Incorporating Fuzzy Reference Points into Applications of Travel Choice Modeling

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Summary. The uncertainties involved in travel alternatives have an effect on travelers' choices, however travel choice models and commercial applications have limitations in capturing the uncertainty in the mind of the travelers. Travelers' preferences, as revealed in field studies and laboratory studies, are generally supported by the robust findings of Prospect Theory, a descriptive model of individual choice under risk and uncertainty. Prospect Theory models responses to risky situations framed as 'gains' and 'losses' defined over a reference point. However, different from choices made in economic/financial contexts, the concepts of 'winning' or 'loosing' in a travel choice context may be considered to be fuzzy rather than crisp. Extending the principles of prospect theory, this paper introduces a model based on a fuzzy representation of the travel time's reference point in the mind of the traveler.

1 Introduction

Travel choice models are designed to emulate the behavior of travelers over time and space and to predict changes in system performance, when influencing conditions are changed. Such models include the mathematical and logical abstractions of real-world systems implemented in computer software. Uncertainties in the transport system (such as the reliability of transport modes) affect the travel choices made by individuals. Traditionally, uncertainties of transport systems have been addressed in research works and commercial tools (such as equilibrium models, discrete choice models or micro-simulations) by probability measures. It has been argued that common models of travelers' behavior and commercial applications do not offer much insight on the way travelers make choices. In applications that do address the uncertainty or variability in the transport system, travel choice models used mainly measure the uncertainty of the system, and do not attempt to capture the uncertainty in the mind of the traveler, and its effect on travel choices. In order to make practical use of travelchoice models in stochastic networks a link is required between objectively measurable uncertainty of the transport system and travelers' perception of that uncertainty. The aim of this study is to combine elements of travelers' responses to uncertainty in order to represent travel choice in complex travel behavior contexts. In this work it is suggested to combine three important aspects of

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