ABSTRACT

A multi criteria problem consists of a number of alternatives which are evaluated under a set of predefined, usually conflicting, evaluation criteria. An aggregation phase refers to a function or an aggregation operator which combines the performance values of each alternative in order to produce a single final score. This single final score implies the preference score of the particular alternative which will be helpful for decision makers in selecting, ranking or sorting the alternatives. The available aggregation operators can be grouped into two major classes which are called as additive and non-additive aggregation operators. This study investigated an operator called Choquet aggregation operator which can be called as a generalized operator due to its capability of becoming both types of operators. It is found that the Choquet aggregation operator is of an additive type in a situation where the interactions among the criteria are not considered. Conversely, it is a non additive aggregation operator when the interactions are found and determined prior to its utilization. This research has provided several subjective approaches to calculate these interactions which are also known as fuzzy measures.

To elaborate more on its capability, one multi criteria problem in educational sector was identified and solved by this operator. Based on the data of the academic achievement of 33 students of year six on five subjects in a primary school in Perlis, two sets of aggregated final scores were obtained. One set of the final scores was evaluated by the operator after considering the interactions between the criteria which were calculated as λ-fuzzy measures. The other set of the overall scores was obtained by simple weighted average method with the assumption that the subjects were independent but were assigned with subjective weights of importance. These two sets of scores were compared with the scores provided by schools that were determined by simple average method and grade point average (PNGK) method. The overall performance score of students obtained by Choquet non additive aggregation operator was suggested as the main reference for the school to analyze the performance of the students. This is due to the fact that in many practical applications most criteria present interactive characteristics. It is also suggested that, a new grading Choquet-based information system for evaluating students' performance could be introduced in all level of education. Furthermore, the usage of this aggregation operator could be extended in evaluating performance across other sectors because it can be used in two different settings whether the evaluation criteria are independent or there are interactions or interdependencies between the criteria.

Keywords: aggregation, Choquet, interaction, fuzzy measure, additive, non-additive, academic achievement