GPS Automated Travel Diary Ready for Travel Behavior Surveys

Outcome —GPS-Automated Travel Diary (GPS-ATD) based on commercial off-the-shelf hardware combined with AHMCT software platform. Ready for use in 2010 survey.

Benefit — The GPS-ATD minimizes user burden during household travel surveys, while providing accurate, reliable, and spatially dense traveler behavior information at a significantly reduced cost. This improved information will enhance travel demand modeling, transportation management, and land use planning. Basing the system on a commercially available platform removes risks associate with commercialization and deployment.

AHMCT researchers, in conjunction with the Caltrans Division of Transportation System Information, have developed the second-generation GPS-ATD to replace traditional paper-and-pencil and computer-assisted approaches for travel surveys. The GPS-ATD minimizes the user burden during longitudinal travel behavior surveys, while providing accurate, reliable, and spatially dense traveler behavior data at a significantly reduced cost. The second-generation GPS-ATD leverages commercially available hardware combined with an enhanced version of AHMCT's travel diary software platform.

Why We Are Pursuing This Research

Household travel surveys directly measure traveler behavior at the level of the individual, and provide for a better understanding of the factors that influence personal travel behavior. These data are critical in:

- developing travel demand models, forecasting demand,
- measuring and understanding trends in population behavior,
- assessing the impact of changes in transportation policy or the transportation system.

Previous surveys used paper-and-pencil diaries to obtain traveler information. This approach has well-known drawbacks, and is not suited for long-term mobility pattern observations. It does not capture detailed route choice information. Moreover, multi-day personal surveys often suffer from survey fatigue and low response rates typical with longer durations. It is common for respondents to under-report or provide incorrect data due to poor memory, misunderstanding instructions, or carelessness. For example, short infrequent trips that occur during the day are most often not reported.

Therefore, a new method is needed for comprehensive, highly automated, and efficient data collection for individual travelers. Many factors can contribute to a driver's decision for choosing a particular route. A system which can monitor traveler location, time, speed, and current and next task is required. Surveys should be carried on for a long duration while maintaining survey data accuracy and minimizing burden on the respondents. The GPS-ATD addresses these needs, and the resulting system can support the next Caltrans longitudinal travel behavior survey in 2010.

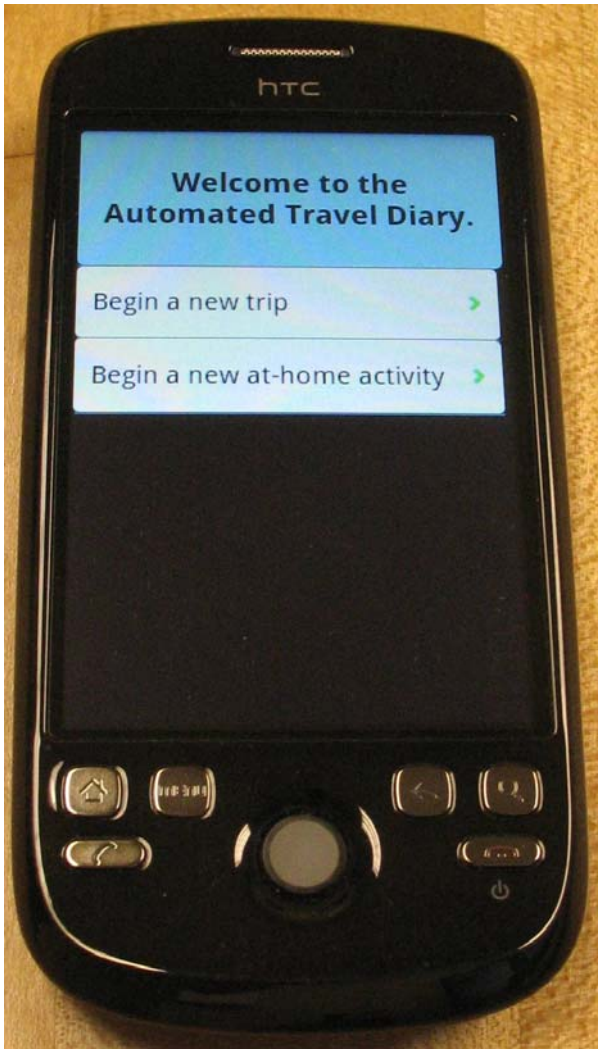

Figure 1 – The Phase 2 GPS-ATD on HTC Magic Phone

What We Have Done

In previous Phase 1 research, AHMCT researchers developed the prototype GPS-ATD system. This work included custom hardware design and fabrication, and development of the Phase 1 GPS-ATD software platform. The current Phase 2 effort enhanced the GPS-ATD software platform, and updated it for use on commercially available Smartphone / PDA units. The current implementation runs on Google's Android OS. Similar implementations on advanced mobile operating systems, e.g. Blackberry or iPhone are possible. Combining off-the-shelf hardware with the advanced AHMCT GPS-ATD software platform provides a tailored solution for travel behavior surveys, in a form that can be easily procured by an agency without typical commercialization or deployment concerns and risks.

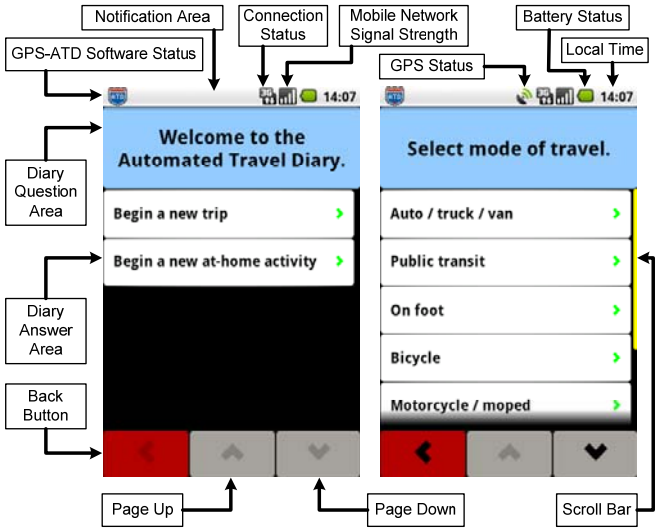

Figure 2 – Block diagram of the GPS-ATD

The GPS-ATD provides an intuitive user interface to capture the trip activity information (trip purpose, travel mode, etc.), with minimum user input. Each survey participant interacts with their own GPS-ATD. The system captures and logs data from the GPS receiver, allowing identification of corridors, route lengths, and regional / inter-regional trips. Because of the advanced design, the GPS-ATD can provide many capabilities beyond previous methods in travel surveys:

- reduce the user burden by automating data collection and reducing data entry,
- provide activity-time-space relationships,
- minimize under-reported trips,
- capture all transportation modes and mode changes,
- provide strong support for automated data analysis,
- provide vehicle position during GPS outages using inertial sensors,
- provide second-by-second detailed vehicle position, speed, acceleration, and emissions information,
- provide wireless synchronization,
- provide coordinated data collection with OBD-II data logger, for engine emissions-related information,
- and allow survey duration up to 30 days.

The GPS-ATD user interface runs as an application on the Android device, and the user interacts with the GPS-ATD in an intuitive manner, with minimal user burden. By capturing trip purpose and activity information, along with sensed data (location, speed, etc.), high-quality data can be collected, all with lower user burden than the paper-based diary approach. The data will support travel demand modeling, emissions predictions, and sustainable development planning.

Current Status

AHMCT is providing deployment support for on-going testing of the Phase 2 GPS-ATD by Caltrans TSI. The device may be used in the 2010 Statewide Travel Behavior Study, pending funding. The device is well-suited for use in studies by Metropolitan Planning Organizations and similar agencies. Improved surveys will provide decision makers with current, accurate and reliable traveler behavior data at significantly reduced cost. The GPS-ATD will minimize user burden and provide activity-time-space relationships.

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Figure 3 – Example trip with mode changes: Bus » walking » BART » walking » Bus » Amtrak » walking » auto