Regularity results for a class of obstacle problems

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Abstract

We present some higher differentiability results of integer and fractional order of the gradient of solutions to variational obstacle problems of the form

$$\min\left\{\int_{\Omega} F(x,u,Du)dx:\ u\in u_0+\mathcal{K}_{\psi}(\Omega)\right\},$$

where $\Omega\subset\mathbb{R}^n$ is a bounded set, $n\geq 2$. The boundary datum u_0 and the obstacle ψ belong to the Sobolev class $W^{1,p}(\Omega)$ and the admissible class $\mathcal{K}_{\psi}(\Omega)$ is defined as follows

$$\mathcal{K}_{\psi}(\Omega)=\{v\in u_0+W^{1,p}(\Omega):\ v\geq\psi\}.$$

The energy density F is assumed to be convex and of class C^2 and satisfies p-growth condition, $p\geq 2$, with respect to the gradient variable.
We show that a Besov regularity assumption on the gradient of the obstacle ψ transfer to the gradient of the solution.
The results are contained in joint works with Michela Eleuteri ([1],[2]).

References

[1] M. Eleuteri; A.Passarelli di Napoli, Higher differentiability for solutions to a class of obstacle problems, *Calc. Var. and PDE's*, 2018, 57:115.

[2] M. Eleuteri; A.Passarelli di Napoli, Regularity results for a class of non-differentiable obstacle problems, *Nonlinear Anal.* 194, (2020), 111434.

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