



Caltrans Division of Research,
Innovation and System Information

Research

Notes

Transportation
Safety and
Mobility

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Project Title:
Roadway Detector System
Evaluation

Task Number: 1546

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C1 Loop Detector Reader

Develop an inexpensive tool to diagnose loop problems and collect accurate data for evaluating vehicle detection system.

WHAT IS THE NEED?

According to California Department of Transportation (Caltrans) Performance Measurement System (PeMS), the department-wide traffic database repository, approximately 30 percent of the data generated at the Caltrans' roadside traffic detection stations is questionable in accuracy and therefore unusable.

Due to the challenges of determining the causes for the inaccuracies, the problem has remained unsolved over the last decade, during which time considerable effort was spent with little improvement to the malfunctioning stations.

WHAT ARE WE DOING?

The objective of this project is to develop the ability to collect 100% of the real-time data flowing through Caltrans controller cabinets, validate this data, and make it available on the intranet for both existing and anticipated new Caltrans applications.

Freeway applications:

- The data can be aggregated and fed into Caltrans PeMS via eXtensible Markup Language. This raw data is two to three orders of magnitude more resolved than the data currently available in PeMS.
- Real-time detector diagnostics based on this high-resolution data developed by past research can tell if the detector, splice, or loop are going out of calibration.

Data Validation:

- Data is validated to international American Society for Testing and Materials 2532 standards using VideoSync, which synchronizes the real time data with real time video.



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WHAT IS OUR GOAL?

The project's goal is to develop effective tools and techniques to diagnose and troubleshoot detection station malfunctions, thus allowing Caltrans to repair as many of the unreliable units as possible.

WHAT IS THE BENEFIT?

The C1 Loop Reader/Analyzer collects traffic data, which is used to evaluate new vehicle detection systems. This, in turn, enables Caltrans to select the most reliable vehicle detection system. A reliable and accurate vehicle detection system can direct traffic more efficiently and effectively, and ultimately improve traffic flow.

WHAT IS THE PROGRESS TO DATE?

A "Deployable Prototype C1 reader" with Raspberry Pi as data storage has been assembled that consists of a flex cable that connects each C1 pin, and a Printed Circuit Board (PCB) that converts this data to TCP/IP and sends it to a web server.

Staff from the Office of Traffic Operation Research (OTOR) had traveled to District 2 at Clear Creek Road to collect data for the evaluation Wavetronix radar. OTOR staff had completed observational analysis of Wavetronix radar detection systems was performed using the VideoSync II software application to determine the sensitivity percentage of said systems and document artifacts found during the analysis procedure.

OTOR staff continued to work with District 4 (D4) for the evaluation of Sensys detection system and Infra-Red Traffic Logger (TIRTL). Detection data and video had been collected from the evaluation site at D4 Powell on ramp and Cutting/San Pablo on ramp. A report has been completed for the evaluation at D4 Powell on ramp.

OTOR staff had completed the project plan to develop the next generation C1 box prototype with ESP32 microcontroller that supports WiFi since current one (Rabbit microcontroller) is no longer in production. At this point, the next generation C1 was able to read all data from the C1 connector and save into the SD card. In addition, wireless data retrieval was also developed for this C1 box.

OTOR staff had repaired three of the broken C1 readers so that they would be readied for deployment into the field.