Research Project: ***SP909B4D***
Date: ***February 2012***

RESEARCH SUMMARY

BLUETOOTH TRAFFIC DETECTORS FOR USE AS PERMANENTLY INSTALLED TRAVEL TIME INSTRUMENTS

Problem

In support of the Maryland State Highway Administration (SHA) business objectives related to mobility and congestion relief, in 2009 the University of Maryland's (UMD) Center for Advanced Transportation Technology (CATT) proposed to develop the use of Bluetooth ™ traffic monitoring (BTM) technology as permanently installed sensors on the Maryland highway network. These sensors would be used to directly measure travel time at a high level of accuracy continuously – 24 hours per day, 7 days a week, 365 days per year (24/7/365). The initial development of BTM technology at UMD from 2007-2009 targeted portable, easily deployable sensors. In 2008 a prototype system of 25 sensors was produced and remains in use with the SHA Highway Information Services Division (HISD) to this day. This project extends the availability of high resolution BTM data for real-time operations applications.

Objective

Building on the success of the portable BTM sensors, the objective of this project was to enable BTM technology to be permanently installed on highways and arterials in order to deliver real-time, continuous and highly accurate travel times 24/7/365. The effort was divided into a series of objectives, with related tasks and corresponding deliverables as outlined below.

- *Develop specifications*
- *Design equipment for permanent installation*
- *Develop specifications for application monitoring software*
- *Develop, test, and demonstrate prototype system*
- *Validate accuracy, effectiveness, and operational parameters*

Description

As of October 2011, UMD CATT through partnership with Traffax Inc., a private commercial business manufacturing and selling Bluetooth-based sensors based off technology developed at UMD, has designed, deployed and tested six prototype units on a corridor along I-95 and I-495 between Baltimore and Washington, DC. Installation of the six prototype sensors began in early 2011. The successful demonstration of the real-time, permanently installed BTM sensors was the ultimate goal of this project, and with the sensors and the corresponding central processing having operated for the majority of 2011, that objective has been met.

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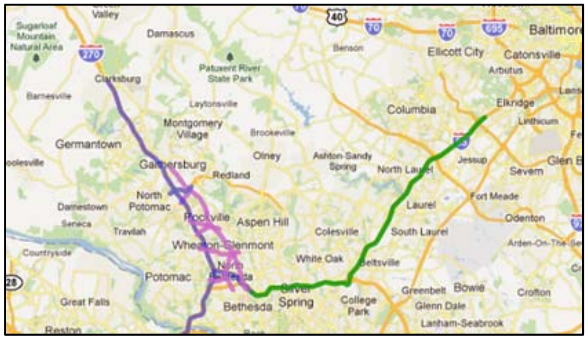
Results

The resulting design and prototypes of permanently installed BTM sensors meet the demanding environment for permanently deployed equipment along roadways including consideration of environmental extremes (temperature and humidity), continuous and sustainable power sub-systems, and robust wireless cellular communications. Concurrently real-time central processing was established to handle continuous traffic reporting in support operations. The flexibility of placement of BTM sensors proved extremely cost effective, not only taking advantage of existing structures, but the speed of installation and ability to mount anywhere allows selection of safe locations that do not require a high degree of Maintenance of Traffic, further decreasing installation and life-cycle costs.

The base electronics from portable units were combined with power and communication sub-systems to produce an easily deployable sensor that can be mounted on existing structures quickly and inexpensively. The sensors can take advantage of local power and communications resources if available. Data from each sensor is forwarded via the internet to a central host processor. At the central server, the individual observations of MAC addresses are combined and processed to yield real-time estimates of travel time and speed.

The six prototype units continue to operate 24/7 and have been combined into a larger BTM sensor deployment funded by a Small Business Innovate Research (SBIR) grant from the Federal Highway Administration (FHWA). Deployment for the SBIR began in mid-2011 and with the six prototype units from this project further leverages the investment in the permanent BTM sensor research by Maryland SHA. Data from this network is available both in real-time as well as in archive data sets for engineering, planning and performance measure studies. The extent of the SBIR network (including the initial six prototype units) is shown in the figure below.



Report Information

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