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Quasilinear elliptic equations with source terms involving the function or its gradient

in collaboration with Haydar ABDELHAMID

Abstract

Here we consider a quasilinear equation of the form

$$\begin{cases} -\Delta_p v = \lambda f(x)(1 + g(v))^{p-1} & \text{in } \Omega, \\ v = 0 & \text{on } \partial\Omega, \end{cases} \quad (1)$$

where $p > 1$, $f > 0$, $\lambda > 0$, and g is nondecreasing, $g(0) = 0$. We show a precise link with a second problem presenting a source gradient term with a natural growth:

$$\begin{cases} -\Delta_p u = \beta(u) |\nabla u|^p + \lambda f(x) & \text{in } \Omega, \\ u = 0 & \text{on } \partial\Omega, \end{cases} \quad (2)$$

where $\beta(u) \geq 0$, defined on an interval of \mathbb{R} . We deduce new results of existence and multiplicity concerning the two problems, and the existence of extremal solutions, in particular when g is convex and $\lim_{t \rightarrow \infty} g(t)/t = \infty$.