Software Design Document (SDD)
LA City Sidewalk Assessment Project

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Contents

1 Introduction

1.1 Purpose

The LA City Sidewalk Assessment Project is a collaborative effort between software engineering and mechanical engineering teams aimed at improving sidewalk accessibility and pedestrian safety across Los Angeles. The purpose of the software component is to build a full-stack application that stores, processes, and visualizes sidewalk condition data collected by a robotic rover. The rover captures metrics such as slope, displacement, GPS location, and images. Our software enables users—city officials, engineers, and field testers—to interact with this data for analysis and infrastructure planning, particularly for ADA compliance.

1.2 Intended Audience

- Instructors evaluating student progress

- Developers contributing to the system over multiple terms

- City Planners/Officials assessing sidewalk safety and repair needs

- Mechanical Engineers integrating hardware outputs into the software

- Field Testers collecting live sidewalk data

1.3 Overview

This document provides a technical description of the software architecture, UI components, database schema, and data integration pipeline used to support the LA City Sidewalk Assessment Project. It evolves across project snapshots to document new features and improvements.

2 System Architecture

2.1 Workflow

The sidewalk assessment ecosystem includes hardware and software layers.

Hardware Layer (Rover):

- Controlled remotely by field testers

- Captures GPS coordinates, slope measurements, vertical displacement, and images

- Transmits collected data to the software system (via SD card or live upload)

Software Workflow:

1. Rover collects data in the field (slope, displacement, GPS, photos)

2. Data is uploaded (manually or via web interface) to the software platform

3. Database stores sidewalk metrics with timestamp and location metadata

4. Web dashboard displays reports on a map with filtering tools

5. Admin panel allows city officials to review field data and flag non-compliant segments

6. Collision avoidance logs may be reviewed post-deployment for performance auditing

2.2   Site Breakdown

Module	Function
Login/Register	User authentication and role-based access (admin/field tester)
Upload Data	Interface for uploading CSV/image files from rover
Map Dashboard	Interactive map plotting sidewalk data by severity, slope, and location
Reports Table	Filterable table of all sidewalk assessments
Admin Panel	Manage users, approve reports, export data
Rover Logs Viewer	Optionally review raw logs from rover (for debugging and calibration)

3   User Interface

3.1   How to Use

- Field testers log in, upload new field data from rover memory

- City officials view the interactive map, click points for slope, displacement, and photo data

- Filter by slope severity or ADA compliance

- Admins can export filtered reports for city repair scheduling

3.2   Database Explanation

Tables:

- `users`: id, username, email, password_hash, role (admin/user)

- `assessments`: id, user_id, gps_lat, gps_lon, slope_cross, slope_run, displacement_vert, displacement_horiz, photo_url, timestamp, status

- `collisions` (optional): id, timestamp, rover_id, location, obstacle_type, avoided

Each data entry is associated with the rover's GPS location and timestamp, enabling longitudinal sidewalk tracking.

4 Glossary

Term	Definition
UI	User Interface
API	Application Programming Interface
ADA	Americans with Disabilities Act
DB	Database
GPS	Global Positioning System
Slope	Gradient of sidewalk in vertical/horizontal direction
Collision Avoidance	Rover feature to navigate around obstacles autonomously

5 References

- https://github.com/Jonjy/CS3338_Group1

- https://ascent.cysun.org/project/project/view/222

- https://www.ada.gov/

- https://leafletjs.com

- https://flask.palletsprojects.com

6 Versions Table

Version	Date	Description
1.0	2025-04-25	Initial draft
1.1	TBD	Snapshot 2 – Map dashboard integration
1.2	TBD	Snapshot 3 – Admin tools + rover collision data
1.3	TBD	Snapshot 4 – Final polish + export features