Abstract

Urban parking remains a continuous challenge in modern cities, contributing to traffic congestion, driver frustration, and unnecessary CO_2 emissions. This project presents a browser-based simulation platform that uses crowdsensed LiDAR data from static infrastructure and vehicle-mounted sensors to explore a different approach to real-time parking detection. The system integrates point cloud processing, SUMO-based traffic simulation, and interactive 3D visualization to create a digital twin of urban parking dynamics.

While the current implementation is limited to a local simulation and does not yet connect to live sensors or a backend system, it serves as a functional proof-of-concept for LiDAR-driven occupancy detection and client-side spatial logic. The platform demonstrates the technical possibility of integrating multi-source spatiotemporal data to simulate real-time parking scenarios, detect space occupancy, and visualize user parking behavior at a large scale.

Apart from Simulation, the project introduces a broad idea focused on improving navigation systems by adding real-time parking, guidance, dynamic route adjustments, and allowing users to reserve parking spots in advance. This idea creates a starting point for building parking assistance systems that can work at different scales, do not depend on specific sensors, and use existing technologies to support smarter and more flexible urban mobility in the future.