TOPIC: OPERATIONS RESEARCH

TITLE: MULTIPLE CRITERIA AND GROUP DECISION ANALYSIS

SUBTITLE: AHP: GROUP METHODS, AGGREGATION, WEIGHTS,
                  CONSISTENCY, INTERVAL JUDGMENTS

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ABSTRACT

The concept of Multiple Criteria Decision Analysis (MCDA) is simple, natural, attractive and especially of great practical use. Thus, MCDA is an important part of Operations Research (OR) and numerous of articles and books discuss this topic (for example: Vincke, P.: Multicriteria Decision Aid, 1992; and Figueira, J., Greco, S., Ehrgott, M.: Multiple Criteria Decision Analysis, 2005). The domain of MCDA is choosing, ranking or sorting the possible courses of actions (alternatives) of the problem under consideration. Despite the variety of MCDA approaches, methods and techniques, the basic elements of MCDA are very simple: a finite or infinite set of actions, at least two criteria and at least one decision maker (DM). When presenting these elements in a hierarchical structure, and aggregating the preferences of several DMs into collective preferences under a set of conflicting criteria, group Analytic Hierarchy Process (AHP) is suitable as MCDA technique.
AHP (Saaty, T.L.: The Analytic Hierarchy Process, 1980) enables combining empirical data and subjective judgments, and also intangible and immeasurable criteria. It is based on pairwise comparisons of criteria and alternatives on the same level regarding those on the next higher level. Although, group AHP has been extensively studied and applied in plentiful multicriteria problems with several DMs, some theoretical/methodological questions remained still unsolved.

Consequently, this lecture is involved in:
1. A quick overview of MCDA methods
2. An overview of AHP methods for calculating a priority vector from comparison matrix for one DM
3. A review of group AHP methods (several DMs)
4. Proposal of our new invented group AHP method
5. The prove of theorem about acceptable consistency of group comparison matrix
6. Proposal of a new method for aggregating individual judgments in an interval group judgment
7. Some ideas for applications of new, in the lecture proposed, group AHP methods

The new proof about acceptable consistency of group matrix, a new group AHP method for calculating priority vector and a new method for aggregation of individual judgments into group interval judgment presented in the lecture are based on some joint papers with my assistant and doctoral student Petra Grošelj, University of Ljubljana, Biotechnical Faculty:
- GROŠELJ, P., ZADNIK STIRN, L.. Acceptable consistency of aggregated comparison matrices in analytic hierarchy process. *Eur. J. oper. Res*. 2012, vol. 223, no. 2, str. 417-420
- GROŠELJ, P., PEZDEVŠEK MALOVRH, Š., ZADNIK STIRN, L.. Methods based on data envelopment analysis for deriving group priorities in analytic hierarchy process. *Cent. Eur. j. oper. res*., 2011, vol. 19, iss. 3, str. 267-284
- GROŠELJ, P., ZADNIK STIRN, L..Aggregation of individual judgments into group interval judgment in AHP, Submitted to *Fuzzy sets and systems*.