

Multiple Solutions of Dirichlet Problems to Implicit Differential Equations and Inclusions in Billiard Spaces

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Abstract

This is a joint work with Jan Andres (Palacký University in Olomouc, Czechia). We investigate a Dirichlet problem for implicit differential inclusion of the second order with state-dependent impulses in the form

$$\begin{aligned}x'' &\in f(t, x, x', x'') \quad \text{if } t \in [0, T], \quad x \in \text{int } K, \\x(s+) &= \dot{x}(s) + I(x(s), \dot{x}(s)), \quad \text{if } x(s) \in \partial K, \\x(0) &= A, \quad x(T) = B, \quad A, B \in \text{int } K,\end{aligned}$$

where K is an interval in $\mathbb{R}^n$, $f : [0, T] \times K \times \mathbb{R}^{2n} \multimap \mathbb{R}^n$ is the Marchaud mapping, the impulse function I corresponds with the absolutely elastic impact of the ball at the boundary of the "billiard table" K , $T > 0$. We give existence and multiplicity result for solutions with prescribed number of impacts.