Imprecise Swing Weighting for Multi-Attribute Utility Elicitation Based on Partial Preferences

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Abstract

In this paper, we present Imprecise Swing Weighting (ISW), a novel method for eliciting multi-attribute utility functions (MAUFS) based on partial preferences. ISW is a practical, easy-to-use, and computationally efficient method that can be applied to a wide range of problems. The main result is a consistency and uniqueness property that ensures the elicitation problem has a unique solution if and only if the elicitation data satisfy a certain condition. We also present a decision support method for incorporating imprecision in the elicitation process, based on ISW.

Keywords: Multi-Attribute Utility, Elicitation, Imprecise Preferences, Partial Information, Decision Support.

1. Introduction

Imprecise models have been widely used in decision analysis and multi-attribute utility theory (MAUT) to address the inherent uncertainty and imprecision in human judgments and preferences. In this paper, we present Imprecise Swing Weighting (ISW), a novel method for eliciting multi-attribute utility functions (MAUFS) based on partial preferences.

2. Imprecise Swing Weighting

The ISW method is based on the concept of swing weighting, which is a simple and intuitive way of assigning weights to attributes. The ISW method extends swing weighting to the imprecise setting, allowing for the elicitation of MAUFS with imprecise preferences.

3. Theoretical Results

The main result of the ISW method is a consistency and uniqueness property that ensures the elicitation problem has a unique solution if and only if the elicitation data satisfy a certain condition.

4. Decision Support

We present a decision support method for incorporating imprecision in the elicitation process, based on ISW. This method allows for the incorporation of imprecise weight statements in the elicitation process, which can be particularly useful in real-world applications where preferences can be only partially specified.

5. Applications

The ISW method can be applied to a wide range of problems, including environmental management, health care, and economic decision-making.

6. Conclusion

ISW is a novel, strong, and very general consistency result that can only be partially specified. The method enables practically handling new very wide range of problems where preference can only be partially specified.

References


Details in the paper!