



Smart Parking System

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Abstract : The world is aware of the current situation; the population is growing every day, and the number of automobiles is growing as well. As a result, everyone is dealing with a parking dilemma, as there are fewer possibilities for legal parking. This model allows users to check the current state of the car park (vacant/occupied slots) and reserve a parking spot using Android devices and it also finds all kind of spaces available nearby like empty lands, parking areas ,etc. For the user using maps sdk Version 2.We also used splash screen for guiding the end user what this app can do. This model also allow online payments for cashless transaction and also this model uses number plate scanner for the authorization of vehicle and also it is cheap and user friendly.

Index Terms - Android, Java, Firebase, XML.

I.INTRODUCTION

PARKING is an expensive activity in terms of both money and time and effort spent "hunting down free parking spots." According to current research, a car spends 95% of its life parked and only 5% of its time on the road [1]. According to the British National Travel Survey [2], a car was driven for 361 hours on average per year in 2014 in England, resulting in approximately 8404 hours of parked time. Now, where would you keep your car for such a long period of time? The first problem produced by the global surge in car owners is, of course, cruising for parking. Approximately 30% of traffic is generated by drivers looking for parking places [3]. In 2006, a study in France estimated that 70 million hours were spent seeking for parking each year in France, resulting in a loss of 700 million euros per year [4]. According to a global parking survey conducted by IBM [5] in 2011, the average time spent looking for a desirable parking spot is 20 minutes. We can deduce from these figures that cruising for parking accounts for a significant amount of global pollution and fuel waste.

To address parking issues, the research described in this study integrates parking reservation and price models. In the case of parking reservations, Mouskos et al. [6] modelled the process as a resource allocation problem. Their model is built on MILP, and the goal is to reduce driver costs. Their model offers real time reservations with fixed pricing.

On the pricing front, Shoup et al. [3] developed innovative ideas that led to the creation of San Francisco Park (SFPark) [7] in San Francisco, which intends to reduce traffic congestion by dynamically modifying rates based on sensor historical data. Sensors are placed on the asphalt in SFPark to collect parking data, which is then kept in a database and processed weekly or monthly. Price increases and decreases are proportional to expected utilisation, according to historical statistics. Although dynamically changing parking fees are intended to balance parking supply and demand and promote overall utilisation, they are based on past data and statistics that may or may not be precise enough to have the intended effect.

The proposed research will assist in scheduling a parking place for a car, as the name "Smart Parking System" implies. The old method has the disadvantage of taking longer and hence being less efficient. Such issues will be made easier by the proposed research. The more traditional techniques for booking a vehicle are not more efficient. Maintaining the data of the user who had reserved a parking space necessitates a considerable number of human resources. The entire premise is chaotic, since car drivers park their vehicles on the side of the road. As a result, there is a significant traffic jam or congestion. As a result, a smart parking application is required. The main goal of the application is to solve all of these challenges that we all experience in our daily lives. The application must be created in a user-friendly manner so that it can be used by anyone. This manual technique is inefficient since the user has no restrictions on where they can park their automobiles.

A smart parking space is one that allows the user to accomplish tasks such as:

1. Parking space availability.
2. There are parking lots near the destination.
3. The cost of the designated parking place.
4. Legalised approval of the reservation.
5. An advance parking facility should be available.

These considerations should be kept in mind by developers during the application development phase. The programme should also be user-friendly so that a user may easily schedule a parking spot. According to the user's perspective, we are attempting to design an application while keeping the user's demands in mind. The smart parking application will allow users to reserve a parking space in advance, allowing them to prepare accordingly. Our app will make the parking process much more straightforward, efficient, and time-saving.

The majority of the time, finding a parking space to park one's vehicle is a pain. Because most traffic happens solely as a result of car congestion in urban areas, individuals waste time looking for parking spaces in unusual places.

1.1 Challenges

Challenges during making our model:

- User Interface:

In this, we don't know how's our app gonna look, we made multiple samples to give user a simple and easy app to use. We also give quick info before using the app.

- Email Verification:

In this, we want to make sure that user should be verified person. So, we use firebase authentication to verify about the user. We send email to user email, if user click in the given link the it make sure user is verified.

- Connectivity to Database:

In this, we face issue during connecting to database, sometimes database crashed or it does not show the desire result.

- Nearest parking slot to user:

In this, we face issue to give the nearest location to user according to their location, then we came up with solution by using maps services to locate the location.

- Vehicle is registered or not:

In this, we don't know whether a vehicle is authorised or not so, to make sure that vehicle is authorised or not we use Numberplate scanner.

- Online payment method:

In this, we don't know which type of online payment method owner accept so, it cause issue to the user if they don't have same online payment method. So, we make sure that we use all the of payment option.

1.2 Requirements

Memory Required:1280MB

Minimum SDK Version:21

1.3 Modules

There are two modules: -

1.3.1 Normal User login

In this user register themselves by giving all their details including password. After the successful registration user can sign in to the app by using email id and password and then they can select the nearest parking spot according to their timings and they can also see the history and can also change their password if they want.

1.3.2 Owner User login

In this user register themselves by giving all their details including password. After the successful registration user can sign in to the app by using email id and password and then they can add parking spaces in the app and type of online payment mode they accept and also they can select timings and can also change their password if they want.

II. RESEARCH METHODOLOGY

There have been various re-researches and investments in the automobile parking sector over the last two decades. Some of them had been deployed in practice like Parking Guidance and Information (PGI) systems [8]–[10]. PGI systems use variable message signs to give drivers with real-time parking information within controlled areas. They obtain information on total occupancy by placing sensors mostly at the entrances and exits of parking lots. Other deployments, which have been observed in commercial shopping malls and business districts to better utilise parking spaces and reduce searching time, typically use one sensor per one parking spot.

Most of the researches have focused on how to detect the occupancy state of parking spots [11]–[13]. Those systems, however, have not solved all of the issues. Where parking is regulated, competition for parking leads to increased traffic congestion, leaving alternative parking options unoccupied. This also explains the well-known phenomena of "several cars chasing the same place." It is necessary to collect data about parking lot occupancy, but it is even more crucial to make effective use of that data.

Image processing has been considered as one of the intelligent systems for car parking [14]. In this technology, a camera captures a brown rounded image of the parking slot, which is then processed to detect the free parking spot. On the 7-segment display, information about currently available parking places is provided. Initially, a brown-rounded image of parking spaces is captured. To make binary pictures, the image is segmented. The noise in this image has been eliminated, and the object boundaries have been detected. By calculating the area and perimeter of each object, the image detection module identifies which objects are round. As a result, the available parking place is assigned.

A vision-based car parking system [15] is being developed, which detects free parking slots using two types of pictures (positive and negative). In this method, the object classifier detects the required object within the input. Images of cars from various viewpoints can be found in positive images. There are no automobiles in negative photos. To detect the presence of cars in the area, the given co-ordinates of parking lots are used as input. However, depending on the type of camera utilised, this technique may have limits. Furthermore, because the coordinate system selects precise parking spaces, the camera must be fixed. The method may be limited due to a lack of positive and negative images.

To process the number plates of the vehicles, the Number Plate Recognition approach [16] for constructing autonomous automobile parking systems uses image processing as a foundation. The image of the vehicle's licence number plate is captured in this system. It's then divided to get the number plate's component characters. Free-parking spots are detected using ultrasonic sensors. The number plate photos are then taken and examined. At the same time, the current time is recorded in order to calculate parking rates. The LCD shows a 'FULL' indicator, indicating that no parking space is available. However, the system has several constraints, such as the backdrop colour being required to be black and the character colour being white. In addition, the study is limited to one-row number plates.

A mechanical model with an image processing facility was proposed by Smart Parking System [17]. The car would be parked on numerous levels using lifts. In order to prevent unauthorised car entry, image processing is also employed to record the number plate and store it in a database for comparison.

As a result, we want to create a car parking system that is totally automated and requires minimal human intervention, while also eliminating the limits of earlier systems.

Title	Author	Technologies Used	Source
Automatic parking management and parking fee collection based On Number Plate Recognition	M.Ataur Rehman, M.M. Rashid, A.Musa, A.Farhana and N.Farhana	Image processing	International Journal of Machine Learning and Computing, vol. 2, no. 2, pp. 93-98, 2012.
Vision based automated parking System	Patrick Sebastian, Hamada R.H. Al-Absi, Justin Dinesh Daniel Devraj and Yap Vooi Voon	Vision based system	10 International conference on Information Science, Signal Processing and their Applications (ISSPA 2010), no. 1, pp. 757-760, 2010
Intelligent Parking space detection system based on image Processing	Norazwinawati Basharuiddin, R. Yusnita, Fariza Norbaya	Image processing	Internation Journal of Innovation, Management and Technology, vol. 3, no. 3, pp. 232-253, 2012.
Integrated Car Park System for Smart Parking Solution	Harprith Kaur Randhawa, Deshinta Arrova Dewi and Nirmal Kumar Karmani	Internet Of Things	INTI JOURNAL eISSN:2600-7920 Vol.2019:038
Smart Parking System using Android and QR code for widyatama university	Yuqbal Faza Aula Dipa,Dani Hamdani	Android,QR code	International Journal of Computer ,Network Security and Information System(IJCONSIST) vol:1,issue:2,march 2020,pp. 55-60
UParking: Developing a Smart Parking Management System Using the Internet of Things	Norah Farooqi ,Shroug Alshehri ,Sahar Nollily ,Lama Najmi ,Ghaidaa Alqurashi ,Abeer Alrashedi	Internet Of Things	IEEE 2020
Cloud-based Smart Parking Reservation System using IoT	Abhijit Pathak, Abrar Hossain Tasin, Md. Shahid Uddin Rahat, Vicky Barua, Munna Das, Sudarshan Das	Cloud,IOT	IEEE 2020

Table 2.1:Old Technologies

III.RESULTS AND DISCUSSION

This method explains the research and data collection techniques to design an application that is "Parking." At this stage, the system development process method is carried out in a structured manner and has several stages that must be passed, such as data collection techniques and software development

Methods

3.1 Data Collection Technique

Data collection techniques used by authors are:

3.1.1 Literature Study

At this stage, the researcher looks for relevant theory references and collects several journals with issues related to the author's title.

3.1.2 Observation

The author makes direct observations of the activities related to the problem taken by aiming to obtain complete data.

3.2 Software Development Method

At this stage, the researcher uses the prototype method used to get an overview of the application that will be designed and will be evaluated over the user. With that, the author can get a complete picture of the display system or System engineering procedures that will be built.

3.2.1 Listen to Customer

Developers and customers together determine the general objectives and identify all the needs and description of the parts needed and desired in the application or system to be made.

3.2.2 Build/revise mockup

The design is done quickly, and the design represents all aspects as needed, and this design is the basis for making a prototype.

3.3 Customer Test Drives Mockup

In this process, the customer will evaluate and evaluate the prototype created to clarify the needs of the application following the primary purpose.

Technology used in our mode:

Android:

Android is an open-sourced operating system founded by Andy Rubin. It is a Linux-based operating system that allows developers to develop and run apps that can perform both basic and advanced functions.

Java:

It has always been a starting point for new developers and used by the majority of people who work with Android development. Eclipse, NetBeans, and IntelliJ IDE are the most popular IDE's(Integrated Development Environment) used for developing an Android application using java.

Android Studio:

Android Studio is an Integrated Development Environment (IDE) specifically for developing android applications that are open source. This Android studio has developed IntelliJ IDEA an IDE for the Java programming language. Android studio is integrated with (SDK) or Android Software Development Kit to distribute to Android devices. The programming language used by Android Studio is Java

XML:

XML stands for eXtensible Markup Language, which is used as a language markup language for exchanging data between diverse systems. The XML describes the arrangement of information and focuses on how information looks. XML can store data both in attributes and contents as elements that are placed between the opening and closing tags .

JSON:

JSON is an abbreviation of (JavaScript Object Notation) in the form of a data exchange language format that is easy to read and write by humans, with made and made it easy to translate by computer. JSON is a text format that does no depend on any programming language because it uses the style of language commonly used by programmers. JSON provides better performance compared to XML .

API:

Application Programming Interface (API) is a liaison application with other applications that allow programmers to use system functions that can interact and relate to each other. The API consists of interfaces, unctions, classes, structures and so on to build and develop software .

Google Firebase:

Firebase is a realtime database with backend infrastructure services as a service (BaaS) that facilitates device developers who build better applications. Firebase has several features such as Analytics, Cloud Messaging, Authentication, Realtime Database, Storage, Hosting, Test Labs, Accident Reporting, Notifications, Remote Configuration, Application Indexing, Dynamic Links, Invitations, Adwords, and Admob.

UML:

UML is a language that visualises and analyses from an OO (Object-Oriented) software development system. It is also used to determine or describe a software system. The primary purpose of UML diagrams is to help the project team communicate, export potential de-design, and validate the design of the software architecture .

QR Code:

QR Code (Quick Response Code) is a two-dimensional barcode that can store data. Bigger compared to Barcodes. By using QR Code, data that can be stored can be in the form of numbers, letters, binaries, and kanji. QR Codes can be used free of charge, even for commercial purposes. The Qr Code was first introduced by the Japanese company Denso Wave in 1994. The QR code was intended to be translated quickly. Qr code 1s also one type of barcode that can be read with a mobile camera .

App Overview

In this we basically describe how our app perform it's task one by one like in first place it register the user ,after registering user login to the app and thence can book the parking slot, after that he pay for his booking and exit with e-receipt.

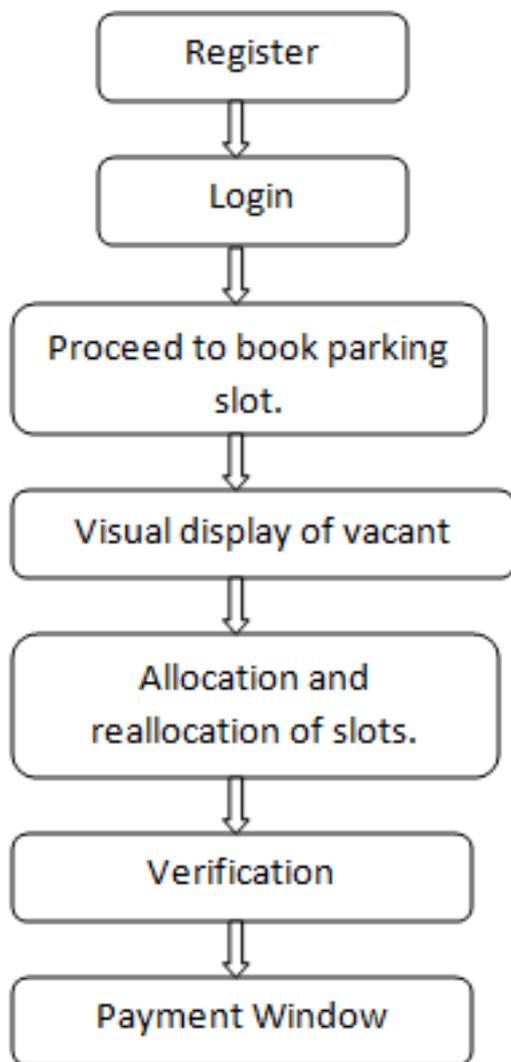


Fig3.1: App Overview



Sequence Diagram

In this sequence diagram illustrates the interaction between objects and indicates communication between these objects.

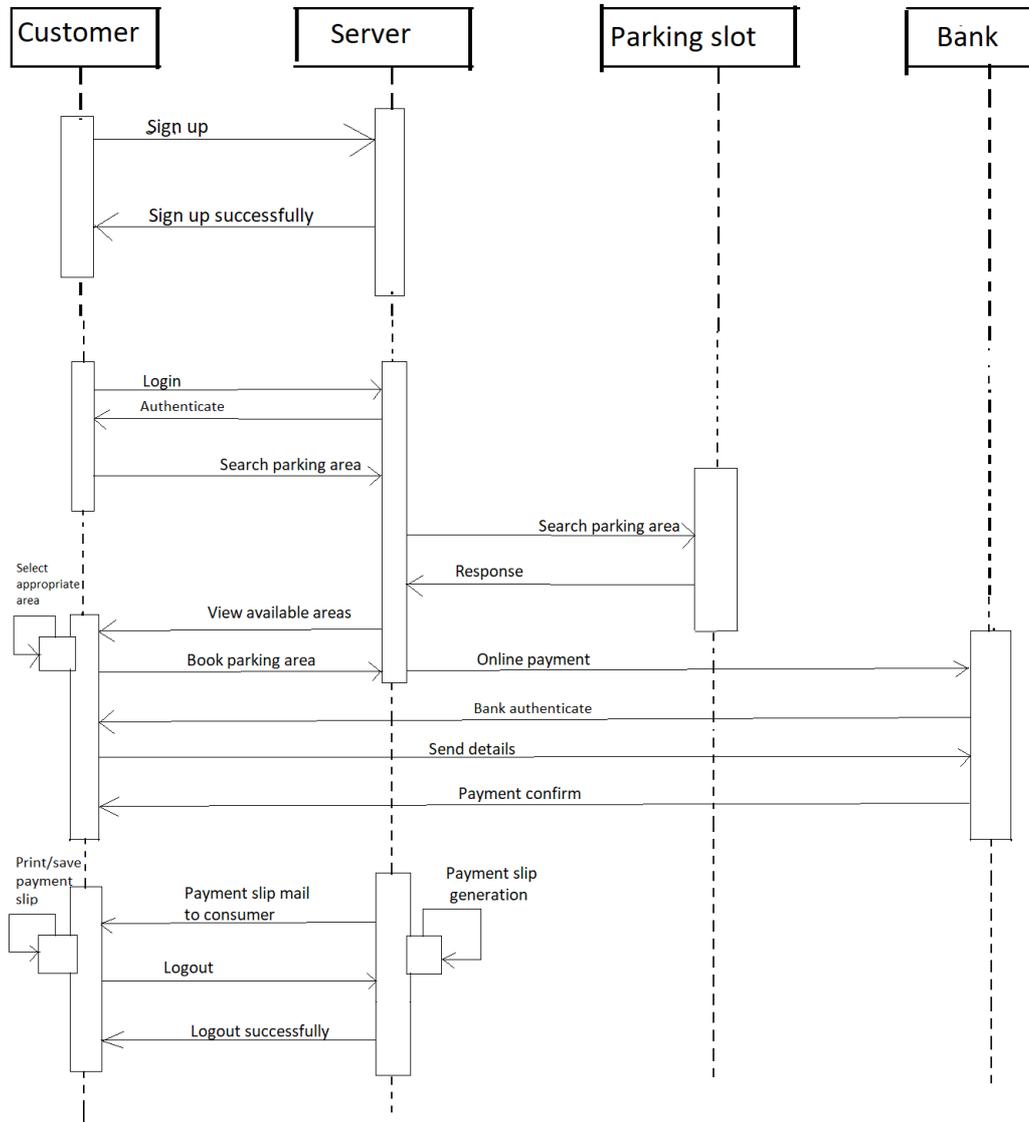


Fig3.2: Sequence Diagram

ER Diagram

It displays the relationship of entity sets stored in a database

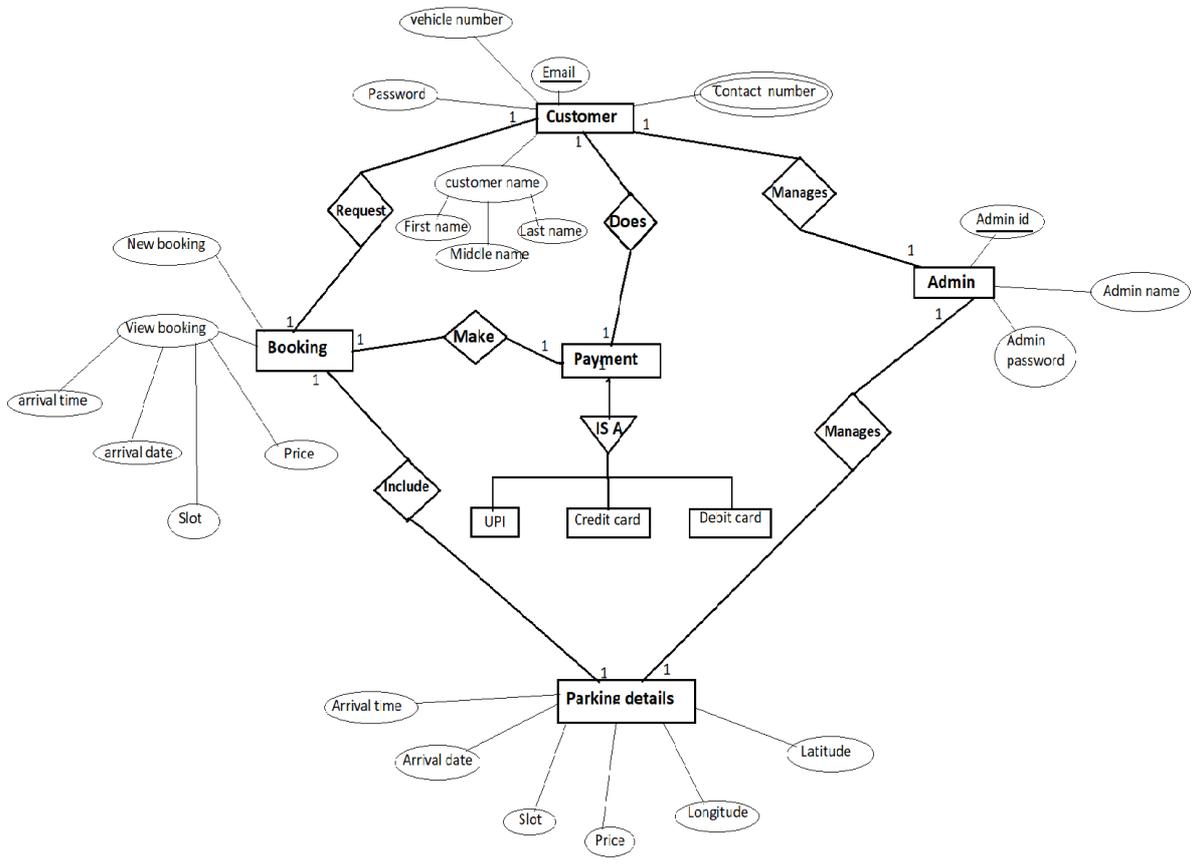


Fig3.3:ER Diagram

Figures:

Sign In

In this place user or owner can login by using their email id and password.



Welcome Back,
Sign in to continue

Email

Password

[Forgot Password?](#)

SIGN-IN

New user? [Sign Up](#)

Sign Up

In this place user or owner register themselves by filling all the details.



Welcome to Smart Parking,
Sign up to continue

Name

Contact No.

Email

Password

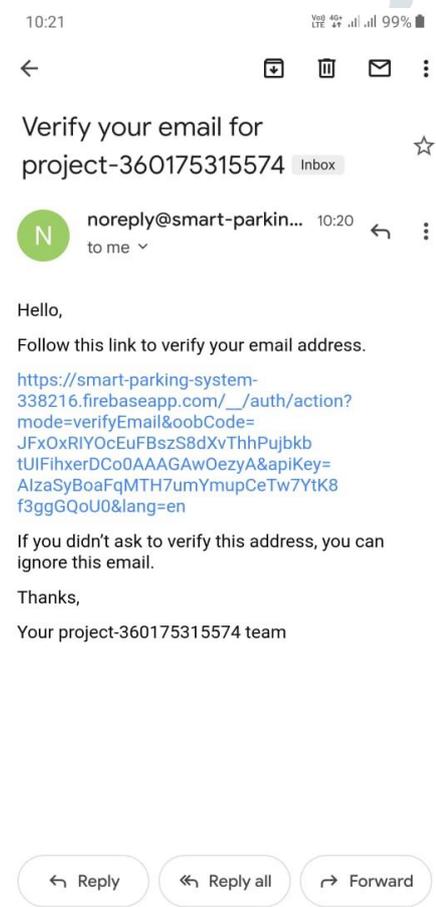
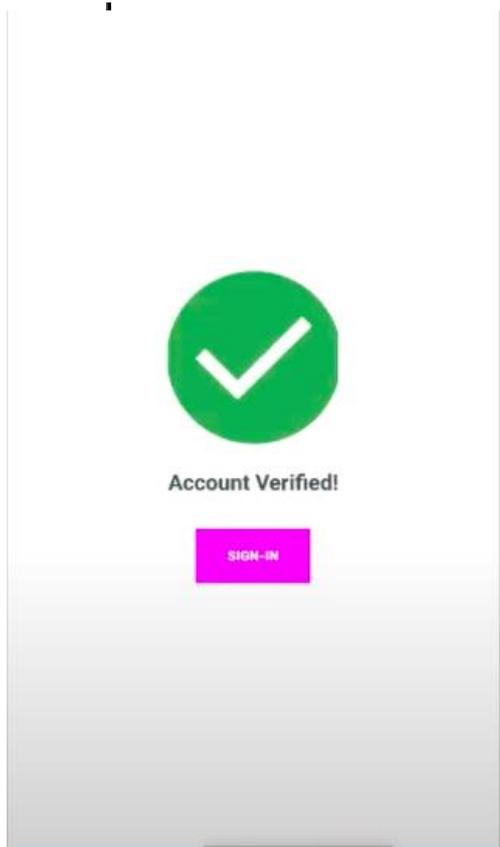
User Type
 Normal Type Owner Type

SIGN-UP



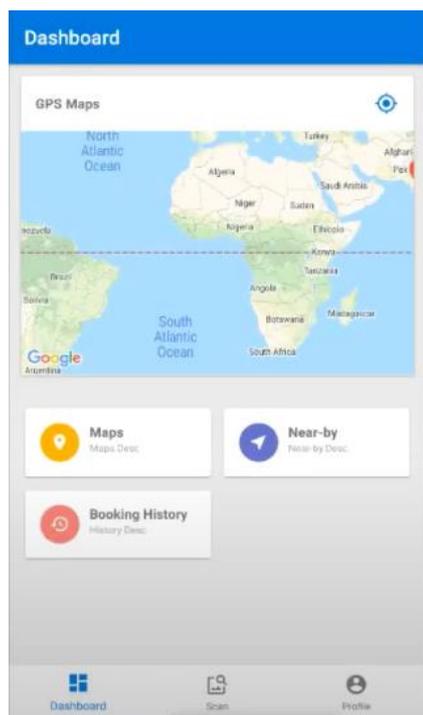
Authentication

In this place a mail is send to user or owner for verification of email id.

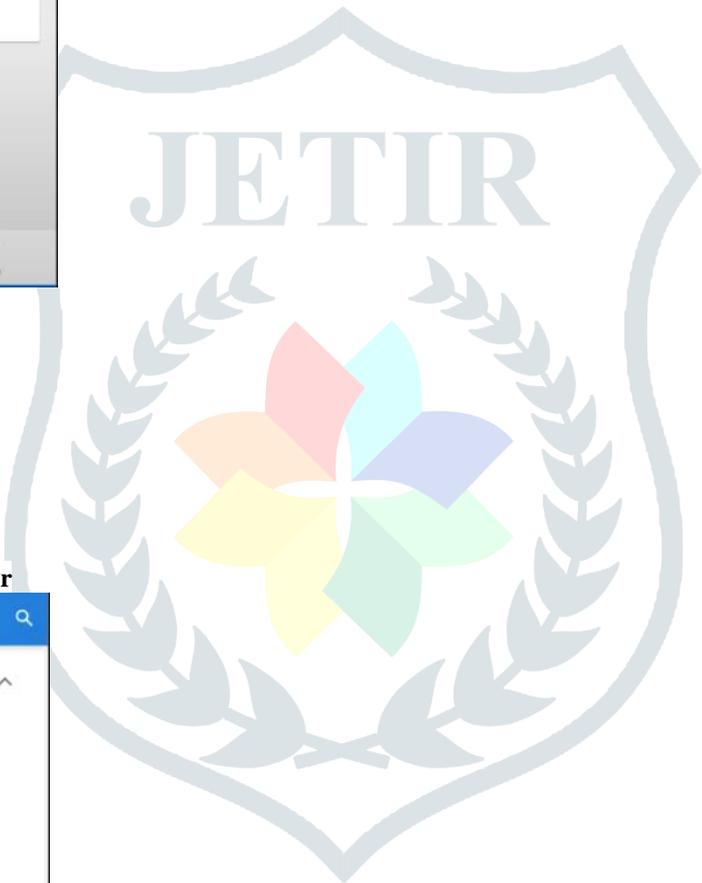


User Dashboard

Here, user can see the nearest available parking spaces and the payment history.

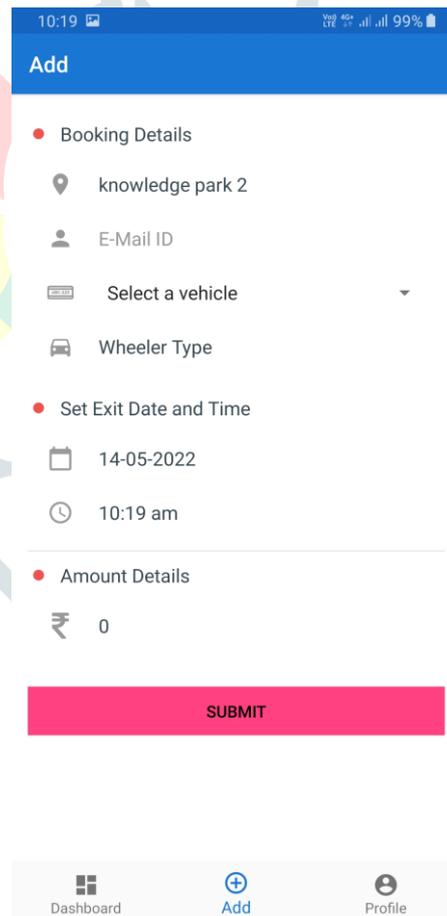
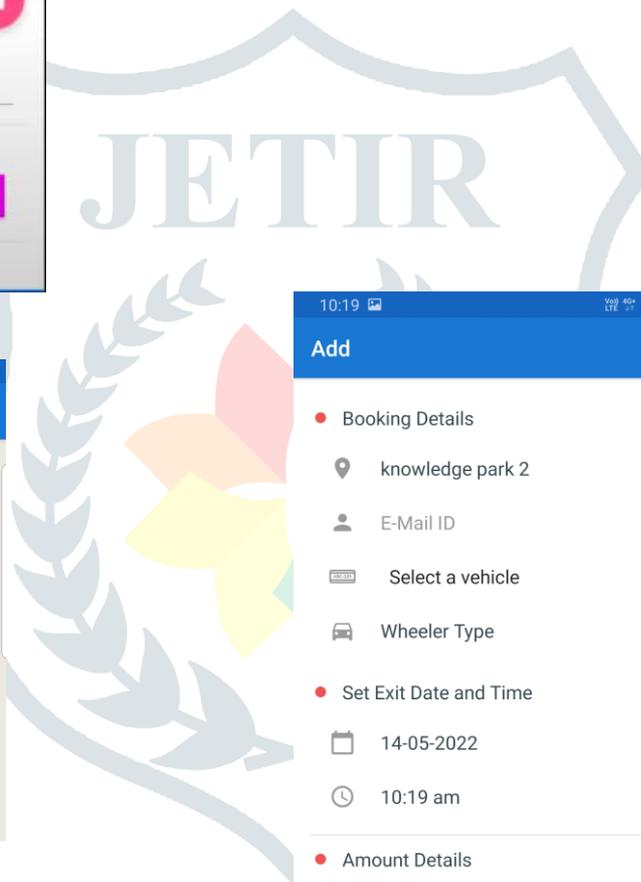
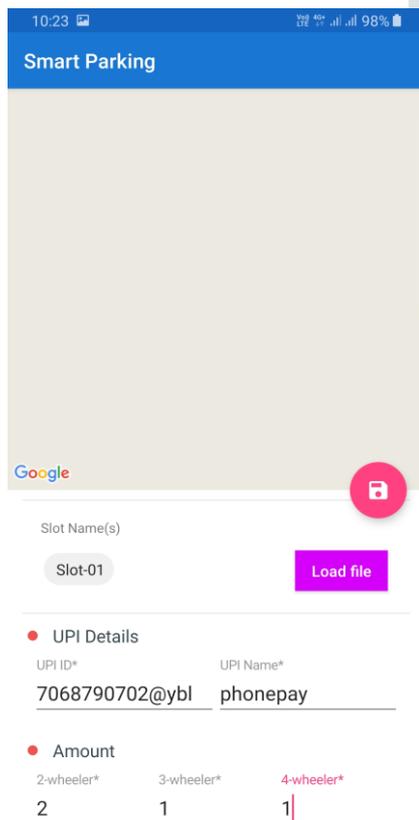
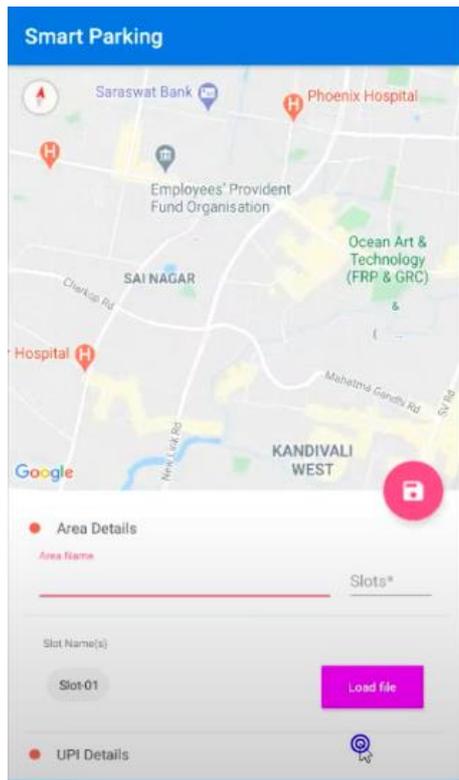


Showing available spaces to user



Owner Dashboard

Here ,owner can add his parking spot to the application and also his online payment details.



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