

TRAVEL TIME ESTIMATION USING CELL PHONES (TTECP) FOR HIGHWAYS AND ROADWAYS

BACKGROUND

State DOTs use travel time data for various planning and operational purposes. The conventional methods for collecting traffic flow information on roadways and highways include the use of cameras, sensors, matching license plates, toll booth traffic flow records, and so forth. Employing such methods provides valuable information but incurs very high operational costs, in addition to other associated costs (e.g., maintenance of equipment, software upgrades, and dissemination of the information to drivers). Consequently, many state DOTs have become increasingly interested in alternative technologies, such as cell phones, that can be used as travel probes to estimate travel times.

OBJECTIVES

The main objective of this research was to study the maturity and practical application of cell phones as real-time traffic probes to estimate travel time along highways and roadways. The research team investigated the reliability, accuracy, and reproducibility of travel speed and travel time computations based upon the use of cell phones as traffic probes and compared them with methods such as 511-based operations and Global Positioning System (GPS) - based measurements. The research team also investigated and evaluated organizations that use cellular phone data to calculate travel time.

FINDINGS AND CONCLUSIONS

The research showed that the accuracy of the cell probe technology, with regard to calculating travel times, depends on traffic conditions. Positive travel and speed estimation results were observed for free-flow conditions, but sufficiently accurate results were not conclusively observed for heavily congested traffic conditions. No independent validations were found to have been performed in the United States that would suggest that the technology is mature enough to provide travel time information for arterials. Evaluation of the technology's performance on highways in heavy traffic conditions, where the information is more important than in free-flow traffic, produced mixed findings. Thus, while the technology has potential for travel time and speed estimation applications, more research is needed, especially on the highways for which the findings were mixed.

If cell phone travel time estimation is to be used in Florida, FDOT needs to establish a criterion for proving the accuracy of results prior to investing in the technology for roadway network applications. For instance, a requirement may be made that computed speed with cell probes be at least 95% accurate (absolute error < 5%), at least 95% of the time, at all levels of traffic conditions.

BENEFITS

This study provides an up-to-date evaluation of the maturity and accuracy of cellular phones for use as traffic probes. The findings will be useful to FDOT in its business dealings with organizations that claim to provide travel time information using this technology, and will aid in avoiding premature and costly implementation of the technology.

This research was conducted by Subbarao Wunnava, PhD, Kang Yen, PhD, Tad Babij, PhD, and Richard Zavaleta, of Florida International University. For more information, please contact Randy Pierce, Project Manger, at (850) 410-5608, randy.pierce@dot.state.fl.us