Real-Time Car Parking System

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***Abstract*— Rapid development in the technology sector has given rise to many modern smart solutions. One of the areas where technology is highly sought after is efficient parking solution systems (Smart-Car Parking Systems-SCPS). This review provides an in-depth study of technologies, techniques, and frameworks used in existing SCPS indicating the contribution of IoT, sensor networks, ML, and mobile apps on their efficiency. The paper also discusses several key issues, including scalability, cost, user adoption, and future research and development suggestions. To aid researchers and policymakers in urban mobility and smart city movement development, strategy, this review has consolidated findings from more than 50 studies.**

Keywords—Smart Parking, IoT, Sensor Networks, Urban Mobility, Machine Learning, Parking Reservation, Smart Cities

INTRODUCTION

As a result of urbanization, parking issues have become a growing problem worldwide. Traditional parking practices are reduced by modern parking demands, which have adverse experiences for people, increase in cars within the city, and time to grow for wastage. In addition to these concerns, the use of fuel and air pollution increases due to these disabilities. Therefore, to solve these issues, smart car parking systems (SCPs) are becoming increasingly popular as they provide hope in solving the urban parking crisis. SCPS includes an advanced framework and technologies such as IoT, sensors, and real-time data processing, providing accurate information to drivers on free parking slots, allowing for reservation and payment of online parking sites, and looking for parking Drivers spend less time spent in. , The SCP can reduce emissions with every car that uses it by reducing the dedicated time for parking. In addition to space and traffic management, SCPS also can improve the environmental status of cities. Despite these possibilities, lack of knowledge about economic costs, technical difficulties, and adoption obstacles of users. This letter presents the background information required to understand how SCP works, the technologies used in their construction, the current status of development, and future possibilities. The primary focus is on the effect that SCPS will have on its role in changing urban parking and creating a clever and more durable city.

LITERATURE SURVEY

Ref. No. & Year of Publication	Micro-controller	Sensors used	Additional Hardware	Display/ Output	Target Application
1. (2017)	Raspberry Pi	Ultrasonic Sensor	Motor Driver	LCD Display	This system provides real-time parking information to drivers, which helps manage urban parking and reduce overload in urban centers.
2. (2018)	Arduino UNO	IR Sensor	Bluetooth module	Mobile App	This system helps buyers find parking spaces available through a mobile app, improving their purchase experience.

Ref. No. & Year of Publication	Micro-controller	Sensors used	Additional Hardware	Display/ Output	Target Application
3. (2019)	Raspberry Pi	Camera	Wi-Fi module	Web Interface	This system uses a web interface to inform employees and visitors about parking availability, optimizing the use of space in office buildings.
4. (2020)	Arduino UNO	Ultrasonic Sensor	GSM Module	LCD Display	This system uses GSM technology to send SMS alerts to residents of available parking spaces, improving parking efficiency in residential complexes.
5. (2021)	ESP32	Magnetic Sensor	RFID Reader	LED Indicator	The system uses RFID technology to skill passengers efficiently to evacuate the parking sites of the airport, reduce the crowd, and improve operations.

MOTIVATION

This research is aimed at achieving permanent urban development. Continuous issues related to air pollution, traffic congestion, and increasing driver dissatisfaction are caused by disabled parking systems. In developing a smart parking system, we aim to:

A. Reduce the time taken in search of parking slots.

B. Improve the efficiency of existing parking locations.

C. Integrate the system with mobile devices for more ease of use.

D. Support the environment by reducing fuel by burning fuel

PROBLEM DOMAIN

The problem domain encompasses the following:

A. Urban Parking Challenges: Few parking lots, plenty of demand, and inefficient management.

B. Technological Limitation: The absence of real-time data and lack of integration with user devices.

C. Environmental Impact: Greater emissions as a result of extended search periods.

PROBLEM DEFINITION

The main problem addressed by this study is the ineffectiveness of the traditional parking systems, causing:

A. Time and fuel lost by drivers.

B. Underutilization of the parking spaces.

C. Traffic congestion and pollution.

INNOVATIVE CONTENT

The proposed system has the following innovations:

A. Real-time slot detection: The availability of parked slots is realized by the ultrasonic sensor in real-time.

B. Mobile Application: Users can pay through slot availability, reserve, and even mobile apps.

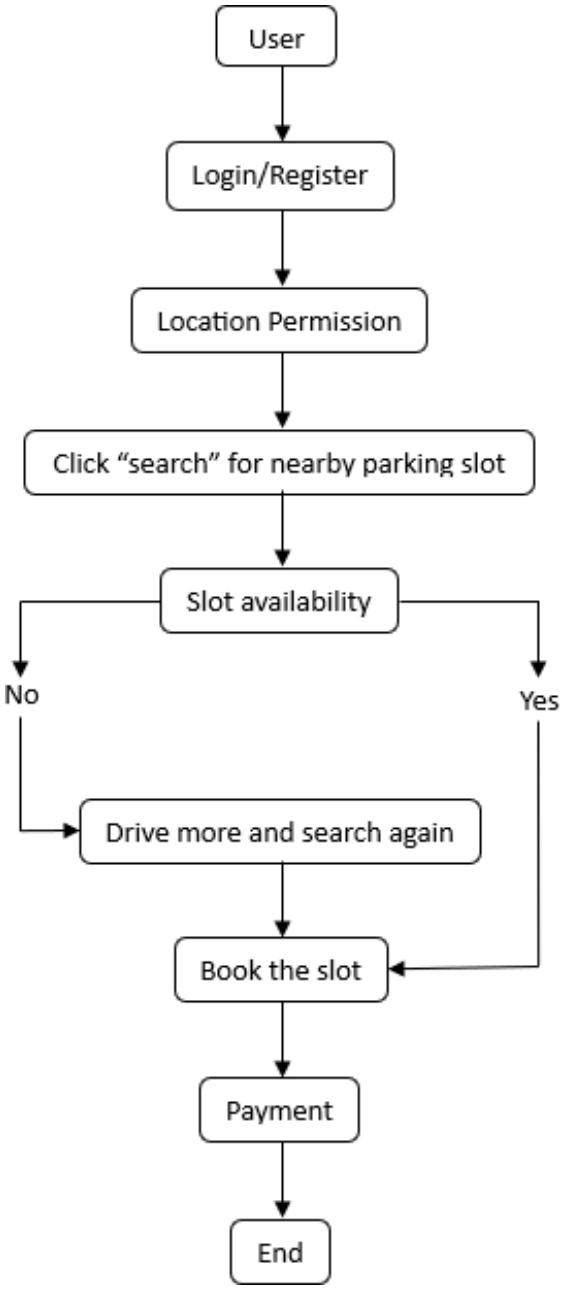
C. Dynamic Pricing: Price adjustment depending on the demand and time of day time.

PROBLEM-SOLVING

The proposed smart car parking system uses strategically placed IR sensors in the parking slot to detect the presence of the vehicle, all are associated with an Arduino microcontroller that continuously monitors the situation. The control logic includes algorithms for dynamic updates of accurate vehicles and dynamic updates of parking availability, ensuring efficient resource management. To enhance the user experience, the system has a user interface that provides real-time parking information through an LCD on the entrance, a mobile application, or a web-based interface, allowing the driver to allow the driver easily available places. Get Allow to find out. The performance assessment will focus on the accuracy, reliability, and accountability of the system, which measures major matrices such as accuracy, reaction time, and major matrix such as accuracy against a predetermined benchmark. Additionally, the proposed solution will be compared with existing parking

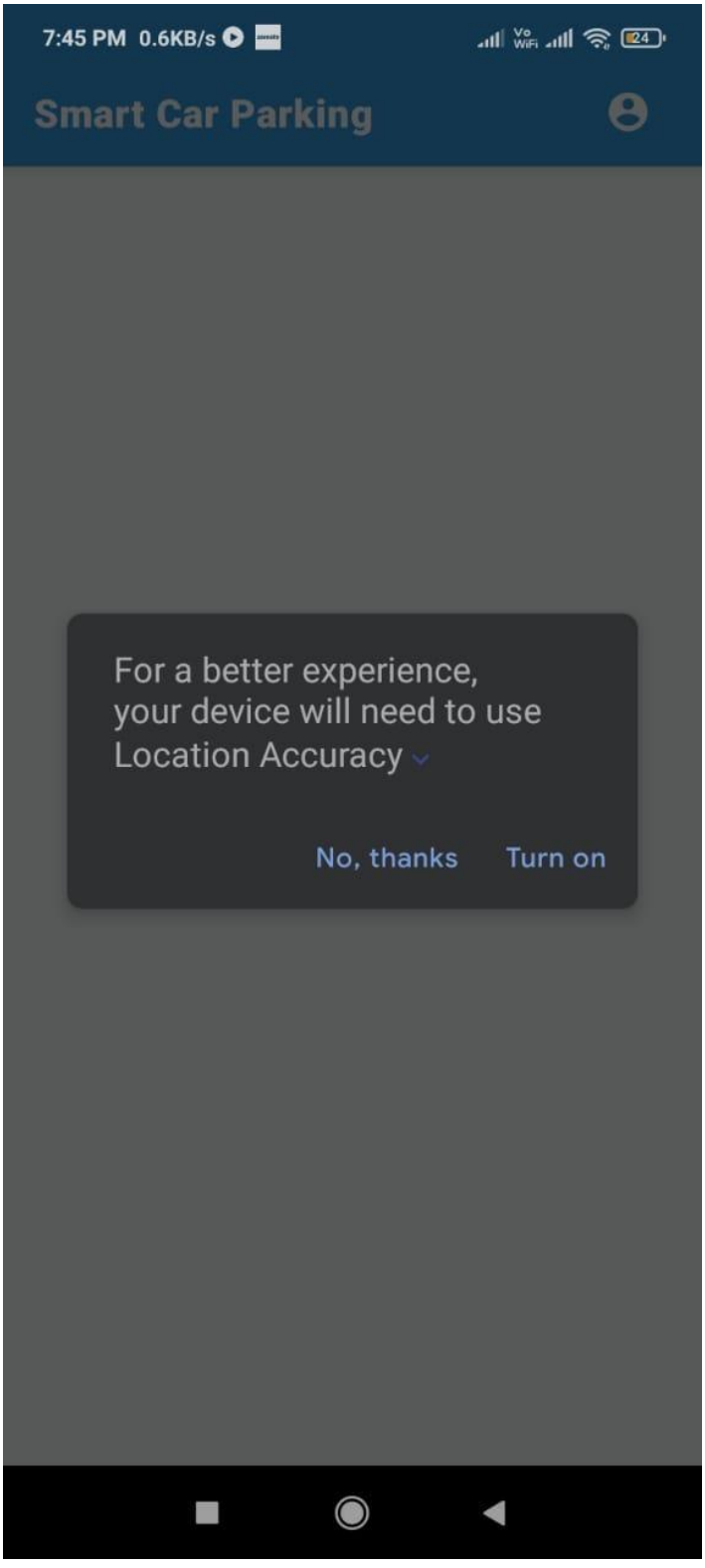
management systems to assess its advantages and boundaries in terms of cost defense, ease of implementation, scalability, and user satisfaction. Smart car parking system has diverse applications, including urban parking lots to reduce traffic congestion, shopping malls to increase customer experience, office buildings for customized space allocation, residential complexes, and well-organized management public programs Larger ceremonies have been included, involved in handling parking efficiently.

REPRESENTATION

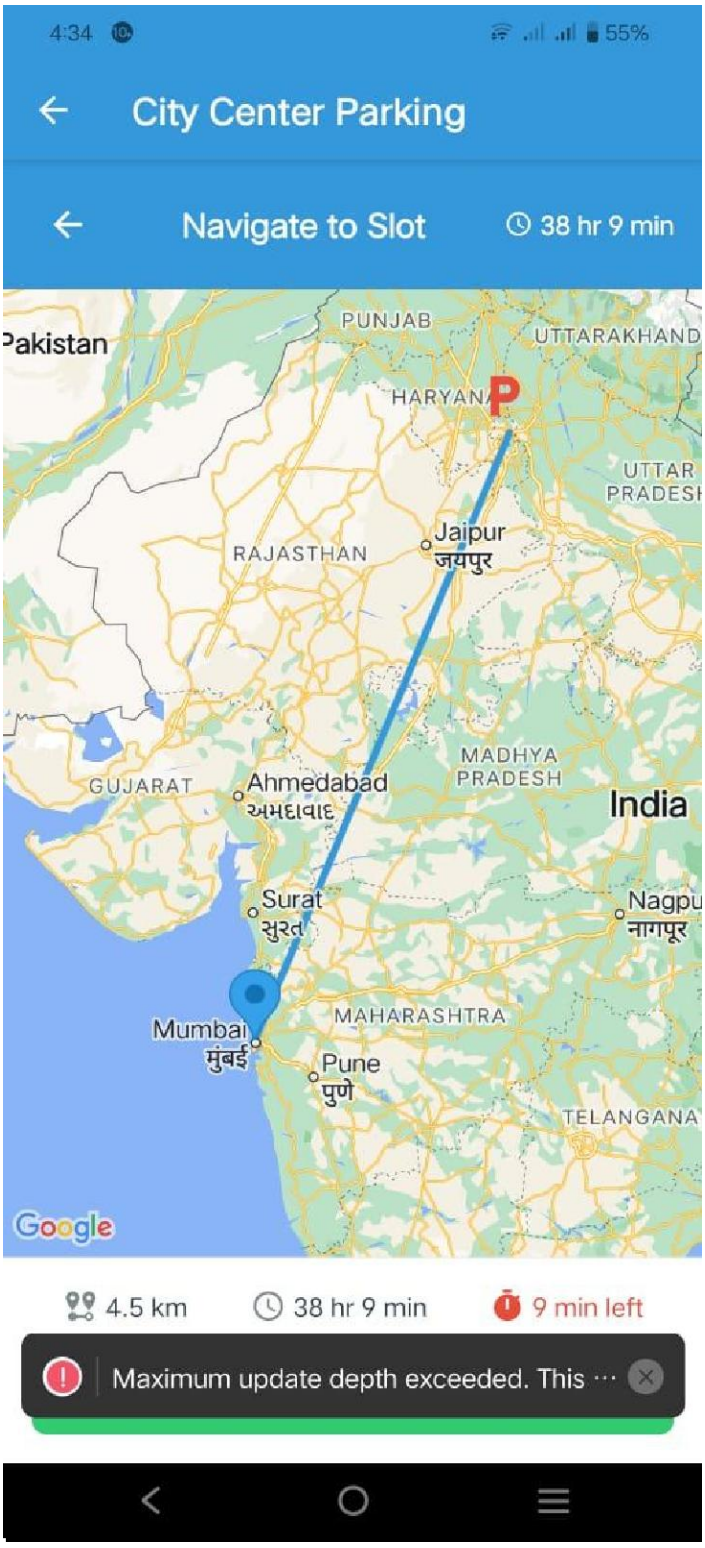


Flowchart

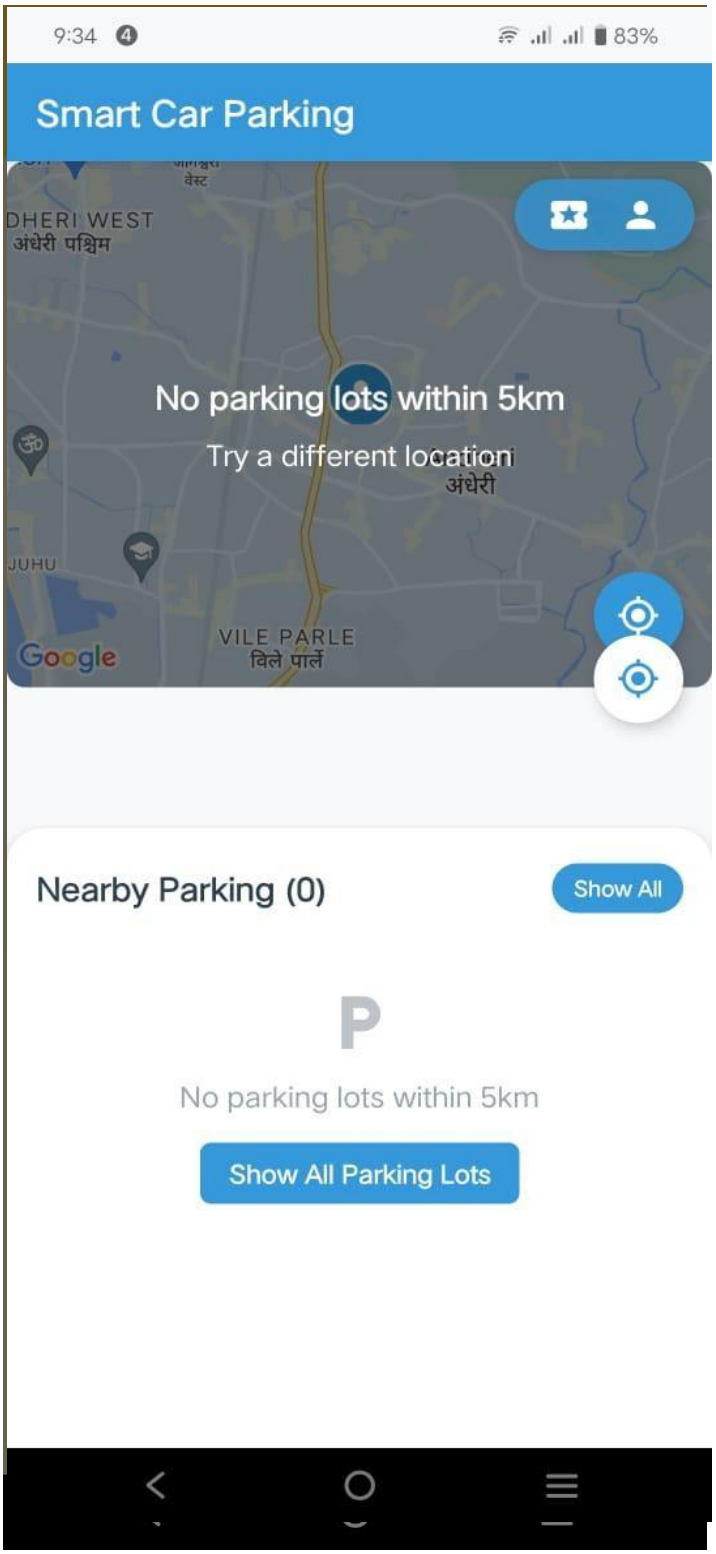
RESULT



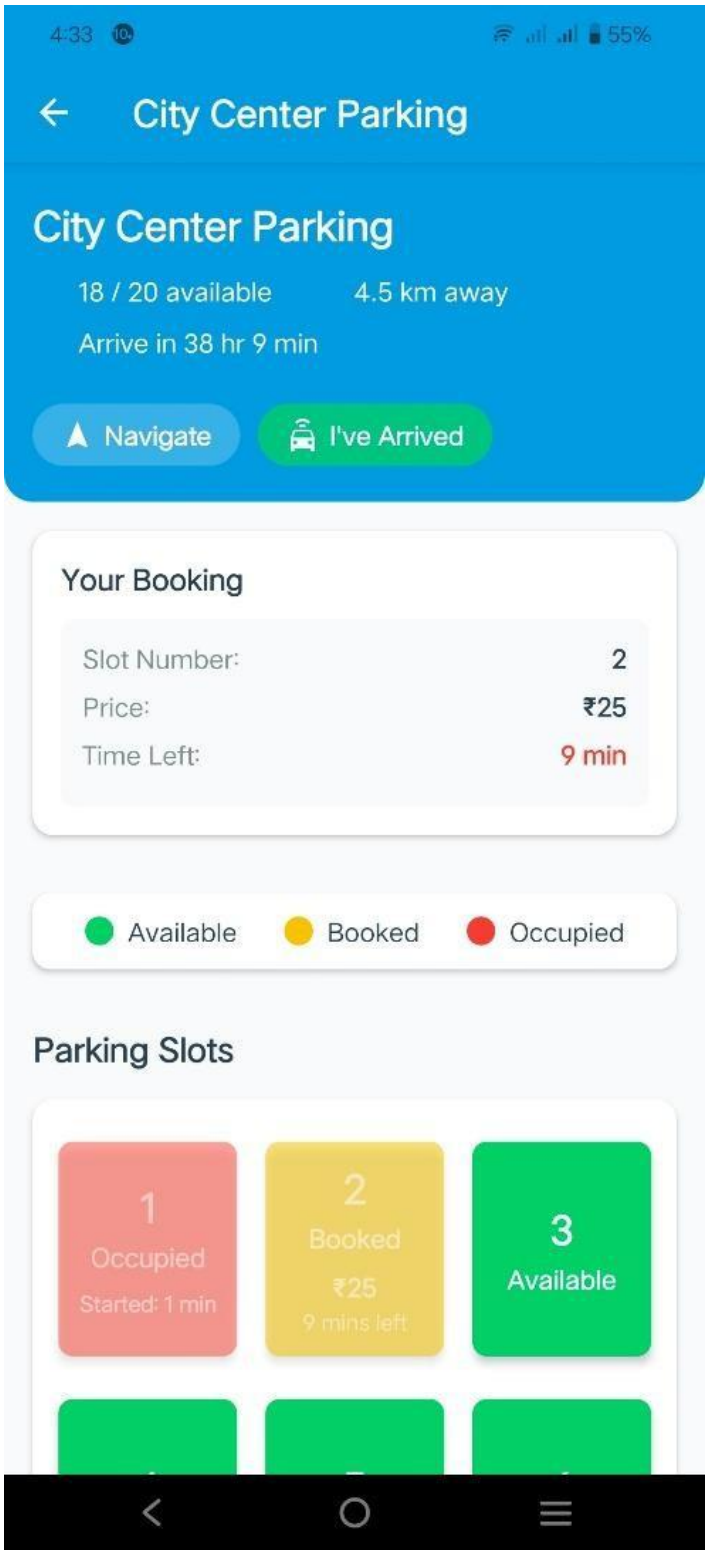
After opening the ‘Smart Car Parking’ application it will first ask for the user’s location service to track the nearby parking spot from the user’s location.



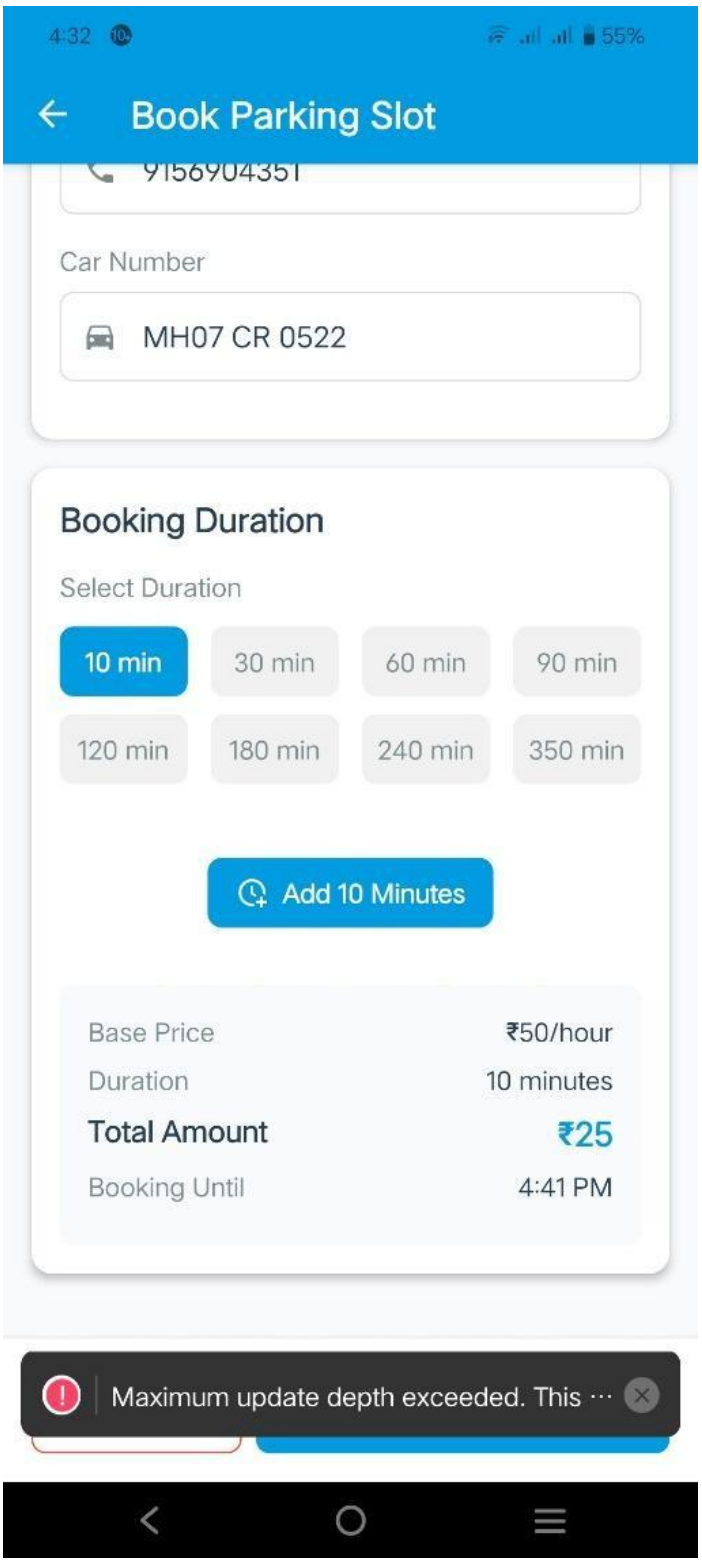
After opening the map the user will get to know about the nearest parking spot from your location.



If the user clicks on the parking spot that is far from its location, the user will get a popup like 'you are too far from the parking location. Try within 3km'.



When a user clicks on the nearest parking spot the user will get to know about the occupied or unoccupied slots of that parking. The red color will indicate that the slot is occupied and the green color will indicate that the slot is not occupied.



While booking a parking slot the user must fill in all the required details carefully and make the payment to ensure the booking.

CONCLUSION

A smart car parking system is a possible solution to urban parking challenges. The system improves parking efficiency, reduces environmental impact, and enhances the user facility by taking advantage of IOT and real-time data processing. Future work will be on the integration of AI for the expansion of the system for future analysis and multi-level parking facilities.

FUTURE WORK

A. Integration of AI to predict parking availability.

B. Expansion into multi-level and underground parking garages.

C. Use of blockchain to facilitate secure transactions.

ACKNOWLEDGMENT

We would like to thank Finolex Academy of Management and Technology for providing the resources and support needed to conduct this research.

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