

# Can We Model Driver Perceptions? An In-Situ Experiment in Real-World Conditions

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## **ABSTRACT**

It is clear that perceptions play a significant role in traveler decisions. Consequently, traveler perceptions are a corner stone in the feasibility of traveler information systems; for traveler information systems are only valuable if the drivers are incapable of accurately acquiring the provided information on their own, and if the provided information is relevant for the drivers' decision criteria. Accuracy of traveler perceptions has been repeatedly researched in public transportation, and has been found to vary according to different reasons. However, in spite of the clear significance of traveler perceptions, minimal effort has been put into modeling it. Almost all travel behavior models are based on traveler experiences, which are assumed to reflect traveler perceptions via the addition of some random error component. This work introduces an alternative approach: instead of adding an error component to represent driver perceptions, it proposes to model driver perceptions. This work is based on a real-world route choice experiment of a sample of 20 drivers who made more than 2,000 real-world route choices. Each of the drivers' experiences, perceptions, and choices were recorded, analyzed and cross examined. The paper demonstrates that: i) driver experiences are different from driver perceptions, ii) driver perceptions explain driver choices better than driver experiences, iii) it is possible to model and predict driver perceptions of travel distance, time and speed.

## 1. INTRODUCTION

It is clear that perceptions play a significant role in traveler decisions. Consequently, traveler perceptions are a corner stone in the feasibility of advanced traveler information systems (ATISs); for ATISs are only valuable if the drivers are incapable of accurately acquiring the provided information on their own, and if the provided information is relevant for the drivers' decision criteria. ATISs are the branch of Intelligent Transportation Systems (ITSs) that entail providing travelers with information to help them make informed decisions. ITSs refer to transportation systems that make use of information technology and communication to tackle negative transportation impacts, such as to mitigate traffic congestion and to reduce accidents.

Accuracy of traveler perceptions has been repeatedly researched in public transportation, and has been found to vary according to different reasons. For example Moreau has found that perceptions of wait time can significantly differ from actual times [1]. Other studies have shown that travel time perceptions can vary according to whether the time is spent traveling or waiting [2, 3], whether the waiting time is expected or not [4], and whether the traveler experiences time drag [1]. Another recent study showed that travel time perceptions can vary according to the drivers' familiarity with the destination [5].

Similarly, a few driver behavior articles discuss variations in value of travel time under different travel conditions. For example, under stopped and moving freeway travel conditions [6]; under free-flow, slowed-down, and stop-and-go travel times [7]; and between ramp-delay and freeway travel times [8].

In spite of the clear significance of traveler perceptions, minimal effort has been put into modeling it. One possible explanation may be attributed to cost and past technological limitations. It is because of these two reasons that most travel research, in general, and route choice, in particular, is based on either stated preference surveys [9, 10] or travel simulators [11, 14]; both of which are characterized with limitations due to their inability to address the accuracy of travelers' perceptions. Stated preference surveys are surveys in which drivers answer questions about their behavior in hypothetical situations. Travel simulators are computer based programs that digitally display the choice situation and its characteristics for a participant. Then the participant makes his/her choice. There are guidelines to make these methods more realistic [15]. Nonetheless, since drivers do not actually live the choice situation, it is impossible for either of the two methods to capture drivers' perceptions of real-world traffic conditions. This been said, it is important to point out that GPS-based and real-life experiments are becoming the norm in travel behavior research [16, 20].

Driver perceptions of travel conditions remains to be an under-researched area. Almost all travel behavior models are based on traveler experiences, which are assumed to reflect traveler perceptions via the addition of some random error component [21, 24]. This work introduces a base for an alternative approach: instead of adding an error component to represent driver perceptions, it proposes to model driver perceptions. This work is based on an in-situ real-world route choice experiment of a sample of 20 drivers who made more than 2,000 real-world route choices. Each of the drivers' experiences, perceptions, and choices were recorded, analyzed and cross examined. The paper demonstrates that driver experiences are different from driver perceptions, drivers

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