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RESEARCH
SERVICES SECTION

TECHNICAL SUMMARY

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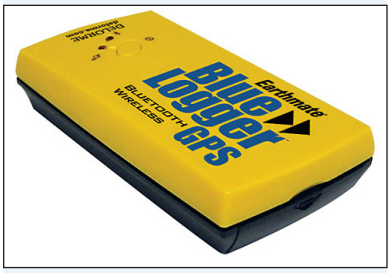
PROJECT COST:
$69,618



Small (1.5-inch) WAAS-enabled GPS units mounted on bicycles tracked commuter routes and speeds.

Commuter Bicyclist Behavior and Facility Disruption

What Was the Need?

How will a bicycle commuter react when a section of the path he uses every day is rerouted? To avoid a tight squeeze along a bridge, will a cyclist choose a longer route to her office? Mn/DOT and local municipalities have relatively little travel behavior data to answer questions like these about those who commute by bicycle.

To better prioritize future infrastructure improvements and understand the impact of disruptions on cyclists, planners need data about how a bicycle commuter is likely to react to negative experiences or changes in facilities (such as bike paths). This type of data has been difficult to gather using existing research methodologies. Previous research has relied on travel logs and interviews but has lacked the precise details that indicate how a commuter responds to disruptions. Examples of disruptions include construction on a bike path, an event that brings additional traffic to a preferred route, concerns about safety on a dedicated bike path or a combination of factors.

Until recently, Global Positioning System receivers have been too large for practical use on a bicycle and too expensive for use with a large number of volunteers. They have also lacked the precision necessary to accurately track bicycle location and movement.

What Was Our Goal?

This purpose of this study was to establish the use of GPS equipment as a viable method for recording cyclist movements and behaviors through a project recording bicycle commuters' behavior. Investigators wanted to know what disruptive factors affect route choices among bicycle commuters, how bicyclists make route choice decisions when faced with disruptions, and how the commuting bicyclist behaviors correspond to results from previous research on the travel behavior of drivers.

What Did We Do?

Researchers first developed and tested the research protocols and equipment for the study. They used a new generation of small GPS receivers that use wide-area augmentation system signals. WAAS-enabled GPS dramatically improves the receiver's accuracy from within about 13 meters to a 2- to 3-meter level of accuracy, making this a feasible tool for tracking cyclists.

Investigators selected 51 volunteers, split approximately evenly between men and women, who lived in South Minneapolis and commuted at least three times a week by bicycle to either downtown Minneapolis or the University of Minnesota campus. Participants turned on GPS units to track their commutes over a three-week period and participated in two surveys and a focus group discussion.

Volunteers were asked to use their preferred routes during the first week and were assigned different routes during the second and third weeks. This allowed researchers to compare the behavior of several commuters on roughly the same route. Data were collected for 938 individual trips; GPS receivers recorded each commuter's position every 2 seconds, giving investigators detailed information about the commuter's selected route and speeds.

continued

"This study suggests that giving bicycle commuters GPS units can help transportation planners determine how bicyclists actually commute to work and assess where improvements for bicyclists should have priority."

–Francis Harvey,
Associate Professor,
University of Minnesota
Department of
Geography

"The methodology is probably the most important outcome here: It proved that using GPS units to track bicycle commuter behavior can work. We also learned how to make it work better in the future."

–Darryl Anderson,
State Bicycle and
Pedestrian Coordinator,
Mn/DOT Office of Transit

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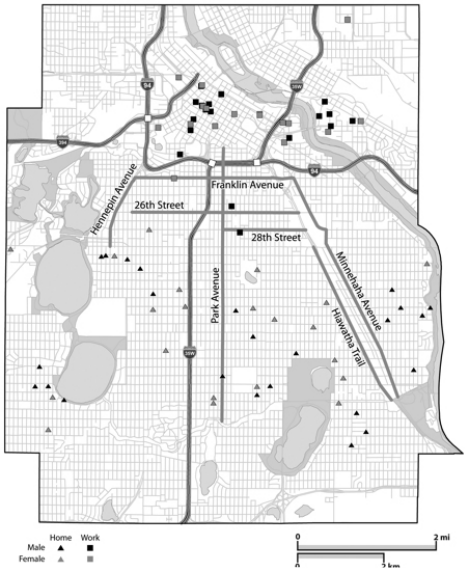

This map shows home and work locations of study participants. Researchers used a visual clustering method to select applicants who lived near one another.

How Did We Do It?

Researchers presented four primary outcomes related to commuter cyclist behavior and research methodology from this study:

- **Safety is the key determinant of commuter speed.** Commuters travel faster when they feel very safe, though they also travel faster when they feel unsafe in hopes of shortening the amount of time in the perceived unsafe portion of the route.
- **Commuters tend to choose similar routes.** Route choice is influenced primarily by perceived safety, with comfort and confidence as close secondary influences. Improved facilities (such as bike paths) and traffic volumes also influence choice.
- **Longer routes are the norm.** Commuters choose longer routes based on the above-mentioned factors instead of traveling the shortest distance to their destination.
- **While GPS units are effective data collection devices, GPS data processing remains complex.** Difficult data management issues arose, including some unexplained GPS unit inaccuracies, excess data accrual while commuters waited at intersections, and challenges regarding how to define a "trip" when commuters made side trips or forgot to turn off the GPS when they arrived at their destination.

What's Next?

Researchers are currently disseminating these findings and intend to submit an article for publication in *The Professional Geographer*. Project results suggest opportunities for further study; for example, regarding the varied strategies that cyclists use to navigate complex intersections or how nightfall impacts women's route choices.

This study was the first to use GPS to track commuter cyclist behavior and showed that small WAAS-enabled units work well for such research. This methodology has the potential for wide application because these units can be mounted on almost anything and even worn by pedestrians. The challenge moving forward is to integrate high-resolution GPS data into the existing body of spatial-behavior research.

This Technical Summary pertains to Report 2007-15, "Commuter Bicyclist Behavior and Facility Disruption," published May 2007. The full report can be accessed at http://www.lrrb.org/PDF/200715.pdf.