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Minima of Some Integral Functional: Existence and Regularity

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Abstract: We prove the existence and the regularity of minima for functional whose prototype is:

$$J(u) = \int_\Omega \frac{|\nabla u|^p}{(1+|u|)^{\alpha p}}\, dx - \int_\Omega F.\nabla u\, dx, \qquad u \in\ W_0^{1,p}(\Omega),$$

where Ω is a bounded domain of $I\!R^N$, $p > 1$ and $\alpha > 0$. The function F belongs to some Lebesgue space.

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1 Introduction and Statement of Results

In this paper, we deal with the study of minima for functional whose prototype is:

$$J(u) = \int_\Omega \frac{|\nabla u|^p}{(1+|u|)^{\alpha p}}\, dx - \int_\Omega F.\nabla u\, dx, \qquad u \in\ W_0^{1,p}(\Omega), \tag{1.1}$$

where Ω is a bounded open subset of $I\!R^N$, $N \geq 2, \alpha > 0$, and and $1 < p < N$. The datum F belongs to the space $(L^r(\Omega))^N$ for some $r \geq 1$.

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