

Consensus Reaching Model for Two-Rank Group Decision Making with Personalized Individual Semantics

Zhen Zhang

Institute of Systems Engineering, Dalian University of Technology,
Dalian 116024, P.R.China
ZhenZhang_CN@ieee.org

Abstract. Group decision making studies how to obtain a collective solution based on the opinions of multiple decision-makers. In group decision making, to eliminate preference conflicts among decision-makers and ensure that the decisions made are accepted by all decision-makers, it is necessary to use the consensus reaching process to assist decision-makers in feedback adjustment until a satisfactory consensus level is reached. Traditional group decision making problem focuses on obtain a complete ranking of all alternatives from best to worst. However, in many real-life scenarios, there are many group decision making problems that we need to assign two rank levels only for alternatives, so as to create a ranking of one subset of alternatives above another subset, which is called two-rank group decision making problems. As an effective tool to express decision-makers' preference relations, linguistic preference relations can be used due to the fact that it allows decision-makers to compare only two alternatives at a time using linguistic terms. However, in two-rank group decision making problems with linguistic preference relations, it is common that the same linguistic term may have different meanings for different decision-makers, which is usually called personalized individual semantics (PISs). How to model PISs in two-rank group decision making problems becomes a challenge that needs to be tackled. In this paper, we develop a consensus reaching model for two-rank linguistic group decision making problems, taking into account PISs for decision-makers. Specifically, we first use consistency-driven models to check and improve the consistency of each decision-maker's linguistic preference relations. On this basis, we determine the two-rank preference vectors for individuals and the group. Afterward, we propose a two-rank consensus measure method and design a two-rank consensus reaching process to help decision-makers improve the consensus level, in which a PIS-based consensus level maximization model and a PIS-based minimum adjustment model are proposed. Furthermore, an algorithm is proposed to implement the consensus reaching framework. Ultimately, a numerical experiment and some simulation results are provided to demonstrate the effectiveness of the proposed method.

Keywords: group decision making, personalized individual semantics, two-rank, consensus reaching process