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**Preference Profile Estimation in Multiple Criteria
Discrete Alternative Problems**

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Abstract

This paper addresses the problem of preference profile estimation based on partial preference information from a decision maker. We assume that the decision maker is faced with a multiple criteria discrete alternative problem and has to rank the alternatives or choose a most preferred one. The research has important applications in discrete MCDM problems involving a large number of alternatives, where the amount of preference information solicited from the DM in ranking the alternatives is an important issue; and in GDM applications where estimated preference profiles can be used to estimate Pareto optimal solutions for the group. We set up the estimation problem as a Graph theory problem, specifically involving solving a Hamiltonian path problem. The nodes in the network correspond to alternatives, and the arc (link) lengths correspond to likelihoods of preference relationships. These likelihoods are estimated using the preference information available and are updated as more information becomes available. The method is an iterative procedure involving repeated solution of the Hamiltonian path problem and additional preference information being elicited from the decision maker. The methods are computationally tested and rules proposed for questioning strategies, termination strategies, and accuracy estimation procedures.