Project Title: Advanced Applications of Person-based GPS in an Urban Environment

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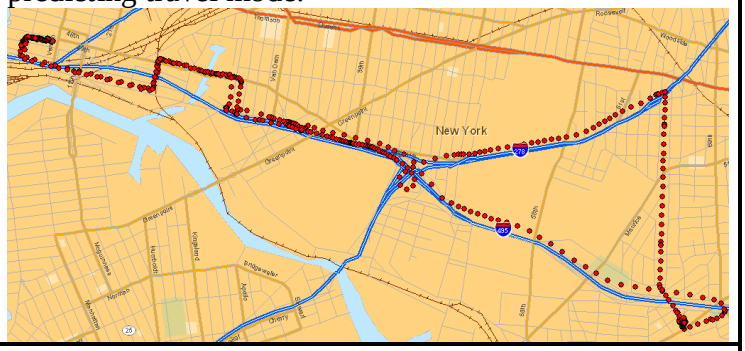
Finding an effective method for obtaining information on the travel patterns of household members is a critical need for transportation planners and researchers. This is particularly the case for Metropolitan Planning Organizations (MPOs), now being pressured to improve their travel demand forecasting capabilities. An emerging strategy for generating high-quality data is the use of Global Positioning Systems (GPS) trace data to collect travel patterns. The GPS trace data includes data elements that accurately track the location and time of travel, but not the essential mode information, such as walking, biking, transit or auto. Currently, this data is used as supplementary information, requiring survey participants to carry the GPS unit and fill out a traditional survey instrument, or provide information during a prompted recall interview over the phone. A modified methodology reduces the survey component and allows participants to enter mode information on the web, on the GPS device, or other electronic unit. An emerging area of research uses only the GPS trace data to infer mode. Such a strategy could greatly reduce respondent burden, and at the same time, provide a high quality source of travel behavior information.

The research team reviewed fourteen studies and found the methodologies used to identify modes from GPS trace data fell into three basic methodologies. These methodologies are rule-based, neural networks, and fuzzy logic. These methods each have distinctive characteristics, with advantages and disadvantages associated with their use and effectiveness. To test the effectiveness of each of these methods, a test-bed GPS data was collected.

For this study, 24 individuals from the City University of New York were recruited. They were asked to carry an on-body GPS unit for a period of five weekdays. Each GPS unit was configured to automatically log the person's position every 5 seconds, along with the date and time, latitude, longitude, speed, etc. Additionally, survey participants were also asked to fill out a travel log for one designated travel survey day. For each activity and trip, detailed information was requested, (e.g., the location name, exact address or intersection, mode taken to access the activity site, departure and arrival time, and purpose of the trip). Three methodologies were applied to the data: a rule-based geographic information systems (GIS) method; a neural network method; and a fuzzy logic method.

The neural networks were shown to be the most effective method implemented, based on the ability to exploit subtle patterns in the data based on a small number of input parameters, and overall ease-of-use. Future research will investigate the development of additional machine learning techniques and experiment with the additional parameters to determine the effectiveness of the techniques across large, diverse data sets. Replicating the results across various data sets will be essential in order to demonstrate that automated methods can simultaneously reduce respondent burden, while consistently and accurately predicting travel mode.



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