

# EXISTENCE AND MULTIPLICITY RESULTS FOR SINGULAR PARTIAL DIFFERENTIAL EQUATIONS WITH SUPERLINEAR TERM

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We study the solution of **S. Yijing, W. Shaoping and L. Yiming** in *Combined Effects of Singular and Superlinear Nonlinearities in Some Singular Boundary Value Problems (2001, Journal of Differential Equations)* for the following singular problem:

$$\begin{cases} -\Delta u = h(x)u^{-\gamma} + \lambda u^\beta & \text{in } \Omega, \\ u > 0 & \text{in } \Omega, \\ u = 0 & \text{in } \partial\Omega; \end{cases} \quad (0.1)$$

where  $\Omega \subset \mathbb{R}^N$  is a bounded domain with smooth boundary  $\partial\Omega$ ,  $N \geq 3$ ;  $h \in L^2(\Omega)$ ,  $h > 0$  a.e. in  $\Omega$ ;  $0 < \gamma < 1$ ;  $\lambda > 0$  and  $1 < \beta < 2^* - 1$ ,  $2^*$  being the critical exponent of the Sobolev embedding, given by  $2^* = \frac{2N}{N-2}$ .

It is proved that under certain hypothesis there exists  $\lambda_0 > 0$  such that for all  $\lambda \in (0, \lambda_0)$ , the problem (0.1) has two weak solutions. The proof is based on Variational Methods and on the usage of the Ekeland Variational Principle and the Nehari sets.

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