HIGHER DIFFERENTIABILITY RESULTS FOR SOLUTIONS TO SOME NON-AUTONOMOUS ELLIPTIC OBSTACLE PROBLEMS

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The aim of this talk is to present some higher differentiability results for solution to non-autonomous obstacle problems of the form

$$\min \left\{ \int_{\Omega} f\left(x, Dv(x)\right) dx \, : \, v \in \mathcal{K}_{\psi}(\Omega) \right\},$$

where $\mathcal{K}_{\psi}(\Omega)$ is the class of admissible functions and the function f satisfies some growth and ellipticity conditions.

Mostly, the energy density satisfies standard p-growth conditions, with $p \geq 2$ or $1 < p < 2$, but also the case of (p, q)-growth conditions is treated, with $q > p \geq 2$.

The second key point is that the map $x \mapsto D_{\xi} f(x, \xi)$ belongs to a suitable functional space, and the regularity properties of solutions depend on this space, and on the assumptions on the obstacle ψ.

In [1], [3] and [4], the obstacle and the map $x \mapsto D_{\xi} f(x, \xi)$ belongs to some Sobolev spaces and ψ is also assumed to be a priori bounded.

In [2] both integer and fractional order higher differentiability results are proved, since both the cases of Sobolev and Besov-Lipschitz coefficients are treated.

References

[1] M. Caselli, A. Gentile and R. Giova, *Regularity results for solutions to obstacle problems with Sobolev coefficients*, **269**, no. 10 (2020), pp. 8308–8330.

[2] A. Gentile, *Higher differentiability results for solutions to a class of non-autonomous obstacle problems with sub-quadratic growth conditions*, Forum Mathematicum, **33**, no. 3 (2021), pp. 669–695.

[3] A. Gentile and R. Giova, *Regularity results for solutions to a class of non-autonomous obstacle problems with sub-quadratic growth conditions*, `https://arxiv.org/abs/2201.07679` (2021, preprint).

[4] A. Gentile, R. Giova and A. Torricelli, *Regularity results for bounded solutions to obstacle problems with non-standard growth conditions*, `https://arxiv.org/abs/2110.09586` (2021, preprint).

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