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Convex Bodies of Optimal Shape

Given a continuous function $f : S^{n-1} \to \mathbb{R}$, we consider the minimization of the functional $\int_{\partial A} f(\nu_A)\, d\mathcal{H}^{n-1}$ with respect to $A \subset \mathbb{R}^n$, included in a class of convex bodies defined by surface or shape conditions. This corresponds to non-parametric formulations of older problems, including Newton's problem of the body of minimal resistance, following an approach due to G. Buttazzo and P. Guasoni [J. Convex Analysis 4 (1997) 343–351]. We establish existence and uniqueness results and some characterizations of the minimizers.