Project Summary

Texas Department of Transportation

0-4750: Long-Term Research into Vehicle Detector Technologies

Background

The Texas Department of Transportation (TxDOT), like other transportation agencies, has used inductive loops for vehicle detection for many years. However, the well-documented issues with inductive loops and the increasing availability of newer detectors have created the need to investigate the performance aspects of newer detectors. Determining appropriate replacement strategies requires first investigating the accuracy and reliability of new detection technologies along with means of interfacing the new detectors with TxDOT's existing Advanced Traffic Management System (ATMS) and other legacy components.

What the Researchers Did

TTI conducted a literature search to identify promising new detectors and determine whether these new or relatively new detectors appeared to fill a need for TxDOT freeway monitoring. Texas Transportation Institute (TTI) researchers made recommendations to the Project Monitoring Committee (PMC) for field testing at two freeway test beds. The detector selection process occurred at the beginning of the project and again in fiscal years 2005 and 2006. TxDOT and TTI made improvements to the test beds as needed based on the test plan or other needs. The field test plan involved comparing count, speed, and occupancy outputs from selected new detectors against an accurate baseline system, the Peek ADR-6000. The detectors selected for the research were the Wavetronix SmartSensor SS105 (microwave radar), SAS-1 (acoustic), Autoscope Solo Pro (video), Iteris (video), Traficon (video), and Sensys Networks (magnetometer). Beyond conducting field tests of detectors, TTI investigated means of interfacing with the TxDOT ATMS, given the rapid increase in availability and need for newer detectors and the resulting combinations of old and new components that would likely need a means to communicate with the ATMS.

What They Found

The performance aspects of new detectors are improving, making them viable replacements for inductive loops in some cases. Besides speed and count accuracy, other considerations are cost and ease of setup. The cost and ease of setup aspects of the video systems are less attractive than those of the SAS-1 acoustic and Wavetronix SmartSensor SS105 microwave radar units. The life-cycle costs of the acoustic and microwave radar units are comparable, but the performance of the microwave radar was more consistent than the performance of the acoustic technology. The Sensys Networks magnetometer is an accurate system but requires lane closures for installation and replacement, so its life-cycle cost is anticipated to exceed that of the microwave unit.

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Concerning the interface with TxDOT's ATMS, the Wavetronix DataCollector/DataTranslator system is viable as a state-of-the-art, flexible, scalable, off-the-shelf, and immediate solution to TxDOT's needs where a combination of legacy components and contemporary detectors are being implemented side-by-side. The Wavetronix system is an enterprise-quality hardware/software solution, currently marketed using Dell enterprise server hardware. However, some TxDOT districts would be better served by Wavetronix providing a software-only solution that would run on a generic enterprise hardware platform.

What This Means

Findings of this research indicate that — from a performance standpoint — microwave radar, magnetometers, and some video image vehicle detection systems (VIVDSs) are probably all suitable for freeway applications. VIVDSs are more complex, require periodic lens cleaning, and are usually more expensive, but a positive attribute is that they offer a view of the traffic stream. However, the latest VIVDS technology may still be affected slightly by some weather and lighting conditions although the manufacturers have reduced those impacts in recent years. The magnetometer technology that was included in this research warrants continued evaluation over a longer period of time. Its accuracy levels are noteworthy and, of course, it is not affected by weather, but the battery life needs to be verified in high-volume traffic. One negative attribute is that the magnetometer is an intrusive device, requiring interference with traffic for installation and replacement. It is a promising replacement for loops since installation is faster and its accuracy is similar to loops. Finally, the Wavetronix SmartSensor SS105 (and a newer version, the SmartSensor HD) is a rugged auto-configuring device that does not interfere with traffic, can be mounted on an existing pole, can cover up to 8 lanes (10 lanes for the HD) in sidefire orientation, and is apparently not affected by weather or lighting conditions.

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