

# Parking Assist: An Android Application to Manage Urban Parking Problem

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**Abstract:** This paper aims to introduce an Android application that offers simple solutions to parking-related problems. Very few people rely on public transport nowadays and as the population increases, the demand for vehicles also rises. In fact, Delhi NCR is among one of the regions having the highest number of vehicles. Traffic collisions, parking, billing and most importantly the safety of one's car are some of the most daunting concerns that passengers face daily. Due to the large number of vehicles and restricted, often unplanned parking spaces, people are forced to search for safe parking spaces. This leads to stress, anxiety and a whole lot of wasted time. Parking spaces are currently managed manually which has several security and efficiency related issues. This system is dependent on quality of manpower that is often under skilled and has a high rate of incompetency. Thus, the application-based system provides real-time tracking information and automation that partly improves security, increases efficiency and reduces costs by reducing dependency on manpower. It helps supermarkets, buildings and other organizations do better by adding ease and skill to the parking lot.

This paper highlights the high points of this application working on two levels- user and business level. While users can use it to browse through parking lots, view details of hosting locations and make payments prior to their visit, business clients can use the application to rent and monetize their vacant parking spaces by providing the necessary information.

**Keywords:** Android application, Business level, Parking, Payment, Pre-booking, Rental, User level.

## 1. Introduction

Traffic has been growing at a rapid rate over the years. This problem often occurs in urban areas, where the number of vehicles is higher compared to the availability of parking spaces. Searching for a parking spot, especially in multi-level parking spaces is a tiring task, and even more is the long in and out-of-line purchasing and collecting parking tickets respectively. The main drawback of such disorganization and stress is the lack of use of technology. Most of the management is manual which makes it time consuming and expensive to work. In fact, the situation gets worse over the weekends and public holidays, as we continue to cycle through many parking lots to find free space.

Therefore, this situation necessitates the need for a parking plan that regulates parking in a particular area and ultimately intervenes to reform the parking spaces.

Parking Assist not only provides pre-booking solutions to established parking spaces, but also provides business customers to provide their vacant parking spaces to increase the number of parking spaces in the area. This Android-based application works on two levels - User and Business level.

The user level allows users to view and book parking spaces prior to their visit. It enables them to optimize payment through the application itself, thus reducing unnecessary queues during check-in and check-out.

On the other hand, the business level allows clients to create their own empty spaces for any user at or near that location. This will help the client by monetizing their location when they are away and also be productive for users by providing multiple parking spaces, which vary in features and prices, in a given area.

## 2. Literature Survey

Several parking applications have been made keeping in mind the parking issues. They all used technology and automation to their best to try to solve the parking problem in metropolitan areas.

An application [1] intends to use Internet of Things (IOT) to automate parking systems. It requires details such as parking availability, check-in and check-out time. It involves installing smart sensors to collect real-time data to monitor parking areas and requests users to make reservations.

The main challenge here is to install sensors that are usually expensive and less reliable because they are only able to communicate with users. It also requires all parking spaces to work with their own payment services on an hourly basis, which is difficult to integrate into all available spaces.

Another existing solution [2] aims to use the parking system using the Android operating system. The program works when the driver arrives at the scene, pulls out of the car and sends an SMS using the Android application. On receiving the message, the driver is notified of the free space using another SMS. The car just tracks its way into the parking lot and is made to wait for more details about the designated building.

While this minimizes manual intervention, it is a very complex process. The program doesn't provide a lot of spaces to park in and is limited to the application.

In addition, it uses the Android application to send SMS and does not allow record keeping of previous visits and reservations.

Smart Parking system [3] has suggested a model for working using image processing. The car will be parked using a lift at multiple levels. Also, image processing is used to add a number plate and store it to the comparison database to avoid illegal car entry.

The setback here is the high cost of installing these models in parking lots. In fact, many parking lots already have a multi-level parking facility. Therefore, this model would only be limited to certain spaces.

One of the smart car parks has been suggested through the use of image processing [4]. In this system, a brown circular image on the parking slot is captured and processed to get free parking. Initially, a picture of parking spaces with a brown circular image is taken. This image is split to create binary images. The noise is removed from this image and the object boundaries are traced.

This process, however, is time-consuming and provides image recognition of the parking slot only. It does not provide advance reservations or payment facilities.

The number plate recognition system [5] for developing a self-propelled parking system uses the basis of image correction to process the number plates of the cars by separating each character on the number plate. Ultrasonic sensors are used to obtain free parking spaces. On the other hand, the current time is noted in order to calculate parking fees.

However, the disadvantages of the program include the background color being black and the letters white in color. Analysis is also limited to number plates with only one row or font type. In addition, there is no option to make prior reservations.

There is also a vision-based parking system [6] that can detect the parking spaces available by linking to show regions of interest.

Positive photos contain photos of cars from various angles. Negatively classified pictures have no cars in them. The coordinates of defined parking areas are used as input to determine the presence of vehicles in the area. However, the limitation here is that the camera used did not provide satisfactory results and selected only specific parking spots. Thus, with increasing traffic and geographical variability, accuracy decreased and confidence reduced.

While these programs have a lot to offer, Parking Assist ensures that the operation is not only cost-effective but also reliable and easy to maintain by the parking authorities.

It ensures efficiency in case of exceeding time limit and updates prices during major events or weekends. The easy-to-use application offers a variety of options at both user and business levels, making it easy to deal with parking issues at hand.

### 3. Methodology

#### A. Designing of the Application

The basis of the application was in the designing of application screens. Therefore, the requirements collected were represented with the help of Wireframes.

A wireframe is often used to place content and functionality on a page that looks after user needs and experiences. Graphics of the proposed screen designs were created to visualize the step by step process.

#### B. Technologies Used

##### 1) Hardware

- Accelerometer
- Compass
- Camera
- GPS receiver
- Wi-Fi/ Cellular Data

##### 2) Minimum Hardware Requirements

- Architecture: x86 x64
- Processor: Quad-Core
- Memory: 1GB
- Storage: 50MB

##### 3) Minimum Software Requirements:

- Platform Android
- API Level 15

##### 4) Database

- Firebase Database

##### 5) Other- Permissions

- Location

Precise location (GPS and network-based)

- Device ID & call information

read phone status and identity

- Photos/Media/Files

Read the contents of user's storage modify the contents of user's storage

- Wi-Fi connection information

View Wi-Fi connections receive data from Internet.

#### C. Implementation

The application is developed on two levels, namely business and user level.

##### 1) Business Level

The main purpose of the business level of the application is that the client can rent their own parking space by simply registering with our application. Here, the owner can access the following locations:

- Pin the Spot: The client can pin the location of the rental. This can be done by long pressing on the pin displayed on the screen. This shows the client's current location.
- Enter details: After marking the location, the client can enter all the information needed to offer a place, namely:
  - Owner's name and contact number
  - A description or guide on how to get to the parking

area.

- Other features: The client may toggle to specify the type of spot like covered, onsite staff, camera access, etc.
- The number of parking spaces the client wants to offer.
- Parking owner can add photos of parking space.
- The owner can claim the cost of parking
- Packages: If the owner has already leased say, six parking spaces, and wants to offer more, they can buy packages that contain multiple parking spaces at a reasonable price.

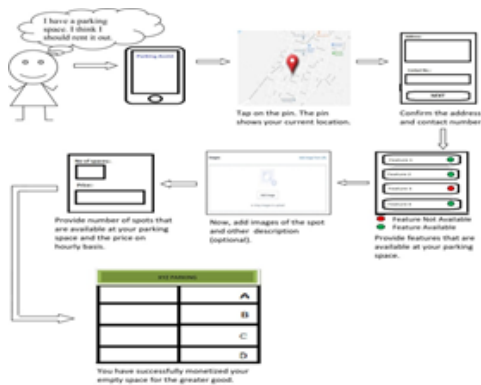


Fig. 1. Working at the Business Level

## 2) User Level

The user level application focuses on providing services that make it easier for users to find, book and pay for parking at the desired location.

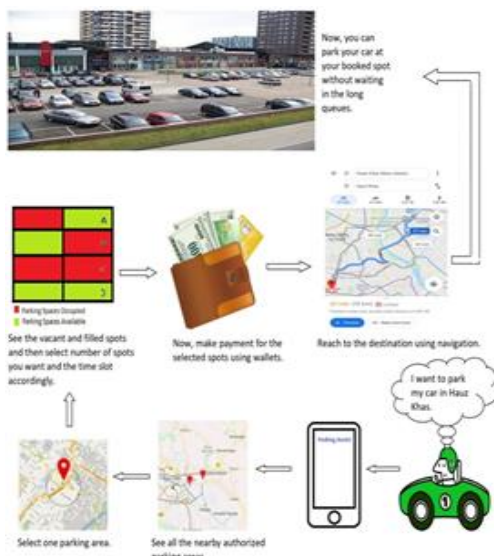


Fig. 2. Working at the User Level

- Login using mobile number: This allows the user to enter

a mobile number and as a verification process, they receive a one-time password (OTP) to verify their identity.

- Book Parking: If a person wants to park their car somewhere, they can choose from a number of parking spaces in the area and book a place prior to their visit to the location.
- Spot Details: The user can find the details of the owner and check the provided features such as camera, onsite facilities, wheelchair access, etc.
- Payment Wallet: The user can make transactions using a payment wallet and can also add cash to the wallet in case of insufficient balance.

## 4. Conclusion and Future Work

In this paper, we have presented the working of our Android application- Parking Assist. It provides efficient reservation and management of parking spaces for hassle free allotment of parking slots. It is a boon to all the travellers who fear the long queues, extended waiting hours and unnecessary arguments where parking spaces are concerned.

While the application has surpassed the features of existing applications, our motive would be to rightly utilize our resources to meet every requirement of our intended users. –

- Integrating navigation to the parking lot.
- De-allocation of parking spots.
- Integrating other payment merchants.
- Enabling voice-enabled application features.
- Verification of business level users.

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