GPS MOBILE PROBES: A FIELD EXPERIMENT

February 8, 2008 / 9:30am – 6:30pm

Objectives at a glance:

A field experiment to collect traffic data from GPS-enabled cell-phones

Provides a proof of concept for traffic-flow reconstruction from probe vehicle measurements

Collecting Traffic Data from Mobile Probes

The potential of cell phones to operate as traffic data collection devices has been considered by the Intelligent Transportation Systems (ITS) community for several years. Government agencies currently deploy networks of traffic sensors that are expensive to install and maintain. Leveraging commercial cellular networks could drastically cut the ongoing costs of traffic monitoring and expand coverage to thousands of miles of highways and urban arterials for which sensors are not even considered an option. Available methods to collect data from cell phones rely on approximate positioning provided by the cellular networks and have shown limited accuracy to date. However, GPS chips are now built into more and more handsets and they will soon become as ubiquitous as cell phone cameras. For instance, Nokia will stop producing cellular phones without GPS in less than 18 months. The prospect of large numbers of GPS-equipped cell phones reporting position and speed with 10 meter / 3 mph accuracy at regular intervals represents a huge leap forward. Yet its implementation requires addressing key questions regarding individual privacy, data ownership, network load, and proper traffic flow estimation techniques.

The Experiment

The experiment will test a novel traffic monitoring system designed to collect velocity and position data from GPS-enabled Nokia N95 cellular phones.

Under the umbrella of the California Center for Innovative Transportation (CCIT), Caltrans, Nokia, and UC Berkeley's Department of Civil and Environmental Engineering are collaborating to conduct an unprecedented experiment in the area of traffic monitoring. For an entire day, 100 vehicles carrying the GPS-equipped Nokia N95 will drive along a 10-mile stretch of I-880 between Hayward and Fremont, California. Given their number, those vehicles will constitute up to 5% of the traffic traveling along this section, a penetration rate that adequately represents the potential of the market for GPS-equipped cell phones in the near future. The data obtained in the experiment will be processed by a team of UC researchers led by Professor Alex Bayen to determine the trade-offs between data volumes, information quality and privacy concerns. The experiment will thus underline the value-added available from cellular phones, which could rapidly complement existing traffic sensors. This work will ultimately guide the design and sharing modalities of future traffic information collection systems that can be operated by the private sector and offer substantial benefits to government agencies and the traveling public.

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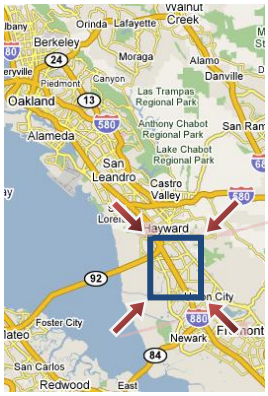
Logistics



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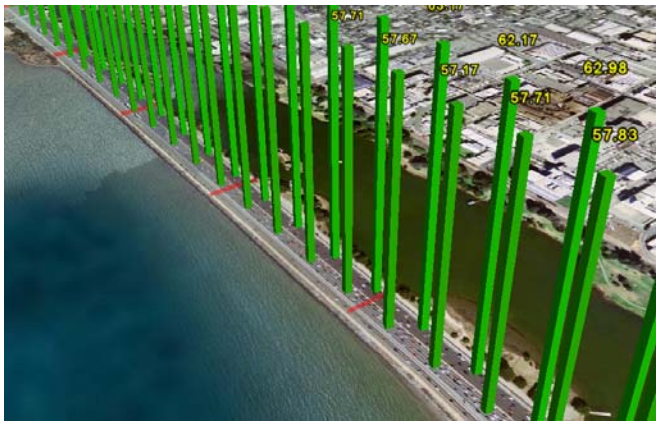
The experiment will take place on Friday, February 8, 2008, from 9:30am until 6:30pm. 150 hired UC students will drive 100 vehicles in a loop along I-880 between Winton Ave. to the North and Stevenson Blvd. to the South. This 10-mile-long section was selected for its traffic properties, the availability of an existing knowledge base for this particular highway from traffic simulations, and for its proximity to UC Berkeley. There are a number of conveniences available along the section, including access to parking, gasoline, and food. Drivers will be taking 1-hour breaks throughout the day. The driving pattern will ensure a penetration of 4-5% of the total flow. Each vehicle will carry a Nokia N95 phone, which will store speed and position information every 3 seconds. At the same time, the measurements from the cell phones will be sent wirelessly to a server for real-time processing. Cameras located on bridges at both ends of the loop will be used to record the actual travel times of all vehicles, including those not participating in the experiment, which will provide a 'ground truth' reference that can later be compared with the estimates produced from the GPS data.

Capturing the Event

A public relations event will be organized in the morning at the experiment command center for representatives from government agencies, industry, and academia. This will be followed by a reception and lunch at CCIT headquarters in Berkeley starting at 12:30 pm. Come share the excitement of a Berkeley-scale event with societal-scale transformation potential!



A Google Earth rendering of collected GPS data. Virtual trip lines measuring speed upon crossing of the vehicles are shown in red.

VIP and Media Event:

February 8, 2008
10 am – 2:30 pm
Union Landing, California and UC Berkeley

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