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Parametric Variational Principles in Absence of Convexity: A Compact Zero-Dimensional Approach

Communication Info

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Abstract

The notion of a parametric variational principle first appeared in the work of P. Georgiev [1], who established a parametric version of the smooth Borwein-Preiss's variational principle, which itself contains the Ekeland's one as a special case. More recently, R. Deville and A. Procházka [2] proved a parametric version of the Deville-Godefroy-Zizler variational principle.

In comparison with [1, 2], we establish in this paper a parametric variational principle in the nonconvex setting. To this end, we first assume that the parameter space is paracompact and zero-dimensional; this topological condition compensates for the absence of a convex structure. We prove a key lemma that ensures the existence of continuous approximate minimizers, which arises as a particular case of the nonconvex selection theorem [3, Theorem (2.4)]. This lemma plays a central role in the proof of our main result. In a second time, both compacity and zero-dimensionality of the parameters set well be involved, with natural conditions on the original function, in the proof which proceeds through a meticulous analysis of the lower sublevel sets and applying a Baire category theorem.

As a consequence, our main result yields parametric versions of classical variational principles.

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