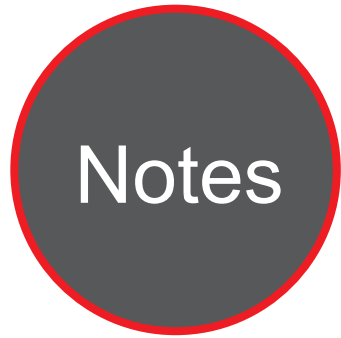




Caltrans Division of Research,
Innovation and System Information

Research



Notes



Transportation
Safety and
Mobility

MAY 2020

Project Title:
Vehicle Infrastructure Integration (VII)

Task Number: 3687

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Support Deployment of RTCM Broadcasts

Deployment support of broadcast Radio Technical Commission for Maritime Services corrections at Caltrans connected infrastructure to facilitate lane-level positioning for connected vehicles.

WHAT IS THE NEED?

Connected Vehicle (CV) technology enables vehicles to exchange information with infrastructure through vehicle-to-infrastructure communications. It potentially provides a solution to utilize vehicles as floating sensors for traffic management and control. Lane-level traffic monitoring is expected to provide an effective solution for traffic control.

CVs use Global Positioning System (GPS) for self-location. Most GPS receivers nowadays use Wide Area Augmentation System (WAAS) correction data as part of position estimation, ultimately improving its GPS position accuracy from within 10 meters without WAAS corrections to within 4 meters with WAAS corrections. Considering the standard 12-foot (3.6 meters) lanes on freeway and 10- to 12-foot (3.0 - 3.6 meters) lanes on arterial, position accuracy provided by WAAS corrections is not adequate for lane-level traffic monitoring.

Real-Time Kinematic (RTK) is a positioning technique to achieve more accurate GPS solutions, typically in centimeters. GPS errors measured at RTK base stations are broadcasted in terms of Radio Technical Commission for Maritime Services (RTCM) corrections. CVs can utilize RTCM correction data to get a more accurate geo-location, which in turn, providing lane-level positioning data to the connected infrastructure.

Field tests conducted at the California CV Test Bed revealed that utilizing RTCM corrections can reliably achieve lane-level positioning. The correct detection rate of lane-of-travel increased from 82% with WAAS corrections to 100% with RTCM



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corrections. Deploying RTCM broadcasts at California Department of Transportation (Caltrans) connected infrastructure can significantly improve the effectiveness of utilizing CV data for traffic management and control.

WHAT ARE WE DOING?

The research team will expand the RTCM data streaming system developed for the California CV Test Bed to:

1. interface with the California Real-Time Network (CRTN) to collect real-time RTCM correction data from CRTN base stations,
2. provide appropriate RTCM corrections to connected infrastructure based on its deployed location, and
3. interface with the Road-Side Unit to broadcast RTCM corrections over-the-air. The CRTN comprises over 580 RTK base stations throughout California and provides a public utility in supporting RTK positioning.

The researchers will develop software tools to monitor the quality of real-time RTCM data streams, to improve reliability of data streaming, increase the spatial coverage of RTCM broadcasts, and minimize the downtime of RTCM broadcasts.

Furthermore, a website will be developed for monitoring the status of RTCM broadcasts at Caltrans connected infrastructure. The website could serve as a repository of deployed connected infrastructure for Caltrans and allows Caltrans staff and potential industry users to keep track the operational status of RTCM broadcasts.

WHAT IS OUR GOAL?

The goal of this project is to provide a one-stop source for the deployment of RTCM broadcasts at Caltrans connected infrastructure, which would allow private and public parties to develop and test CV applications with much-improved position accuracy.

WHAT IS THE BENEFIT?

RTCM broadcasts have the potential to deliver free lane-level vehicle positioning solution for CV, therefore improving the effectiveness of CV applications, increasing the capability of traffic management and control by utilizing CV data, and providing better safety and mobility for all modes of travel.

WHAT IS THE PROGRESS TO DATE?

The project has been executed and will start on June 30, 2020.