

On polarizing outranking relations with large performance differences

R. Bisdorff

University of Luxembourg, CSC/ILIAS, raymond.bisdorff@uni.lu

Abstract

We introduce a bipolarly extended veto principle – a positive, as well as negative, large performance differences polarization – which allows us to extend the definition of the classical outranking relation in such a way that the identity between its asymmetric part and its codual relation is preserved.

Keywords: Multiple Criteria Decision Aid, Bipolar Outranking, Large Performance Differences Polarization

In a recent conference, Pirlot and Bouyssou [1] reported that a strict (asymmetric) outranking relation defined similarly to the classical outranking [2] is formally not identical to its codual relation, meaning the negation of its converse. From value-based orderings, we are used to thinking that a decision alternative x is considered *strictly better than* a decision alternative y , when it is not true that y is *at least as good as* x . Consequently, we genuinely expect the '*strictly better than*' relation to be asymmetric. This will, however, only be the case if the corresponding '*at least as good as*' relation is complete, a fact which is usually not verified when dealing with classical outranking relations. This hiatus is problematic because the asymmetric part of an outranking relation is commonly identified as being its codual relation.

In this presentation we explore this problem in the context of our bipolar-valued credibility calculus [3, 4, 5]. Logical characteristic functions will here denote the empirical validation, or not, of a preferential statement with the help of three states : *more true than false*, *more false than true*, or *logically indeterminate*. It is important to notice here, that in this bipolar setting, the logical negation operation can no longer be identified with standard set complementing. Contrary to classical logic, affirmation, as well as refutation of a preferential statement are here, both, based on explicit, not necessarily complementary, empirical arguments.

We will recall the basics of our bipolar-valued credibility calculus [3, 4, 6] in order to illustrate in a second part, following on from the work of Pirlot and Bouyssou [1], the unsound hiatus between the asymmetric part and the codual of the classical outranking concept [7].

In a third part we will introduce a bipolarly extended large performance difference principle which allows us to adapt the definition of the classical outranking concept in such a way that the identity between its asymmetric part and its codual is indeed given.

Solving a small didactical best choice decision problem, will illustrate the usefulness of our approach and conclude this presentation.

References

- [1] M. Pirlot and D. Bouyssou. Analysing the correspondence between strict and non-strict outranking relations. In Erwin Pesch and Gerhard Woeginger, editors, *23rd European Conference on Operational Research: Book of Abstracts*, Bonn, July 2009.
- [2] B. Roy and D. Bouyssou. *Aide Multicritère à la Décision : Méthodes et Cas*. Economica, Paris, 1993.
- [3] R. Bisdorff. Logical foundation of fuzzy preferential systems with application to the ELECTRE decision aid methods. *Computers & Operations Research*, 27:673–687, 2000.
- [4] R. Bisdorff. Logical foundation of multicriteria preference aggregation. In Bouyssou D et al., editor, *Aiding Decisions with Multiple Criteria*, pages 379–403. Kluwer Academic Publishers, 2002.
- [5] R. Bisdorff, M. Pirlot, and M. Roubens. Choices and kernels from bipolar valued digraphs. *European Journal of Operational Research*, 175:155–170, 2006.
- [6] R. Bisdorff. Concordant outranking with multiple criteria of ordinal significance. *4OR*, 2(4):293–308, 2004.
- [7] B. Roy. The outranking approach and the foundations of the ELECTRE methods. *Theory and Decision*, 31(1):49–73, 1991.