

DESIGN AND DEVELOPMENT OF A COMPUTER SIMULATION EXPERIMENT TO SUPPORT MODE/ROUTE CHOICE MODELING IN THE PRESENCE OF ATIS

PROBLEM STATEMENT

Advanced Traveler Information Systems (ATIS) provide real-time information to motorists regarding traffic accidents, roadway maintenance and construction, heavy congestion, emergencies, and other traffic delays. Information is transmitted via the Internet, television, rest area kiosks, in-vehicle displays, radio, cellular telephone, and changeable message signs. As a result of this newly emerging technology, our travel demand models require data on how travelers' mode and route choice decisions are affected by ATIS. However, very few opportunities to collect this type of information exist because implementation of ATIS technologies into transportation systems is limited and is still in the early stages of development. Therefore, alternatives to the typical data collection methods are needed. Typical approaches for collecting data for route choice modeling purposes include mail-based surveys, telephone surveys, and Internet surveys. More recently, however, researchers have been utilizing computer simulation programs as data collection tools to better understand drivers' behavior in relation to ATIS.

OBJECTIVES

The objectives of this effort were to develop a simulation tool that would enable researchers to study the relationship between mode/route choice decision-making and ATIS. The goal is to better understand the complex of decisions, including the multi-modal aspects of travel, made by travelers and to collect data that support the incorporation of the effect of ATIS into travel models. The research also investigates how travelers' choices (mode and route choices) would be affected if ATIS technology allowed them to have real-time pre-trip and en-route traffic information on the network.

FINDINGS AND CONCLUSIONS

In this project, an interactive computer simulation tool was designed and developed. It was (and continues to be) used to run subjects through several travel scenarios, in which subjects were required to make mode and route choices in the presence of ATIS. A portion of the Orlando network has been captured from a GIS database to serve as a test network. Both driver and transit information are displayed on the screen before and during the simulated trip on the test network. Varying types and levels of information are displayed to test different scenarios. A visual basic program has been developed to capture this roadway network and to simulate a moving vehicle on the network.

Using a computer mouse, a subject has the ability to move the vehicle onto different segments of the network. Different levels of information are provided to the subjects, including transit and route information, pre-trip and en-route information, and information with and without advice. The subject is instructed to travel on the network from a specified origin to a specified destination, during which time he/she will make different travel choices. Various travel congestion levels are built into the exercise. All of the travel decisions are captured and coded to a database for analysis. The experiment began and ended with a short survey to collect the subjects' socio-demographic characteristics, preferences, and perceptions. This simulation is unique because it combines route and mode choices under ATIS in a real network environment.

While the main objectives of the research were the design and development of the simulation program that records test subjects' decisions in response to travel information, a preliminary pilot study was conducted by running ten subjects through the simulation. The subjects were recruited from the University of Central Florida (UCF) where they work/study. The subjects ran the simulation without any problems or confusion. The simulation database file was checked and found to have the correct coded information. Analysis of Variance (ANOVA) and descriptive statistics have been applied to the data of this pilot study. Two modeling efforts were introduced. The first model employs a nested logit model to analyze the complex travelers' decisions in the mode/route choices. The second effort was based on the application of binomial logit/probit models to predict en-route short-term choices (link choice). The travel time was found to be significant in all models. The modeling results also showed that as the frequency of receiving en-route traffic information increases, the probability of a driver choosing the expressway system decreases. The results showed that 33.33% of the drivers followed the advised route without any diversion until the destination, when they were provided with pre-trip information; 8.33% followed the updated en-route advised route link-by-link from the current position to the destination.

BENEFITS

The trip distribution and mode choice programs used by Florida's travel demand models currently do not consider the effect that newly emerging ATIS technologies may have on travelers' route and mode-choice decisions. The computer program developed under this research contract is a tool for gathering data on how travelers' decision-making is affected in response to the knowledge about traffic delays that ATIS provides. The new travel characteristics data provided by this program will help to improve Florida's models as ATIS technologies become more prevalent.

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