$p(x)$-Harmonic functions with unbounded exponent in a subdomain

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Abstract

We study the Dirichlet problem for the $p(x)$-Laplacian, when the variable exponent $p(x)$ is infinite in a subdomain D of the reference domain U. The main issue is to give a proper sense to what a solution is and we consider the limit of the solutions u_n corresponding to the problem obtained by replacing $p(x)$ with $p_n(x) = \min(p(x), n)$. Under suitable assumptions on the data, we find that such a limit exists and that it can be characterized as the unique solution of a variational minimization problem which is, in addition, infinity-harmonic within D. Moreover, we examine this limit in the viscosity sense and find the boundary value problem it satisfies in the whole of U. This is a joint work with Juan J. Manfredi and Julio D. Rossi.