TREC Project Briefs
Transportation Research and Education Center (TREC)

12-2018

Modeling Mixed Freeway Traffic: Human-driven and Self-driven Cars

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EXECUTIVE SUMMARY - DECEMBER 2018

NITC
NATIONAL INSTITUTE for TRANSPORTATION and COMMUNITIES

MODELING MIXED FREEWAY TRAFFIC: HUMAN-DRIVEN AND SELF-DRIVEN CARS

It can be expected that connected automated vehicles and human-driven vehicles will coexist in the transportation network for a long period. To support various traffic control tasks, therefore, it is critical to develop a reliable model to understand the real-time traffic pattern in a mixed CV and HV environment. A new report from the National Institute for Transportation and Communities (NITC) contributes tools to help planners model freeway traffic that is a mixture of connected automated vehicles, or CAVs, and human-driven vehicles.

A primary goal of this research is to lead in the development and deployment of innovative practices and technologies that stand to improve the safety and performance of the nation's transportation system. To this end, Yang conducted research on advanced technology in order to accelerate and expand its deployment by reducing barriers to innovation. This project contributes three tools for planners:

- A novel macroscopic traffic flow model which treats CVs and HVs as separate groups, where a new set of factors are introduced to represent the speed change of HVs due to following CVs in the traffic stream.
- An optimization function, grounded on the traffic flow model, to make real-time adjustment of CAV desired speeds for minimizing the total freeway travel delays.
- Data analysis from extensive simulation experiments, which reveals that there should exist a critical CV ratio that can greatly reduce the speed difference between CVs and HVs in the traffic stream, given the demand pattern.

Using simulations to evaluate the proposed system, results analysis revealed that the proposed models can effectively reduce freeway travel time of both CAVs and HVs. Further sensitivity analysis on CAV penetration rates also indicated that improving the CAV penetration rate would benefit the reduction of traffic delays. The proposed models can serve as the foundation of many other CAV applications on freeways.

Connected autonomous vehicles (CAVs) and human-driven vehicles (HVs) will likely coexist on the transportation network for a long period. NITC researchers develop a model to understand traffic patterns in a mixed CAV and HV environment.

Vehicle Sensor Data (VSD) Based Traffic Control in Connected Automated Vehicle (CAV) Environment (#2018-1175)

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Download Final Report: http://nitc.trec.pdx.edu/research/project/175

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This study was funded by the **National Institute for Transportation and Communities (NITC). NITC** is one of five U.S. Department of Transportation national university transportation centers. Housed at Portland State University, NITC is a program of the Transportation Research and Education Center (TREC). This Portland State-led research partnership includes the University of Oregon, Oregon Institute of Technology, University of Utah and new partners University of Arizona and University of Texas at Arlington.