

Robust vector optimization with a variable domination structure

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ABSTRACT.

In this paper we propose a new definition of robustness for uncertain vector-valued optimization problems equipped with a variable domination structure, derive scalarization results and present algorithms for computing robust solutions.

REFERENCES

- [1] Bao, T. Q. and Mordukhovich, B. S., *Necessary nondomination conditions in sets and vector optimization with variable ordering structures*, J. Optim. Theory Appl., **162** (2014), No. 2, 350–370
- [2] Bao, T. Q., Mordukhovich, B. S. and Soubeyran, A., *Variational analysis in psychological modeling*, J. Optim. Theory Appl., **164** (2015), No. 1, 290–315
- [3] Durea, M., Strugariu, R., and Tammer, Chr., *On set-valued optimization problems with variable ordering structure*, J. Global Optim., **61** (2015), No. 4, 745–767
- [4] Ehrgott, M., Ide, J., and Schöbel, A., *Minmax robustness for multi-objective optimization problems*, Eur. J. Oper. Res., **239** (2014), No. 1, 17–31
- [5] Eichfelder, G., *Optimal elements in vector optimization with a variable ordering structure*, J. Optim. Theory Appl., **151** (2011), No. 2, 217–240
- [6] Eichfelder G., *Variable Ordering Structures in Vector Optimization*, Springer, 2014
- [7] Eichfelder, G., Bao, T. Q., Soleimani, B. and Tammer, Chr., *Ekeland's variational principle for vector optimization with variable ordering structure*, Technical report, Preprint-Series of the Institute of Mathematics, Ilmenau University of Technology, Germany, 2014
- [8] Eichfelder, G. and Pielecka, M., *Set approach for set optimization with variable ordering structures part i: Set relations and relationship to vector approach*, J. Optim. Theory Appl., **171** (2016), No. 3, 931–946
- [9] Eichfelder, G. and Pielecka, M., *Set approach for set optimization with variable ordering structures part ii: Scalarization approaches*, J. Optim. Theory Appl., **171** (2016), No. 3, 947–963
- [10] Fliege, J. and Werner, R., *Robust multiobjective optimization & applications in portfolio optimization*, Eur. J. Oper. Res., **234** (2014), No. 2, 422–433
- [11] Ide, J., and Köbis, E., *Concepts of efficiency for uncertain multi-objective optimization problems based on set order relations*, Math. Method Oper. Res., **80** (2014), No. 1, 99–127
- [12] Ide, J., Köbis, E., Kuroiwa, D., Schöbel, A. and Tammer, Chr., *The relationship between multicriteria robustness concepts and set-valued optimization*, Fixed Point Theory Appl., DOI: 10.1186/1687-1812-2014-83, (2014)
- [13] Jahn, J., *Vector Optimization - Introduction, Theory, and Extensions*, Springer, Berlin, Heidelberg, 2011
- [14] Jahn, J., *Vectorization in set optimization*, J. Optim. Theory Appl., **167** (2015), No. 3, 783–795
- [15] E. Köbis. *Set optimization by means of variable order relations*, Optimization, DOI: 10.1080/02331934.2016.1172226, (2016)
- [16] Kuroiwa, D., *Some duality theorems of set-valued optimization with natural criteria*, In *Proceedings of the International Conference on Nonlinear Analysis and Convex Analysis*. World Scientific, 221–228, 1999
- [17] Kuroiwa, D., *The natural criteria in set-valued optimization*, *Sūrikaisekikenkyūsho Kōkyūroku*, (1031):85–90, Research on nonlinear analysis and convex analysis, Kyoto, 1997
- [18] Kuroiwa, D. and Lee, G. M., *On robust multiobjective optimization*, Vietnam J. Math., **40** (2012) No. 2–3, 305–317

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- [19] Yu, P. L., *Cone convexity, cone extreme points, and nondominated solutions in decision problems with multiobjectives*, J. Optim. Theory Appl., **14** (1974), 319–377

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