

Construction

NOVEMBER 2024

Project Title:

Point cloud feature extraction for
ADA ramp compliance assessment

Task Number: 4189

Start Date: November 1, 2022

Completion Date: January 31, 2025

Task Manager:

Jessaneil Perez
Research Engineer
Jessaneil.Perez@dot.ca.gov

Point cloud feature extraction for ADA ramp compliance assessment

Development of machine learning tools for automated Americans with Disabilities Act (ADA) curb ramps at pedestrian crossings (CRPC) feature extraction from point cloud Mobile Terrestrial Laser Scanner (MTLS) data.

WHAT IS THE NEED?

The purpose of this research is to develop, evaluate, and test automated algorithms that extract ramp data from MTLS data and make quantitative measurements to ensure their ADA compliance.

WHAT ARE WE DOING?

This study aims to develop machine learning tools for automated ADA CRPC feature extraction from point cloud MTLS data. This project will start with an extensive literature review and feasibility studies to learn about the latest techniques in point cloud feature extraction and associated limitations. The Advance Highway Maintenance and Construction Technology (AHMCT) Research Center will further develop technologies that automate conduction of quantitative measurements from the extracted features to ensure of compliance and to identify CRPCs that require repair or modification.

WHAT IS OUR GOAL?

This study will help identify ways in which the process of CRPC extraction can be simplified for the human operator. This can range from complete to partial automation in which human operator still participates in CRPC extraction in a limited role, hence, speeding up the process.

WHAT IS THE BENEFIT?

The development of the deep learning techniques and algorithms will be made available to the California Department of Transportation (Caltrans) team for continuous



DRISI provides solutions and knowledge that improves California's transportation system.

utilization. This will be accompanied by guidelines on operator involvement in order to maximize the reliability of the overall process.

WHAT IS THE PROGRESS TO DATE?

- **Task 1 Manage project:** Weekly internal meetings were held between staff and team members to discuss issues and track study progress. Several meetings with the project manager were also conducted.
- **Task 2 Literature review and feasibility study:** This task is complete.
- **Task 3 Manual annotation:** Additional data have been annotated, and the task is near completion.
- **Task 4 Design of networks for CRPC extraction:** The networks were finalized and executed on all annotated data. The networks performed remarkably, and the task is complete.
- **Task 5 Design of networks for CRPC measurement:** The task was divided into multiple sections: (1) ramp segmentation, (2) plane extraction, (3) corner detection, and (4) quantitative measurements. All steps were finalized and successfully tested. The corner detection algorithm will need fine-tuning for robustness. The task is complete.
- **Task 6 Evaluation of the developed tools:** This task has not started.
- **Task 7 Develop final report:** This task has not started.

The work planned for the next quarter will focus on task 6 and 7.