

Automated Collection, Comparison and Fusion of Data From All Vehicle Presence Detectors in I-405 Detector Test Bed

Research Problem Statement

The various detection systems at Caltrans' Detector Test Bed in Irvine, CA generate an event record for each north bound vehicle that passes by, however, due to occlusion, lane changing, vehicles with trailers and other situations, the detectors will occasionally miss or double count vehicles. Since different detectors use different technology, they miss, or double count, different vehicles. There is currently no way to compile and compare these anomalies without manually going through each event record for each data collection session. Hence, it is difficult to gain insight into which types of situations cause difficulty for which types of detectors.

Objective

The goal of this project is to determine, for a given test period, on which specific vehicle passage events the various detectors disagree and under which circumstances those disagreements occur. The results of these tests will provide DRI personnel with a visual record of each vehicular passage event that causes one or more of the detectors to miss or double count. It will also provide the manufacturers of the detectors currently being tested with a visually verifiable account of exactly how they can malfunction and how they need to be improved.

Background

The Detector Test Bed, located in Irvine on state route 405 and operated by the Caltrans Division of Research and Innovation (DRI) and the University of California at Irvine (UCI), is currently evaluating various technologies for vehicle detection. Among these are machine vision video, inductive loop and microwave detection systems.



All of these systems can generate output files containing event records that consist of a line of text, including a time and date stamp, corresponding to each vehicle detected. A system of 14 cameras mounted on two overpasses, over each lane and connected to 14 PCs in roadside cabinets is currently installed at the Test Bed.



This computer vision system can acquire a digital (Jpeg) image of every vehicle in every lane. The system includes provision for acceptance of real-time signals from other detectors in the Test Bed, and will acquire a JPEG image in the appropriate lane at the moment of external trigger. The corresponding image file is appropriately coded to indicate the detector of origin. This mechanism is intended to facilitate the verification and comparison of presence data between all basic detection devices in the Test Bed.

Potential Benefits

Caltrans Traffic Operations is expanding its vehicle detector infrastructure to provide more traffic information to TMCs, and they need to know how various types of detectors perform in different situations in order to design detection systems for specific environments. The benefit of this project will be to provide DRI and Traffic Operations personnel with valuable insight into the characteristics of vehicle detectors of various technologies and manufacturers. It will also provide the manufacturers of the detectors with a visually verifiable account of exactly how they can malfunction and how they need to be improved.