DRISI

CALTRANS DIVISION OF RESEARCH, INNOVATION AND SYSTEM INFORMATION

TRANSFORMING IDEAS INTO SOLUTIONS

Advanced Research

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Project Title:
Roadway Detector System Evaluation

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Next Generation 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 Performance Measuring System (PeMS) via XML. 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 ASTM 2532 standards using VideoSync, which synchornizes the real time data with real time video.

Caltrans

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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 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?

Two locations in District 4 have been identified to evaluate the Infra-Red Traffic Logger (TIRTL). Traffic data and videos will soon be collected, and a C1 reader will be used to collect data for the evaluation. We are currently waiting for the Hare harness, which connects the Hare to the Type 334 cabinet terminal block. The vendor should soon be completing assembling the harness. The TIRTL and loops evaluation were scheduled in 2022 with District 4 (Ahmad Fahimi and Keith Aidun) on January 11, March 9, and July 6 at Walnut Creek onramp. Data and videos were collected for those dates.

Staff from the Division of Research, Innovation and System Information (DRISI) Office of Traffic Operations Research (OTOR) have completed the project plan to develop the Next Generation C1 box prototype with ESP32 microcontroller that supports WiFi since the current one (Rabbit microcontroller) is no longer in production. The Next Generation C1 could read all data from the C1 connector and save it into the SD card. In addition, wireless data retrieval was also developed as well.

The Next Generation C1 reader has been fully built out and assembled for the first time. The reader was built using the ESP32 device. The coding for the Next Generation C1 reader was also completed to replicate the same functions as the previous C1 Reader. During this time, testing also began for the Next Generation C1 reader device.

The Next Generation C1 reader went through its first real-world tests. These tests brought out an issue with the wireless connectivity that caused it to lock up and fail to collect data properly. The connectivity issue was repaired, and tests resumed. The Next Generation C1 performed its first roadside test at 28 and X Street in Sacramento and another at District 4 Walnut Creek onramp. During District 4 testing, an additional bug of the device appending files together incorrectly was discovered and subsequently corrected

The student that was previously working on this project has departed to work at Intel. A new student was hired to continue the effort of improving this project, collecting, and analyzing video and data.

Another location has been identified to evaluate the new hybrid (Radar and Camera) detection system from No Traffic at Palo Alto (El Camino Real and Embarcadero Rd). A date and time have been scheduled with District 4 (Michael Lee and Bill Jang) for this evaluation on February 23, 2023, and a second evaluation on May 10, 2023.