MULTIPLE CRITERIA DECISION MAKING UNDER RISK, UNCERTAINTY AND FUZZINESS

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In the paper the problems of multiple criteria decision making where some of the data given are vaguely defined are discussed. The vagueness may concern the values of the criteria given, the values of weights of the criteria as well as the definition of the set of feasible alternatives.
To start with the mathematical means of expressing such phenomena are briefly surveyed (fuzzy relations and sets theory, statistical decision functions, subjective probabilities).
The problem of vaguely defined values of characteristics is discussed. Three main types of situations are distinguished:
- incompletely defined characteristics
- interval - valued characteristics
- fuzzy - valued characteristics.
In those cases the problem of aggreating such vaguely defined characteristics is handled. There exist various ways of introducing fuzzy concepts into the model of decision-making situation. We discuss three of them, namely the modelling of decision-maker's preferences by a fuzzy relation (which leads to the problem of defining optimality or at least efficiency under such relation), the representation of characteristics by fuzzy sets of alternatives and the evaluation of alternatives with

respect to the characteristics by fuzzy numbers (including some problems of ordering fuzzy numbers).

Further the problem of vaguely specified relative importance of characteristics is studied, especielly with regard to the necessary modifications of Saaty's method of determining weights. In the problems of vector optimization (i.e. the multicriteria problems with potentially infinite set of feasible alternatives) the problems of fuzziness can be possibly handled by means of fuzzy programming approach, the relations of which to general vector optimization theory is discussed.

Some problems of exchanging fuzzy information between decision-maker and analyst in the interactive procedures of vector optimization are dealt with as well.

The problems of practical applications of selected approaches are also discussed with particular emphasis laid on the prognostic activities.