UNIVERSITY TRANSPORTATION CENTER
RESEARCH BRIEF

PROJECT TITLE: **A Connected Vehicle-Based Adaptive Vehicle Routing Algorithm**

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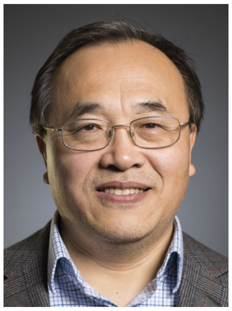
INSTITUTION: SINGLE-INSTITUTION PROJECT
ESTIMATED COMPLETION DATE: AUGUST 2020
SPONSORS: THE PACIFIC NORTHWEST TRANSPORTATION CONSORTIUM, NORWEGIAN PUBLIC ROADS



Background

The past several years have witnessed a major change with regard to data availability in the transportation domain. Connected vehicle systems (CVS), as a leading technology in the intelligent transportation systems, will enable information transfer from vehicle to vehicle (V2V), from vehicle to infrastructure (V2I), and from vehicle to any devices with communication capabilities (V2X). CVS aims to improve vehicle safety and mobility through real-time V2V, V2I, and V2X communications (Paniati, 2005). The communication flows in CVS is based on the radio spectrum of 5.9 GHz specifically allocated by the Federal Communications Commission for Dedicated Short Range Communications (DSRC). The implementation of CVS requires installations of On-Board Units (OBUs) to vehicles and Road-Side Units (RSUs) in roadway infrastructures. Such a system will provide large volumes of diverse, multi-source, and high-resolution data to support numerous applications in traffic planning, operation, and system optimization. Several PacTrans regional agencies have been actively engaged in the deployment of CVS. For example, WSDOT and ODOT are working on an adaptive lighting solution based on communication between vehicles and infrastructure (PacTrans, 2016). In another PacTrans funded project (PacTrans, 2015), the UW team is working on developing a CV testbed that ensure traffic safety through communicating travelers of different modes. With the rapid growth of the system, there is a great potential of connected vehicle (CV) based applications in the Pacific Northwest region.

Research Project

Recently, in our research with the Oregon Department of Transportation (ODOT), the research team developed an automated method for extracting linear lane markings from MLS data as well as evaluating the retroreflectivity of those markings. In the current Pactrans project we are building upon that effort to develop advanced techniques to handle more complex markings (e.g., pedestrian crosswalks, chevrons, and arrows) that were not considered in the prior project, but important to support mobility for multi-modal transportation. First, we project the MLS data into 2D to generate an intensity image and segment high intensity pixels, likely representing various road markings (Figure-b). Subsequently, a deep learning neural network approach, which is known for its high performance for object recognition in many applications, is used to classify various types of markings. This research will enable performance-based procedures for transportation agencies to evaluate pavement marking quality by providing detailed information, including retroreflectivity and types of markings, ranging from high resolution data on a single stripe to aggregated data and analyses statewide. This, in turn, supports informed decision making by DOT management for effective resource allocation. Improved maintenance of pavement markings will also lead to improved mobility with technologies such as autonomous vehicles.