Florida Department of Transportation Research

Using Smartphone as On Board Unit (OBU) Emulator Implementation Study

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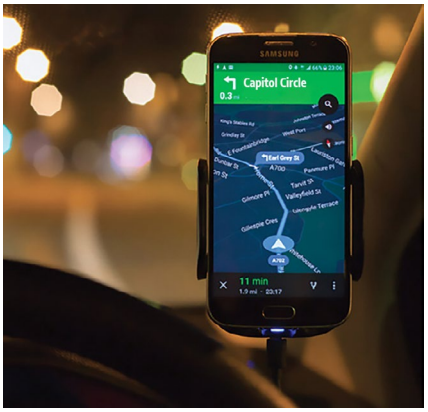
Current Situation

More roads are being equipped with sensors that detect the presence and movement of vehicles. For example, a slowdown of more than a few minutes can cause these sensors to alert traffic managers about a possible incident. Intersections are also being equipped with sensors and, sometimes, cameras that can provide a real-time view and analysis of traffic. This roadside equipment can communicate with automobiles that have an appropriate on-board unit and provide a driver with roadway information about congestion or incidents that can improve travel times and safety. However, relatively few cars currently have such an on-board unit, and it would be useful to find another way for drivers to access this information about their travel route.



Safely mounted for hands-free operation, a smartphone can emulate an on-board unit to deliver traffic information to a driver.

Research Objectives

University of Central Florida researchers developed a system that allows a smartphone to emulate an on-board unit.

Project Activities

The researchers reviewed the literature concerning smartphone sensors, relevant aspects of data communications, roadside sensors, and on-board units (OBUs), through which they identified the features of these technologies that they would use to create an OBU emulator system. They created apps to perform the necessary functions of the system, such as collecting the necessary smartphone data, transmitting this data to a cloud server, processing the data, and returning results to the smartphone. To assess the viability of the concept, a preliminary system had to be developed to answer important questions such as whether the smartphone could provide information that would allow interpretation of local traffic situations, would smartphone communications be adequate, and would a smartphone's battery capacity support the extra work required by the system.

After experimentation and programming, the researchers were able to use information from the smartphone to determine a user's traffic status with good accuracy. Parameters such as position, speed, transportation mode, and acceleration are computed in the smartphone app and then uploaded to the cloud server where, from these data, localization and movement are determined. The system returns relevant information to the smartphone and also stores the data collected from the app to be used cumulatively to understand roadway performance.

The researchers developed pedestrian detection systems for two types of intersections. For intersections with the right equipment, the system detects pedestrians and vehicle queues in real time with high accuracy. For standard intersections, the system can detect pedestrians when both driver and pedestrian have the app. They were also able to show that smartphone communications and battery life were sufficient to run the app and operate successfully as part of the system.

Project Benefits

Smartphone emulation of on-board units will bring the benefits of these devices to more drivers sooner, the potential to improve traffic efficiency and travel time and reduce incidents.

For more information, please see www.fdot.gov/research/.