SmartPath Automated Parking Solutions

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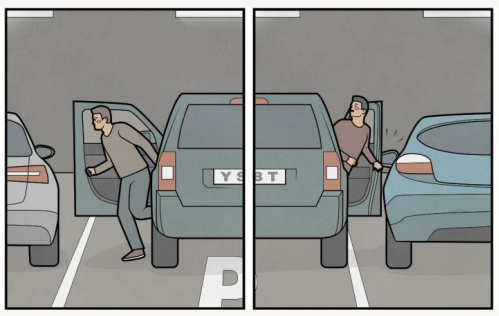
Introduction

Parking is often slow and inaccurate with a high risk of accidents especially in narrow spots that are difficult to navigate.[I] People and the existing self-parking systems struggle with these problems.

Our goal is to create a better self-parking system. The solution would combine multiple advanced solutions such as neural networks and pathfinding algorithms to achieve a faster, safer, less stressful parking experience. Besides that, our project focuses on the needs of the people.

Inacurate parking leads to troubles.[3]



It is all worthless without focusing on the human.[2]

Finding a parking spot

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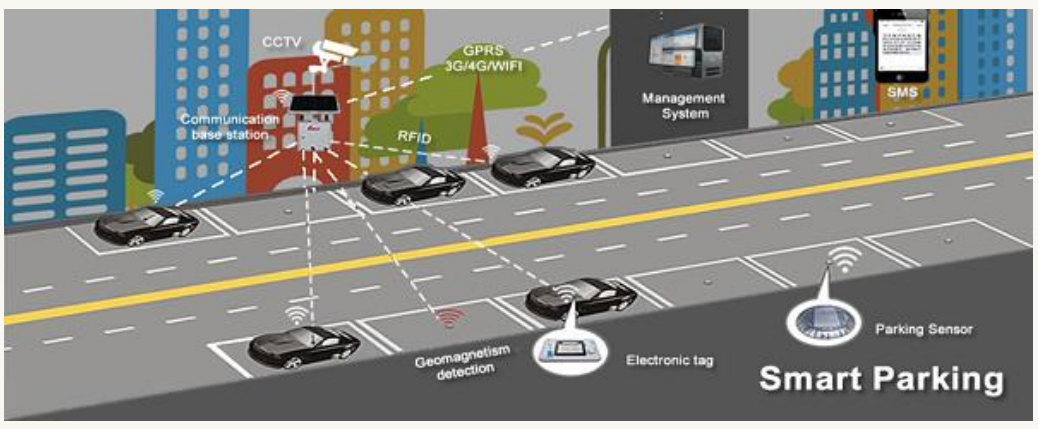
SmartPath leverages cutting-edge IoT systems, including LoRaWAN[4] and Bosch Suite, to detect available parking spaces both in garages and on the street. To ensure the most efficient choice, a Graph Convolutional Network (GCN) model analyzes real-time data, considering factors such as vehicle size, accessibility requirements, and optimal distance. This intelligent system enhances convenience, reduces parking time, and improves overall urban mobility.



The system connects cars, cameras and garages on-line[5].

Mapping obstacles

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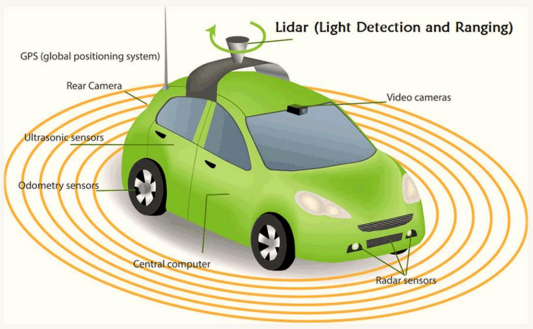
Upon arrival, an enhanced LIDAR system will generate a detailed 3D map of the car's surroundings, accurately detecting nearby objects and spatial constraints to ensure safe and precise maneuvering.



LIDAR system equipped on a car to analyze surroundings[6]

Route calculation

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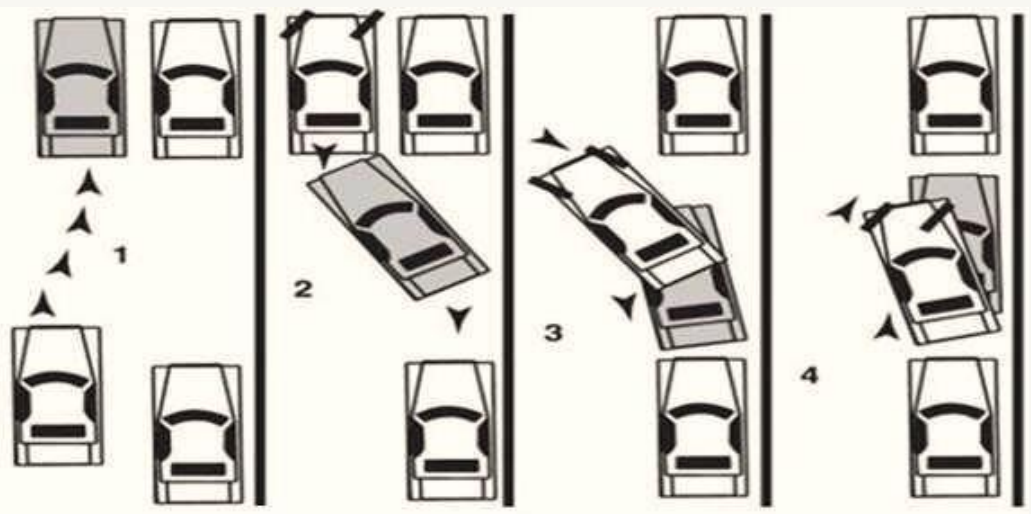
Assisted parking requires finding the best path from start to goal while considering vehicle size, position, orientation, and obstacles. This is formulated as a graph search problem, where A* expands a search tree. To optimize it, we refine cost estimation using A*'s heuristics. Additionally, a CNN model based on UNET algorithm enhances speed, safety, and accuracy.



Finding the optimal route in a parallel parking situation.[8]

Ethical and human aspects

When introducing new technology, the key question isn't just advancement but ethics and human-centered design.

In self-driving functions, safety and privacy are paramount. Our data-driven solution complies with EU regulations, ensuring ethical use. LIDAR creates point clouds without capturing faces or biometric data.[6]

At low parking speeds, built-in safety features prevent collisions while prioritizing human needs—allowing space for door openings, other vehicles, and accessibility.

Because true innovation isn't just smart—it's ethical, human-centered, and designed to improve lives.

A succesful parking [9]

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