

TRANSFORMING IDEAS INTO SOLUTIONS

# **Research Results**



#### **Project Title:**

Point Cloud Feature Extraction for ADA Ramp Compliance Assessment

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

# **Point Cloud Feature Extraction for ADA Ramp Compliance Assessment**

Automated tools for evaluating curb ramp compliance using LiDAR data.

#### WHAT WAS THE NEED?

Surveying is essential for maintaining urban infrastructure by assessing conditions, ensuring safety, and verifying compliance with the Americans with Disabilities Act (ADA). As cities expand and age, accurate surveys help plan repairs, allocate resources efficiently, and minimize liabilities. Traditionally, ramp measurements are conducted manually in the field by trained personnel. This method is highly labor-intensive, prone to errors and limited by the subjective interpretation of the field personnel. To mitigate these challenges, there is a need for automated tools and techniques to ensure consistent and efficient measurements of ADA-compliant ramps.

## WHAT WAS OUR GOAL?

The goal of this research study was to develop a comprehensive framework for automating geometric measurements and compliance assessments for ADA curb ramps using point cloud data. Specifically, the study aimed to improve the efficiency, accuracy, and scalability of infrastructure assessments by integrating different processing techniques.

## WHAT DID WE DO?

This study developed a comprehensive framework for the automation of geometric measurements and compliance assessments using point cloud data for curb ramps. This technique incorporates deep learning-based detection and segmentation with classical geometric and signal processing techniques to automate surveying tasks. The study encompassed a comprehensive review of relevant technologies, feasibility analyses, manual data annotation, and the development of a network framework for the

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extraction and measurement of ramp features. Additionally, the research involved a rigorous assessment of the tools developed.

#### WHAT WAS THE OUTCOME?

Experimental results, including manual fieldbased and point cloud measurements of several ramps, validated the accuracy and reliability of the proposed method across various scenarios, highlighting its potential to significantly reduce manual effort and improve consistency in infrastructure assessment. Beyond ADA compliance, the proposed framework establishes a foundation for broader applications in surveying and automated evaluation of construction infrastructure, paving the way for more widespread adoption of point cloud data in engineering automation. An automated system capable of conducting quantitative evaluations to assess ADA compliance and identifying ramps that require necessary repairs or upgrades has been developed.

#### WHAT IS THE BENEFIT?

The automated system developed in this study will improve ADA accessibility by ensuring that infrastructure such as curb ramps, meets necessary standards for individuals with disabilities, enhancing mobility and independence. By automating the assessment of ADA compliance, the method ensures that these assessments are more accurate, consistent, and timely, ultimately creating safer and more inclusive environments. It streamlines the surveying process, significantly reducing the labor and time traditionally required for manual inspections. The integration of point cloud data with deep learning techniques allows for more scalable and efficient assessments, which is beneficial for large infrastructure networks.

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The final report available <u>here</u>.

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