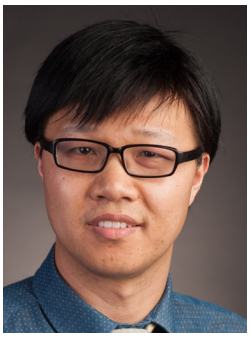
UNIVERSITY TRANSPORTATION CENTER

RESEARCH BRIEF

PROJECT TITLE: **Integrating Driving Simulator Experiment Data with Multi-Agent Connected Automated Vehicle Simulation (Ma-CAVS) Platform to Quantify Improved Capacity**

PRINCIPAL INVESTIGATOR: Haizhong Wang (OSU)

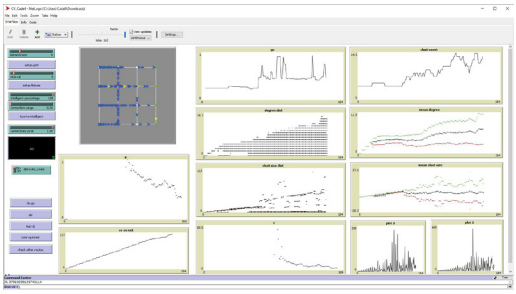
INSTITUTION: SINGLE-INSTITUTION PROJECT
ESTIMATED COMPLETION DATE: AUGUST 2020
SPONSORS: THE PACIFIC NORTHWEST TRANSPORTATION CONSORTIUM, OSU



Background

The introduction of connected and automated vehicles (CAVs) will bring disruptive changes to existing transportation systems and will impact the methods transportation agencies use for the planning, design, and operation of transportation facilities. Current resources used by transportation agencies, such as the Highway Capacity Manual (HCM) or AASHTO Green Book, do not have adequate guidance that considers changing traffic flow characteristics due to CAVs in the traffic stream. Therefore, agencies are not adequately prepared for the near-future, which will likely include mixed fleet traffic of rising CAV market penetrations.

There is limited existing knowledge on human driver behavior when interacting with CAVs. Potential changes to human driver behavior when interacting with CAVs may invalidate parameter assumptions in existing car-following models and simulations. Furthermore, the ability to gather empirical data on human driver behavior in this scenario is limited because there is little to no penetration of CAVs in existing markets.



Research Project

The goal of this project is to validate existing parameter assumptions of human driver car-following behavior in mixed fleet traffic. Validation for these parameters will be derived from a human factors experiment that utilizes the Oregon State University Driving Simulator. Subjects of the driving simulator experiment will be asked to drive in a limited access highway environment with mixed fleet traffic. CAVs in the simulated environment will be visibly distinguishable from other vehicles in the environment. Kinematic data will be collected from the experiment when the subject is adjacent to or following a CAV. From this data, car-following model parameter values such desired velocities, safe time headways, and minimum following distances can be derived.

Parameters derived from the experiment data will be used to inform an agent-based car-following simulation. Results from the simulation will be used to evaluate the validity of existing car-following models with varying market penetrations of CAVs, as well as the validity of model parameter assumptions. The new agent-based car-following simulation will also be used to evaluate the capacity performances of different roadway configurations, such as the effect of separating human drivers from CAVs by lane on limited access highways. The project has the potential to develop capacity adjustments and recommendations for resources such as the HCM.