

Decision support systems mainly based on the methods belonging to the multi-criteria decision analysis (MCDA), which are part of operational research. MCDA methods have been used in tens of thousands of scientific papers, but in spite of their great popularity in the vast majority of them have been identified phenomenon rank reversal. It is a paradox that can be explained by a simple example. Let us assume that we have 4 alternatives A, B, C and D. As a result of the application of a MCDM method will be a following ranking:  $A > B > C > D$ , where the best solution is A and the worst is D. Rank reversal phenomenon lies in the fact that by removing from the basic set of alternatives, e.g. alternative D, we can use the same method to obtain a new rank as  $B > C > A$ . As a result, there has been a change in the initial ranking. Earlier, top-rated option was option A, which is the worst now. This means that we have two somewhat contradictory rankings, where a very difficult task to determine which one is correct.

In response to this problem, a new author's method was proposed, i.e., the Characteristic Objects METHod (COMET). This method takes advantage of fuzzy logic. So that the proposed algorithm has proved to be fully resistant to the reversal phenomenon rank. This method found many practical applications.

The proposed project is looking for a new method based on the achievements in the development of COMET method, and at the same time aims to provide decision support under uncertainty. It turns out that very often the information and data upon which decisions are made are vague, doubtful or uncertain. For this purpose, we propose to use and thoroughly tested three generalizations of fuzzy sets, i.e., intuitionistic fuzzy sets, fuzzy sets type-2 and a hesitant fuzzy sets. These tools are successfully cope in conditions of uncertainty, and that can be used to develop new methods for better decision support.

The newly developed method enables better decision-making under uncertainty. This is especially important in deciding whether strategic or tactical, whose complexity is very high, and the effects are difficult to predict. Therefore, the creation of a new tool that could support these processes is extremely important. So far, there has been since the proposed method, which solved that to all of these problems, and at the same time make any identification of human preference function in the whole domain of decision-making problem.