DRISI
Caltrans Division of Research, Innovation and System Information

Research Results

Evaluating Deployability of Cooperative Adaptive Cruise Control (CACC) to Form High-Performance Vehicle Streams

Effects of traffic flow smoothness and capacity benefits of CACC

Transportation Safety and Mobility

MAY 2019

Project Title:
Evaluating Deployability of Cooperative Adaptive Cruise Control (CACC) to Form High-Performance Vehicle Streams

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WHAT IS THE NEED?

Cooperative Adaptive Cruise Control (CACC) is an enhancement to commercially available automotive Adaptive Cruise Control (ACC) systems that enables them to operate at shorter headways, increasing traffic flow capacity and providing a smoothing of traffic flow dynamics. CACC is one of the Automated Vehicle technologies that are considered “low hanging” fruit as its implementation looks very promising on the short term. It was necessary to check the effects of CACC system on the flow smoothness and capacity benefits.

WHAT WAS OUR GOAL?

The goal of the project was to evaluate the specific effects that CACC could bring on traffic flow smoothness and capacity so that its benefits to traffic operations can be estimated and its deployment feasibility can be assessed.

This proposal covers research that was intended to be conducted in coordination with the research project, “Using Cooperative ACC to Form High-Performance Vehicle Streams”, which the Federal Highway Administration’s (FHWA) Exploratory Advanced Research Program (EARP) has funded at the California PATH Program of the University of California,
Berkeley. The task described herein represents state cost sharing to match the federal funds provided by the FHWA EARP, so the task has been numbered to fit within the numbering scheme of the tasks in the federally funded project.

WHAT DID WE DO?

We evaluated the CACC operational alternatives under diverse conditions, identifying their effects on traffic flow and efficiency which covers the simulation of models developed under the federally funded part of the project. Research work covered the evaluation of calibrated and validated alternative maneuvering protocols and merge coordination strategies for a range of traffic volumes and traffic flow patterns.

The simulation models were used to evaluate the trends in terms of energy consumption, traffic flow capacity and stability as a function of market penetration for the different classes of vehicles conventional manually driven, ACC, CACC, and vehicle awareness.
These results driven from this research were used to determine the relative deployment feasibility of the different alternatives.

WHAT WAS THE OUTCOME?

CACC system shows a definite increase in the traffic smoothness and traffic flow capacity.

WHAT IS THE BENEFIT?

CACC systems will not only smooth out the traffic patterns it will also help the drivers in driving with added safety, reduce fuel consumption, and overall reduce their carbon footprint.