



Project Summary

Texas Department of Transportation

0-5507: Enhancements to Platoon Identification and Accommodation (PIA) System for Intelligent Control at Isolated Traffic Signals

Background

The objective of this project was to enhance and field test the Platoon Identification and Accommodation (PIA) system developed in Texas Department of Transportation (TxDOT) project 0-4304 - *Improved Operation of Traffic Signal Controllers at Isolated Arterial Intersections*. The specific sub-objectives were to:

- extend the system from one to two directions,
- standardize implementation in a TS-2 cabinet,
- incorporate a software classifier to replace the hardware classifier needed by the original system, and
- install/test the enhanced system at two sites.

What the Researchers Did

To accomplish the research objectives, researchers performed the following work in this project:

- Assessed work needed to implement required enhancements.
- Reengineered PIA software to provide platoon progression in both arterial directions. This work included:
 - redesign of user interface and data structures to permit application/configuration for one selected arterial direction or both arterial directions,
 - design and implementation of a software classifier,
 - duplication of platoons detection logic,
 - redesign of platoon progression logic for handling two directions, and, adding a capability to hold phases (either alone or in conjunction with preempts) to increase the efficiency in exercising controller override,
 - addition of serial interface for enhanced bus interface units (BIUs) to provide standardized input/output (I/O) in TS-2 cabinets, but retaining the digital I/O feature to communicate with TS-1 cabinets,
 - expansion of the system to include real-time performance measures, and
 - extension of the original fixed logic for handling privileged minor phases to a dynamic approach using real-time phase utilization.

Research Performed by:

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Project Completed:

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- Developed a TS-2 cabinet-in-the-loop (CITL) simulation testbed for testing the system in the lab.
- Tested the enhanced system using TS-1 and TS-2 based CITL simulation testbeds.
- With significant assistance from the Waco District, prepared an implementation site in Belton, installed the enhanced PIA system there, tested it in shadow mode, and turned on the system.
- Installed and tested the system at a site in College Station. This site has an operating Advanced Warning of End of Green System (AWEGS), which was disabled during the PIA testing period.

What They Found

Through in-lab simulation using the CITL system and field tests, the researchers found that:

- The new software classifier provides accurate speed and detection information from advance detectors.
- The enhanced PIA system works as intended.
- The implementation of dynamic privileged phases improves performance of minor phases when they have high demand and improves platoon progression at other times.
- Added ability to place holds on main-street phases increases system efficiency and provides a way to implement the PIA system without using preempts.
- Several real-time measures of effectiveness (MOEs), such as demand estimation using data from long stopbar detection, can be easily generated. In the future, such MOEs can be used to make the system adapt dynamically to various levels of demand at the intersection. For instance, characteristics of platoons (that is, size and compactness) to be progressed can be dynamically determined based on real-time MOEs for affected phases.

What This Means

The enhanced PIA system developed in this project is ready for implementation at additional sites. Such additional implementation will require installation of advance detectors and purchase and installation of additional hardware. The real-time MOE calculation ability demonstrated in this project can be developed into a full-blown traffic signal system evaluation tool.

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