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TRAVELING SMART: INCREASING TRANSIT RIDERSHIP THROUGH AUTOMATED COLLECTION (TRAC) OF INDIVIDUAL TRAVEL BEHAVIOR DATA AND PERSONALIZED FEEDBACK

PROBLEM STATEMENT

In 1999, the Center for Urban Transportation Research (CUTR) published *Reducing Vehicle Trips and Vehicle Miles of Travel through Customized Travel Options*, a study that demonstrated that the travel habits of households provided with personalized advice could reduce vehicles miles of travel relative to the control group. The project offered a practical exercise that led households to re-appraise their needs and rationale for travel. Specific suggestions aimed at use of public transit service, bike paths, trip chaining, ridesharing, and e-commerce options were provided based on specific travel patterns observed in the activity diaries kept by the study subjects. A weeklong travel diary formed the basis of the personalized advice provided.

Since that project, technology has evolved rapidly to provide a promising method to decrease the costs of collecting and analyzing travel data. In particular, the potential now exists to use personal digital assistants (PDAs) and Global Positioning System (GPS) add-on modules rather than paper diaries, as was done in the previous study, for easier and more accurate tracking of person movements, not simply vehicle movements. The GPS unit provides a means of tracking time, route, and speed, while the PDA provides a means of recording items such as mode, occupancy, and trip purpose. Thus, innovative technology can be employed to better understand and pattern household travel behavior for the purposes of educating, promoting, and encouraging households to utilize alternatives to driving, in general, and to driving alone, in particular. Inefficient and unnecessary fuel consumption through ineffective travel and travel mode choices contributes to energy crises, traffic congestion, air pollution, and loss of productive time.

OBJECTIVES

The study objectives included the following:

1. Determine the capabilities of existing computer and communication technologies in tracking person movements across modes (car, bike, bus, etc.) and over extended time periods (e.g., week versus daily).

2. Design, develop, and test a prototype application to automate the collection of travel behavior data and provide personalized advice to increase use of transit and other alternatives to driving alone.

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FINDINGS AND CONCLUSIONS

This project developed a PDA/GPS/wireless card all-in-one portable prototype unit called "TRAC-IT." The unit collects comprehensive individual trip data including *start time*, *end time*, *origin*, *destination*, *travel speed*, *trip route*, and *trip distance* with minimal input from participant. Limited field testing demonstrated that the technology works. Researchers developed a preliminary personalized feedback system that provides suggestions and encourages participants to utilize modes other than the drive-alone option. The research team developed a system to automatically collect travel behavior data at the person- rather than the vehicle-level and to provide personalized feedback based on the data collected by the test subjects and their households. The developed system was demonstrated to be feasible and able to do the following:

1. Improve the quantity of data collected.

Through the GPS component, TRAC-IT was able to collect and record traveler location, travel path, and speed. The PDA component was able to record GPS information and collect data on travel purpose and occupancy information. The PDA component also applied algorithms developed specifically for this project to reduce the amount of non-essential data, to simplify the analysis. Finally, the system could record travel for all major modes (auto, transit, bike, and walk) to provide a richer and deeper view of travel behavior.

2. Improve the data quality.

TRAC-IT minimized the need for user inputs through the adoption of Graphical User Interfaces (GUI) wizards (e.g., change of mode, frequently visited locations, quick stops). The developed "Smart Diary" components reduced respondent fatigue (i.e., increasing periods of data collection) and improved data quality by populating fields, based on previous patterns, by performing complicated real-time data processing and analysis. For example, for most trips, the participant is expected to provide information on only the following:

- who is traveling
- traveler's current activity
- location at the end of trip
- purpose for being at that location
- travel mode used for the segment of the trip (and was the traveler a driver or a passenger)
- number of household and non-household vehicle occupants for the segment.

The automated elements of TRAC-IT gathered completed data because of wizards developed to capture quick stops, changes of mode, etc. TRAC-IT can collect and analyze multimodal travel behavior and patterns at the household level. Furthermore, TRAC-IT allows data to be synchronized directly into the database, which eliminates the need for data entry and associated errors.

3. Analyze travel behavior at the individual and household levels

TRAC-IT successfully uploaded data to the server and provided suggestions for more efficient transportation options based on the household travel behavior. Other considerations, such as the costs for wide-scale deployment or data collection, enhancements to the underlying technology to address specific transit needs, access to technology, and privacy issues have not been resolved.

BENEFITS

TRAC-IT provides a system that can be used to provide transportation professionals with information useful for planning and facilitating more efficient use of different transportation modes. Benefits of successful implementation should include better use of energy resources and transit services, and positive impacts to air pollution and traffic congestion. Additionally, however, the technology used to develop TRAC-IT could be adapted to other applications. For example, public transit is the only available means of transportation for some, who cannot drive, who do not have a car, or who have a physical or mental disability. Many of these individuals are intimidated by the complexities of public transit, such as how to identify proper routes and transfer points according to schedule, and, therefore, remain trapped in their homes. Getting from one location to another without any assistance, especially for the first time, is especially daunting to those with special needs. Some transit agencies and private providers now employ "travel trainers," whose sole job is to teach new riders with special needs how to successfully travel to and from a particular location using transit. Travel trainers ride with these individuals until they feel that the riders can properly navigate the transit system on their own. Due to the extensive amount of time required in teaching and monitoring individuals with various needs, there is often an extensive waiting list for such assistance from the travel trainers. TRAC-IT's cell phone application could be adapted to increase the productivity of the travel trainer by developing a system using existing mobile communication technologies to assist riders with special needs. Using TRAC-IT as a global positioning system (GPS) enabled cell phone could assist riders with special needs in using the system and enable a travel trainer and/or family members to monitor progress remotely via a simple web page. In addition, the system could be adapted to provide personalized reminders and notifications that are tailored to the specific route that the rider should take. This information could include key locations along the route and timing information that will enable the rider to successfully utilize the public transit system.

Enhancing TRAC-IT to fill such a market need could allow travel trainers to manage numerous cases more efficiently. Such use would increase the sense of independence for these users while assuring their safety and allowing immediate communication with them, as desired or needed.

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