INFINITELY MANY SOLUTIONS FOR A BOUNDARY VALUE PROBLEM

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Abstract

The purpose of this paper is the study of hemivariational inequalities with Neumann boundary condition. Our approach is based on nonsmooth critical point Theorem.

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1 Introduction

The applications to nonsmooth variational problems have been seen in (cf. [2]), Bonanno and Candito studied a class of variational-hemivariational inequalities; In (cf. [1]), Alimohammady studied variational-hemivariational inequality on bounded domains.

The aim of this paper is to study the following boundary value problem, depending on the parameters λ, μ with non-smooth Neumann boundary condition:

$$\begin{cases} -\Delta_p u + a|u|^{p-2}u = 0 & in\ \Omega \\ -|\nabla u|^{p-2}\frac{\partial u}{\partial \nu} \in -\lambda \partial F(x,u) - \mu \partial G(x,u) & on\ \partial\Omega \end{cases} \tag{1}$$

We assume that it is given a functional $\chi : X \to \mathbb{R} \cup \{+\infty\}$ which is convex, lower semicontinuous, proper whose effective domain $dom(\chi) = \{x \in X : \chi(x) < +\infty\}$ is a (nonempty, closed, convex) cone in X.
Our aim is to study the following hemivariational inequalities problem:
Find $u \in dom(\chi)$ which is called a weak solution of problem (1), i.e; if for all $v \in dom(\chi)$,

$$\int_\Omega |\nabla u|^{p-2}\nabla u \nabla(v-u)dx + \int_\Omega a|u|^{p-2}u(v-u)dx$$

$$-\lambda \int_{\partial\Omega} F^0(x,u,v-u)d\sigma - \mu \int_{\partial\Omega} G^0(x,u,v-u)d\sigma \geq 0. \tag{2}$$

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