Potential homeomorphisms in Banach spaces

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Basing on the Mountain Pass Lemma and Ekeland's Variational Principle, we show how the local properties of of potential homeomorphisms can (in some special cases) affect their global geometry. We also provide an alternative proof of certain results from [1] (the reasoning presented does not require the direct use of the Deformation Lemma). We present an attempt to characterise potential homeomorphisms on Banach spaces. As a consequence we obtain that whenever A is monotone and potential homeomorphism, we necessarily have

$$\lim_{\|u\|\to\infty} \langle A(u), u \rangle = \infty.$$

This observation is used to show that bijectivity of monotone and potential homeomorphsim in invariant under monotone perturbations.

References

[1] Pucci, P. and Serrin, J. (1984). *Extensions of the mountain pass theorem.* Journal of Functional Analysis, 59(2):185–210.

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