

Extremal principle revisited

Abstract: Since the extremal principle was introduced in 1979, it has proved to be one of the key tools in nonsmooth optimization and variational analysis, serving as a substitution for the classical convex separation theorem when the convexity assumptions are not satisfied. Several extensions of the extremality property of collections of sets have been introduced as well as several extensions of the extremal principle.

After recalling and discussing the conventional extremality, local extremality, stationarity and approximate stationarity properties of collections of sets and the corresponding (extended) extremal principle, we focus on extensions of these properties and the corresponding dual conditions with the goal to expand the applicability of the generalized separability results. The main arguments used in this type of results are refined, and the relationships between different extensions are clarified.

References

- Kruger, A.Y., Mordukhovich, B.S.: New necessary optimality conditions in problems of nondifferentiable programming. In: Numerical Methods of Nonlinear Programming, pp. 116–119. Kharkov (1979). In Russian. Available at <https://asterius.ballarat.edu.au/akruger/research/publications.html>
- Kruger, A.Y., Mordukhovich, B.S.: Extremal points and the Euler equation in nonsmooth optimization problems. Dokl. Akad. Nauk BSSR **24**(8), 684–687 (1980). In Russian. Available at <https://asterius.ballarat.edu.au/akruger/research/publications.html>
- Kruger, A.Y.: Weak stationarity: eliminating the gap between necessary and sufficient conditions. Optimization **53**(2), 147–164 (2004)
- Kruger, A.Y., López, M.A.: Stationarity and regularity of infinite collections of sets. J. Optim. Theory Appl. **154**(2), 339–369 (2012)
- Zheng, X.Y., Ng, K.F.: A unified separation theorem for closed sets in a Banach space and optimality conditions for vector optimization. SIAM J. Optim. **21**(3), 886–911 (2011)
- Bui, H.T., Kruger A.Y.: About extensions of the extremal principle. Vietnam J. Math. **46**(2), 215–242 (2018)
- Bui, H.T., Kruger A.Y.: Extremality, stationarity and generalized separation of collections of sets. J. Optim. Theory Appl. **182**(1), 211–264 (2019)

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CV: El Prof. Alex Kruger es Full-Professor y director del Centre for Informatics and Applied Optimization (CIAO), de la School of Science, Engineering and Information Technology, de la Federation University Australia, en Ballarat. Sus principales áreas de investigación son el análisis no lineal y la optimización. En particular, sus aportaciones al análisis y a la optimización no suave (cálculo subdiferencial, regularidad, extremalidad, optimalidad, condiciones de estacionariedad, etc.) son reconocidas como fundamentales en el análisis variacional. Según MsthSciNet, el Prof. Kruger tiene 66 publicaciones, y 678 citas por 271 autores.