

MODEL FOR INFERRING OUTRANKING PARAMETERS BASED ON HOLISTIC INFORMATION FROM A GROUP OF DECISION MAKERS

Pável A. Álvarez^a, Danielle C. Morais^b, Juan C. Leyva López^a, Adiel Teixeira de Almeida^b

^aDepartment of Economic Science, University of Occident, Culiacan, Sin, 80020, Mexico

^bDepartment of Production Engineering, Federal University of Pernambuco, Recife, PE, 50740-530, Brazil

pavel.alvarez@udo.mx, daniellemorais@yahoo.com.br, juan.leyva@udo.mx, almeidaatd@gmail.com

ABSTRACT

This work is based on a disaggregation approach for the ELECTRE III method for the group decision-making. We provide a procedure in which the group is supported for tune up the parameters of outranking methods in an iterative and interactive process. An inferring parameters tool obtains holistic information from decision makers, which supports the stage of parameters modification in correspondence with the preferences of the whole group (collective ranking). This inferring parameters tool may be used to help the group to iteratively reach an agreement on how to rank alternatives at a time, reflecting the preferences at the individual level and at the collective level.

In outranking methods, the *Decision Makers* (DMs) express their preference in pseudo-criteria form (w, q, p, v) . With a group preferential aggregation method, which is based on individual's results, a temporal collective ranking is generated. A procedure is iterative developed until reach certain consensus level. The consensus definition is regarded with the similarity of the individual results with group solution. The similarity is measured as a function between DM's ranking (R_i) and group ranking (R_G), $Similarity(R_i, R_G)$. The consensus level (C_A) is calculated with the approximation of the individuals' results with the collective result, $C_A = \sum_{i=1}^{ND} \frac{similarity(R_i, R_G)}{ND}$, where ND is the total of DMs belonging to the group.

When the consensus is not reached ($C_A < \alpha$) some DMs need to change their individual preferences (w, q, p, v) to generate a new individual solution and next a new temporal collective solution. As it is a difficult task for the DM, an inferring parameter tool supports the DM in this stage of tuning parameters up.

The inferring parameters tool is based on a model that considers both individual and group preferences to propose parameters, which obtain individual results matching the collective preference. The tool is developed with an inferring parameters model. This is exploited with a genetic algorithm because the facility of converging and obtaining the Pareto frontier since first running. A solution is encoded as a set of pseudo-criteria in an m -ary string.

$$\text{Individual } \tilde{p} = \begin{array}{ccccccc|ccccccc} w_1 & q_1 & p_1 & v_1 & \dots & w_n & q_n & p_n & v_n & & & & & & & \\ \hline 0.2 & 0 & 10 & 0 & 20 & 0 & 35 & \dots & 0.1 & 0 & 1 & 0 & 3 & 0 & 5 & \end{array}$$

An individual \tilde{p} is feasible if $u(\tilde{p}) = 0$ and infeasible if $u(\tilde{p}) > 0$. Each individual \tilde{p} can then be represented by a duple of objectives u, d .

- i) Individual whose objective function u value is equal to zero. This ensures the all preference information given by the DM (A^*) is included in the preference model generated by the new parameters.
- ii) Individual whose objective function d value is close to zero. This indicates that individual preference obtained by the DM is similar with the group preference.

KEYWORDS. Inferring parameters, Preference disaggregation analysis, Group decision-making/GDSS.

ADM - Multicriteria Decision Aid