one solution.

When $\eta = 0$ and $n = 1$, our results recover those of M. Aitalioubrahim and N. Ayyadi [5].

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