CROWDSOURCING
TRANSIT DATA COLLECTION

A NITC research project tested the use of a mobile application to collect data on the transportation behavior of transit passengers.

The Issue

Understanding the travel behaviors of individuals who use public transit is essential for improving the performance, sustainability and efficiency of public transportation. Travel behavior data are typically collected either automatically with specialized counting technology, or manually by people with clipboards. While such methods provide useful data for understanding transit demand throughout a network, they ignore the important details of how passengers travel to and within a network, as well as their personal experiences during their commute, all of which can enrich the ability of transit agencies to provide sustainable transportation.

Using the riders of public transit themselves as the providers of data has potential to be both cheaper and far more informative than other methods. For this reason, there has been a proliferation of location-based services (LBS) that allow for new methods of data collection involving passengers volunteering data about their commute. This project's objective was to implement and test specific LBS in a bus transit network to better understand the potential and limitations of using this technology to crowdsource travel behavior data.

NITC researchers Christopher Bone, Marc Schlossberg, Ken Kato, Jacob Bartruff and Seth Kenbeek of the University of Oregon designed a custom mobile application that allows passengers to volunteer information about their travel habits. They tested the application with 24 study participants over a period of three weeks on Lane Transit District's EmX bus line located in the Eugene-Springfield area in western Oregon.

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THE ISSUE
Mobile technology has the potential to yield superior data about transit behaviors while still maintaining individual privacy.

THE RESEARCH
The researchers tested a mobile app that recorded:

• The number of commuters using a particular stop;

• The location and time they arrived;

• Answers to questions about travel behavior for each trip.

IMPLICATIONS
The method evaluated in this project stands to simplify and improve the data collection process for transit agencies by allowing passengers to provide the data directly to the agency.

Photo: Passengers with smartphones and tablets board a bus

The Research

The EmX is a bus rapid transit system that currently connects downtown Eugene with downtown Springfield. It has 27 stops. The EmX provided a useful test case for this system because it is a contained route with specified buses, which allowed researchers to test the LBS technologies without having to concern themselves with an entire bus fleet or an entire bus network.

Researchers placed bluetooth low energy beacons on each bus which could detect when a passenger boarded, or was about to board, the bus with the mobile app running on their phone in the background. They also placed geofences around the bus stops on the EmX line, which detected when a user approached the bus stop based on the phone's GPS location. A primary focus at this stage of the research was to evaluate which of the two different LBS technologies was better at capturing the locations where transit riders enter and exit the network.

The research team met with the participants at the beginning of the study period in order to install the application on their phones, and to explain the study requirements and how to use the application. The participants were randomly assigned a version of the application relying on either the bluetooth beacons or the geofences. The team met a second time with participants at the end of the study to download the data from the application, and to administer a post-study survey about the mobile app experience.

Implications

The data collected by the application demonstrates the usefulness of LBS technologies for transit data collection. The data provides insights about the number of commuters who are entering and exiting the transit network at each stop, as well as the time and mode of travel commuters are using. The results
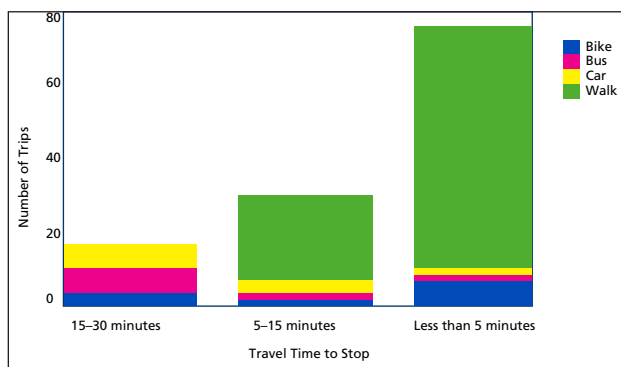
Travel times to transit stops

This graph shows the time it took users to get to a transit stop, organized by travel mode. The distribution of modes and the number of trips per mode can be seen at a glance in this visualization.

shown in the figure to the left demonstrate that most commuters walk short distances to arrive at stops, while most commuters utilizing other modes travel longer distances to arrive at stops.

The method developed in this study stands to save transit agencies significant amounts of money on data collection, while providing them with an unprecedented quantity and quality of data to help them evaluate and improve their services. As with any location-based technologies, concerns about user privacy may be raised, but the anonymous method used in this study yields the necessary data while protecting the user's privacy. This method can help transit agencies better understand the proportion of commuters who are using transit to commute to work, school or home.