

Smart Parking Area Suggesting System

Vaishnavi R. Bhujbal¹, Anuja M. Newale², Puja B. Pawar³, Tanuja P. Badhe⁴, Prof. Saba Chaugule⁵

¹²³⁴Students, B.E., Computer Engineering, P.K. Technical Campus, Pune

⁵Professor Department of Computer Engineering, P.K. Technical Campus, Pune

Abstract- The past decade was reasonably hectic with city life, heavy traffic, no parking space, etc. old parking apps failed to provide real-time information on parking space due to which drivers explore here and there in search of appropriate space, which is pretty frustrating and a wastage of time, fuel, and money.

That could be solved by the implementation of an intelligent Smart Parking Area Suggestion System. It needs to identify the available parking in real time using camera-based technology, make immediate suggestions with AI, user reservations of space, notification in case something goes wrong, and digital payment for effortless parking.

Other key features include route navigation through Google Maps integration and the reservation of parking spots for electric vehicles, multi-language support, and options for differently-able people. The AI-powered solution therefore improves urban mobility on account of congestion reduction and makes the process of managing parking effective with intelligent system.

Index Terms: Smart Parking, Artificial Intelligence, Computer Vision, Real-Time Suggestion, EV Parking, Booking System, Voice Assistance, Accessibility, Urban Mobility.

I. INTRODUCTION

Daily parking headaches reflects urban challenges, with drivers circling around, wasting fuel and increasing pollution. Old parking apps have stuck where they are, incapable of offering real-time availability.

The identification, prediction, and suggestions of parking areas will be done by our smart parking area suggestion system, powered with AI and Computer Vision. Cameras will be implemented for monitoring of car parking areas, with further identification of parking and vacant vehicles done through AI itself. It will also auto-suggest everything from real-time updates to vehicle-specific recommendations, EV spots, and pre-bookings.

It also has built-in multi-language support, voice assistants, and disability access for differently-able people. Further, it integrates AI analytics, connectivity, GPS, and the cloud, making it modern, fast, and eco-friendly in terms of parking management.

II. METHODOLOGY

It integrates AI-enabled vision and mobile/website applications to detect the availability of free parking spot, reservations and provide real-time suggestions to drivers.

A. Research Design

The paper discusses the architecture, features, and usability experience represented by the Smart Parking system. It also talks about the enhancement the proposed system has over the old parking setup in terms of time efficiency and convenience to users.

B. Data Collection

The information is based on the following sources:

Actual CCTVs installed near the parking lots

The AI-powered CCTV cameras deployed around the parking areas record continuous live footage, which is fed through advanced object detection models in order to give an accurate outline of the occupied and vacant parking spots in real time, thus updating the data with very close accuracy.

Application logs: reservation, cancellation, payment

City traffic and parking reports.

C. Case Study Approach

The benchmark systems studied were as follows:

- Park+ India: e-payment integration
- Google Maps Parking API: map-based parking guidance

- Bosch Smart Parking: AI-based car detection

Services rated based on accuracy of detection, frequency of update, usability, smoothness of booking flow, payment integration, and access.

D. Technical Analysis

- AI Module: YOLO/ResNet for Car and Spot Detection
- Back-end: Firebase or AWS Cloud through Python using Flask/Django
- Frontend: HTML, CSS, JavaScript, Bootstrap 5
- This is an MQTT/HTTP protocol: based real-time cloud-synchronized artificial intelligence-driven data processing system that can be continuously broadcast, analyzed, and updated for parking information with the ability to provide real-time suggestions and management.
- Payment methods: include UPI, Cards, Wallets.
- Navigation: live directions through Google Maps

E. Forecast and Future Scope

Future enhancements may include:

- Predicting spot availability using machine learning
- Integration with Smart City Infrastructure

In-car voice assistant

- Carbon footprint monitoring for eco-driving

III. SYSTEM WORKING

Detection and Monitoring:

AI processes the feeds from cameras installed at occupied and vacant parking spots to constantly update the real-time information in the cloud database so that it presents updated information on layout to the users.

Real-Time Suggestions:

It will provide suggestions, using GPS, about which of the nearest available parking spots is optimal in terms of distance, cost, and type of vehicle. EV drivers will be sent to the nearest charging stations.

Reservation System:

The customer can even book a parking spot online, and the cost can be paid digitally too. On making the

payment, a QR code is generated that helps in easy access.

Notifications and Alerts:

It sends messages in the form of SMS, emails, and application notifications to the users regarding bookings and warnings related to their expirations, including information on delays.

Navigation:

Google Maps are a big help in navigating while living, and voice assistance ensures that one smoothly reaches at the destination.

Accessibility:

It keeps the reservations for differently-abled users. Besides, support for various languages and voice commands needs further development to make it more inclusive.

Security and Privacy:

The application authenticates all transactions and encrypts them. The AI module assists the application in detecting suspicious activities, while keeping users' data and video clips in a secured manner.

IV. KEY COMPONENTS

- AI Cameras: Automatic Car and Free Spots Detection.
- AI with CCTV: real-time monitoring of spot status.
- Cloud Database: This would store information regarding the user, payments, and parking.
- User Interface: Web and mobile application for booking and payment.
- Payment Gateway: It handles multi-options of online payment systems.
- Triangulation helps Google Maps estimate arrival time by navigation.
- EV Module Suggests Charging Stations:

Artificial Intelligence for System-wide Security Anomaly Detection toward Safety

V. COMPARISON: SMART PARKING VS. TRADITIONAL PARKING

Aspect × Traditional Parking × Smart Parking System

Detection-Manual Automated: AI + Cameras

Availability Static Real-Time Updates

Bookings Not Available Online Booking

Payment Cash Digital (UPI/ Cards)

Accessibility Limited Multilingual & Voice-Controlled EV Support Rare Dedicated EV Charging Spots Speed Slow Fast & automated Security Weak AI-Based Surveillance

- [2] •IEEE Access Journal. (2022). AI-Based Smart Parking Systems for Smart Cities. IEEE Publications.
- [3] Park+ Technologies. 2023. Digital Parking Solutions and API Documentation. Park+ Developer Resources.
- [4] Google Developers. 2023. Google Maps API: Navigation and Real time Parking Data. Google Developer Guide.
- [5] Singh, K. O., & Colleagues. AI-driven Traffic and Parking Systems. Springer Publications, 2021.

LIMITATIONS

High Installation Cost: Installation of AI-powered cameras has proven that it is highly expensive.

All this monitoring raises many questions about data protection.

Generally, all AI models are sensitive to light and weather conditions.

VI. CONCLUSION

It will handle the parking of cars in the urban city effectively with a smart area suggestion system for parking by using the power of AI and cloud. It lessens the congestion on the streets and saves time, allowing proper utilization of parking for an easy experience by the users.

For EV drivers, multilingual users, and people of different abilities-it's all in one solution: Inclusive and sustainable analysis.

Very soon, integration of driverless cars and intelligent roads is going to bring a totally new revolution in urban mobility and parking management.

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REFERENCE

- [1] Bosch Mobility Solutions. 2022. Smart Parking through the Integration of Artificial Intelligence and IoT Technologies. Bosch Research Reports.