Flexible Aggregation In Multiple Attribute Decision Making: Application To The Kuranda Range Road Upgrade

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Abstract

The conventional method of aggregating the satisfaction of transport projects with respect to multiple attributes is commonly some variant of Simple Additive Weighting (SAW), which involves the sum of products of standardized outcomes of projects with respect to attributes and attribute importance weights. It is suggested that alternative forms of aggregation might be more useful, in particular, the Ordered Weighted Averaging (OWA) operator introduced by Yager (1988). Attribute importance weights and satisfaction of attributes by projects may be aggregated prior to aggregation via an OWA operator. In this case OWA operator weights may be based on the ‘‘attitudinal character’’ of the decision maker expressed in terms of the degree of ‘‘orness’’ and ‘‘andness’’ of the aggregation. A well-known approach is maximum entropy aggregation, in which weights are derived to be as ‘‘even’’ (or as minimally dispersed) as a possible subject to satisfying a given ‘‘orness’’ or ‘‘andness’’ constraint. Recently, aggregation processes have been proposed by Larsen(1999, 2002, 2003) which have several desirable properties and also may be considered as alternative forms of aggregation. An example is given relating to the Kuranda Range Road upgrade (Queensland, Australia) which is limited by grade, poor overtaking opportunities, poor horizontal alignment, and other constraints, and the road is expected to become increasingly congested over the next few years. A more flexible Multiple Attribute Decision Making is used to identify a ‘‘best’’ project from a set of four alternative projects.

Keywords

simple additive weighting; aggregation operator