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A THEORETICALLY SOUND PROCEDURE FOR ELICITING THE PARAMETERS OF A VARIANT OF ELECTRE-TRI

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Abstract: *The additive multiattribute value function model is the main and historically the first model proposed for representing the preference of a decision maker (DM) on a set of alternatives described by multiple attributes (or criteria). From the outset, the exact conditions under which the preferences of the DM can be represented in this model were established. Having at our disposal an exact axiomatic description of a model enables us to design rigorous methods for eliciting the model's parameters. In the case of the additive value function model, such parameters are the marginal value functions and the tradeoffs. Among the rigorous methods for eliciting them is the construction of standard sequences. Even though rigorous methods are often not applicable as such in practical decision situations, they do provide useful guidelines when it is required to depart from them without betraying the essence of the model. Apart from the well-established multiattribute value function theory, a large number of methods were proposed to rank, chose from or sort into ordered categories alternatives evaluated with respect to several criteria. However, much less attention (to say the least) was devoted to give them firm theoretical foundations, which leaves these methods unprotected against suspicions of arbitrariness. Outranking methods such as ELECTRE or PROMETHEE are early examples of such alternative methods, all based on pairwise comparisons. Some efforts were recently made for establishing axiomatic foundations for the outranking relation of the ELECTRE methods. However, a characterization of rankings obtained by means of ELECTRE methods has not been achieved to date. Fortunately, the case is different for ELECTRE-Tri, a method proposed for sorting alternatives into predefined ordered categories. In contrast with ranking methods, which reflect a relative evaluation of the alternatives, sorting methods aim at absolute evaluation. Bouyssou and Marchant (B&M) gave an axiomatic characterization of a variant of ELECTRE-Tri, used with the pessimistic (or pseudo-conjunctive) assignment rule. They named the characterized sorting model Non-Compensatory Sorting (NCS) model. B&M axioms allow us to clearly understand the parameters of the model, namely, the limit profile(s) and the set of sufficient coalitions of criteria. It is hence possible to design rigorous elicitation methods in which the decision maker is asked to assign well-chosen alternatives into a category. The purpose of this work is to present some questioning algorithms in the case of sorting in two ordered categories. The difficult part is the elicitation of the set of sufficient coalitions of criteria. We present an algorithm based on a depth first search exploration of the set of criteria coalitions. This algorithm is not optimal in terms of the number of questions (neither in the worst case nor on average) but it is flexible. Its performance is compared to that of an algorithm that is optimal in the worst case and to what is known about questioning strategies that are optimal on average.*

Keywords: *Multicriteria decision aiding, multicriteria sorting, non-compensatory sorting model, ELECTRE-Tri, parameters elicitation.*