ABSTRACT OF
GRAPH DISTANCE IN MULTICRITERIA DECISION MAKING CONTEXT

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ABSTRACT. In this article we are introducing a dissimilarity measure on a certain class of oriented graphs arising in the context of group decision making. Group consensus is done using Potential Method (PM) developed by author. Main step in PM is to determine normal integral (value function) X of the preference flow F on the set of alternatives by solving the normal equation

$$B^\tau B X = B^\tau F, \quad \sum_{i=1}^{m} X_i = 0$$

where B is incidence matrix of the graph.

Two decision makers can define two different preference flows on the set of alternatives. If they induce the same value function they are considered equivalent. In this context, equation

$$\delta(F_1, F_2) := \|X_1 - X_2\|$$

gives a good dissimilarity measure on the set of preference flows over the same set of alternatives.

We used this measure to define distance matrix for a set of individual preferences in a certain Multi Criteria Group Decision problem. During the research students were asked to give preference flows, for a certain number of criteria, over the set of their teachers. The experiment was organized at two different places. Students of the first group, 29 of them, were allowed to select criteria and alternatives on their own choice, while students of the second group, 48 of them, were forced to select all criteria and all alternatives. Web interface of the questionnaire was (is) available one the local server. Students were allowed to see only their own ranking after processing their input.

In both cases, dissimilarity matrix of individual preference flows was calculated for each group and `Statistica` software was used for clustering. In the first group, outlayers were discovered and eliminated from the group consensus flow. Fine analysis of criteria ranking was not possible due to the lack of information. In the second group two clusters were present and group consensus generated by them were not significantly different. This lead to conclusion that dissimilarity measure, defined above, is very sensitive as a function of preference flow.

Another applications of the method, not discussed here are: discovering hidden conflicts in society, testing a homogeneity of micro-social structures, like sport teams. . .