

Investigation into the Usage of Bluetooth Signals for Roadway Speed Calculations

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With Bluetooth enabled devices becoming more prevalent in vehicles, a few companies have developed proprietary solutions for determining travel times over roadway segments. The objective of this research was to investigate potential issues with Bluetooth technology used for the purpose of traveler information. Some of the concerns with using Bluetooth technology for this purpose include validating that an adequate number of data points can be gathered from devices at high speeds and what mode a device must be in to read a signal. This research included investigating various Bluetooth device capabilities. The assortment of evaluated devices includes end user products such as cell phones, Personal Digital Assistants (PDAs), MP3 players, headsets and cars with Bluetooth technology. The other end of the product spectrum includes Bluetooth adapters for connecting to devices and range extending antennas. Scanning capabilities were ascertained to determine the feasibility of utilizing this technology for the purpose of determining traffic speeds and travel times. One of the initial limitations investigated was whether the end user devices must be in discoverable mode to be detected. Prototype software was developed to scan for devices. Several Bluetooth libraries were evaluated for their scanning abilities, each of which was limited to discoverable devices. Non-discoverable devices can be found using brute force, but not in the number of seconds range required for travel speeds. For the purpose of detecting devices to determine roadway speeds, only devices which are in discoverable mode can be utilized. Because of this, the use of this technology may not provide sufficient penetration coverage long term as remaining in discoverable mode becomes obsolete for emerging devices. On the initiating side of scanning, Bluetooth adapters were utilized in conjunction with both focused and omni-directional antennas to determine effective ranges. Some adapters tested were capable of ranges up to 250 feet, which is adequate for scanning 20 lanes of traffic without an attached antenna. However, finding adapters with appropriate operating temperature ranges will be a challenge. Testing the capability of finding devices at varying speeds showed results consistent with expectations. At lower speeds, 100% of known devices were located. As speeds increased, the percent of known devices found decreased in a relatively linear progression. This paper will present the detailed findings from the research and provide recommendations and lessons learned for potential deployers of Bluetooth technology for determining travel times.