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Research Notes

Collecting Continuous Traffic Counts in California Local Roads for Highway Performance Monitoring System (HPMS) Reporting

The goal of this research is to identify commercially available camera-based systems and gather information on their specifications and capabilities to collect different types of traffic and mobility data aimed at meeting Caltrans data collection needs.

Executive

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Project Title: HPMS Local Roads Data Collection

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WHAT IS THE NEED?

As technology continues to develop, the use of camera-based video detection systems is becoming increasingly widespread in the context of Intelligent Transportation Systems (ITS) applications. A video detection system typically consists of one or more cameras, computer hardware for processing video data, and software for processing and interpreting the images. Video image processing operates by using visual pattern recognition algorithms to identify (and sometimes track) traffic traveling through a video camera's field-of-view.

Camera-based systems together with image processing algorithms have the capability to collect traffic and mobility related data efficiently and help derive meaningful information from digital images, videos, and other visual inputs. Camera-based systems are actively used in various ITS applications, such as automatic license plate recognition (ALPR), speed enforcement, traffic monitoring and control, vehicle detection and classification, incident detection, road condition monitoring, and pedestrian detection. Moreover, the advent of artificial intelligence (AI) integrated with camera-based systems has resulted in the development of multiple systems developed by various vendors that are available in the market.

Various divisions and offices within California Department of Transportation (Caltrans) are interested in utilizing video-based technologies to meet their data needs and functions. Their interests include but are not limited to utilizing video-based technologies for vehicle detection, high occupancy

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vehicle (HOV) reinforcement, bicycle and pedestrian data collection, safety applications, etc. A more specific need is based on recent updates to the Federal Highway Administration (FHWA) Highway Performance Monitoring System (HPMS) Field Manual, which has resulted in the need to collect continuous traffic count data on CA local roadways. Caltrans currently uses traffic data from the Transportation System Network (TSN) to report freeway data (which follows the new HPMS requirement of design-hour approach) and uses contract data (48-hour traffic counts) for reporting local road traffic counts (which is out-of-compliance). To accommodate the newly required "design-hour-based" reporting as described in FHWA's memo, Caltrans is required to use traffic counts collected on a permanent basis (24hours a day/7days a week/365 days a year). Given the absence of continuous traffic count data for local roads necessary for HPMS reporting, there is a need to explore, test, and determine the most suitable data collection technology to meet the new HPMS data reporting requirements.

WHAT ARE WE DOING?

The University will conduct a detailed market search and review of literature to identify commercially available camera-based systems that have the potential for application in various Caltrans needs, such as (but not limited to):

- Speed enforcement
- Incident detection
- Occupancy data collection
- Pedestrian and bicycle data collection
- Vehicle classification
- Travel time data collection
- Automatic license plate recognition
- The application of camera-based systems in the field of ITS can be broadly divided into three main categories, namely:
- Detection/recognition,
- Prediction
- Management

Detailed information on existing available camera-based systems and technologies will be collected to ensure a thorough understanding of specifications, features, capabilities, and limitations. This information will be used to organize the application of camera-based systems into the abovementioned categories, which will help develop the minimum specifications required for specific applications.

Additionally, the University will focus on identifying the most promising and relevant camera-based systems with the ability to collect continuous traffic count data. The University will collect relevant literature, system details, capabilities, infrastructure requirements, that relates to continuous traffic counts, and cost analysis. After the completion of the market search and literature review, consultations with the Project Panel will be conducted to add or discard any systems and select the most promising solutions for further evaluation.

Using the information collected on the capabilities and applications of camera-based systems, and in consultation with the Project Panel, the University will procure a limited number of commercially available camera-based systems for preliminary testing and evaluation. Once the selected camera-based systems are procured, the University will make efforts to develop specific evaluation criteria for each camera-based system based on its capabilities and application. Tests of the selected camera-based systems will be conducted at appropriate locations on California State University, Sacramento campus to evaluate manufacturer specifications, data collection and system capabilities, and practical requirements for deploying such systems.

WHAT IS OUR GOAL?

The goal of this research is to identify commercially available camera-based systems and gather information on their specifications and capabilities to collect different types of traffic and mobility data

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aimed at meeting Caltrans data collection needs for improving transportation safety, mobility, and productivity. Specifically, this research will focus on evaluating camera-based systems available in the market for the purposes of conducting continuous traffic counts besides other needs.

WHAT IS THE BENEFIT?

A final report will be prepared by the University documenting all the findings of the research and final recommendations to Caltrans. The final report will encompass all elements of the research completed and will provide a clear and useful body of information for Caltrans to make decisions upon. The final report will include an evaluation of selected camera-based systems to meet the needs of continuous traffic counts with recommendations for expanded pilot testing in the field. Additionally, the final report will include information on the application of various camera-based systems for different Caltrans data needs. The report will include recommendations for procurement and additional detailed testing and evaluation of the most promising camera-based systems that meet desired Caltrans data needs.

WHAT IS THE PROGRESS TO DATE?

Contract was executed 09/15/2025. We are working on scheduling the kick-off meeting.

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