UNIVERSITY TRANSPORTATION CENTER

RESEARCH BRIEF

PROJECT TITLE: **Efficient Extraction and Evaluation of Complex Pavement Markings from Mobile Laser Scan Data**

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INSTITUTION: SINGLE-INSTITUTION PROJECT
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Background

Pavement markings are an important traffic control device, enhancing both the safety and efficiency of various modes of transportation by aiding vehicles, bicyclists, and pedestrians in effectively navigating the transportation network. The importance of pavement markings continues to grow, as autonomous vehicles, which show great promise to improve the mobility in transportation networks, utilize pavement markings detected through video feeds to help appropriately position the vehicle in the lane. Some pavement markings are required to be made of retroreflective materials to ensure their nighttime visibility, but they degrade due to vehicles passing over them and weathering. Transportation agencies are required to periodically assess the conditions of these markings to ensure they meet public safety requirements. These evaluations are typically performed by handheld retroreflectometer, mobile retroreflectometer, or visual, qualitative assessment. Each of these existing methods has associated limitations, related to various factors such as safety, cost, and repeatability. A potential alternative is the use of mobile laser scanning (MLS) data. Surveys of roadways with MLS are currently being conducted on a regular basis by many transportation agencies, and their attribute intensity (return signal strength) data can be used to estimate retroreflectivity of pavement markings for evaluation goals.

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 (Figure-a) 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.