

Smart-Park: an Android Application for Parking Management

Nilesh Batra¹, Vikram Chandwani², Ritesh Raj³, Manoj Balsuni⁴, Mrs. Madhuri Potey⁵

^{1,2,3,4,5} Department of Information Technology

^{1,2,3,4,5} D.Y. Patil College Of Engineering, Akurdi, Pune

Abstract- Today, we are living in the world where taking the advantage of technology with minimal usage of hardware devices is mostly preferable to reduce the man-power involved in a particular task. One of such task is managing the parking spaces used for parking the vehicles. The continuous growth of the number of vehicles demands more efficient and economic methods to manage them even on road and on times of parking. In this paper we design and implement a prototype of Smart-Park that allows a user to reserve or offer an empty parking space through the android application.

Keywords- Finder and Provider, Parking Layout Design, Dynamic Fare Calculation.

I. INTRODUCTION

As the number of vehicles in metropolitan cities goes on increasing with growing population, the parking management capabilities pose an increasing challenge of accommodating the vehicles, specifically at the shopping malls and crowded avenues. As the studies show, a car spends 95% of its lifetime in parking and only 5% of its lifetime running on road [1], which depicts that with increasing car owners there is also need of more parking space or efficient management of available parking space to park these vehicles. As far as seen in India most of the shopping malls, government and commercial complexes, movie theatres, etc. are having many empty spots in their parking lots, still a large population of cars are parked on the side of the streets resulting in traffic congestions. This occurs due to lack of management of parking space. Hence Smart-Park provides a medium to the user to provide its empty space for parking of such cars, reducing the traffic problems and better management of the available parking space within the country.

As the technology is evolving day by day, there have been various researches conducted over the parking domain from last few years. Various practices have been deployed with aim of lowering the traffic congestion thus reducing the time- costing factor. Our main focus is to effectively utilize the parking resources using an android application where the issues involved in previous researches like dynamic pricing and real time space allocation are solved. The another

important aspect of hardware costing, as compared to existing system involving sensors is lowered as we do not require sensors for monitoring the vacant space rather automatic space updating program will efficiently monitors the parking space.

II. LITERATURE SURVEY

In this paper, we focus on describing the history of car parking system and its processes so as to enlighten and understand overall structure of the project. Some of the features of the traditional car parking system will be documented here. The scope of this survey is basically to identify car parking systems and compare them, to highlight some limitations of the current system which needs improvements.

A. Traditional Parking System:-

In traditional parking systems, firstly after visiting to the parking place user have to check whether the parking space is available or not, if available user have to pay the parking amount and collect the token from counter, then user have to look for the vacant space in the parking lot and park the vehicle which is quite a time consuming task, while leaving the place user have to return the token and exit. This is the traditional parking system which is currently in process, in this whole process user has to be careful that he should not misplace the token otherwise he will have problem while leaving which is also an issue of traditional parking system.

B. Smart Parking System:-

The Smart Parking System reduces the burden of user to visit the parking place and search the vacant space for parking. Also it completely eliminates the token system which is used in traditional system. User can check the availability of the parking space via mobile application rather than visiting the parking spot. User can also reserve the parking space in advance via mobile application and pay online from the same application.

C. Existing Systems:-

In existing systems, user searches for the available parking space nearby or on the specific location. He/she can book the parking space and pay for the same from the mobile application. As seen in fig., most of the existing smart parking systems use sensors which are to be installed on the parking lot to know the current status of the parking spot. The application sends the request to the for the booking of a particular parking space the server checks with the sensor whether the parking spot is occupied by any car or not and then returns the information back to the server which then tells the user the availability of the parking spot.

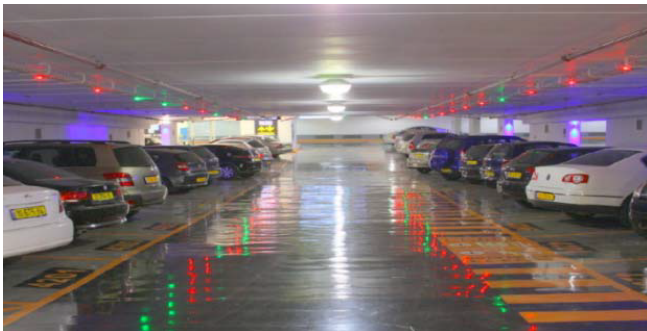


Figure 1. Existing parking systems using sensor technology [1]

The challenges in the existing methodologies are:

1. Each Sensor could focus on a very small scale and hence there comes a need to mount a sensor above each and every parking slot, either onto the ceiling in case of closed parking space or on the surface of the ground in case of open parking space.
2. As the area of the car parking space increases, even the number of sensors needed would also increases and hence would there be an increase in cost of installation onto each and every slot and power consumption needed for the sensor to survey the parking ground the whole day.
3. Sensor may not work if the sensor is dirty or out of alignment. As a result of it, certain area would be undetected and hence comes the problem with the utility of that particular system.
4. Life span of each sensor is limited and hence they need to be checked for replacement with another after certain period of time. In the presence of so much of sensors, it is quite tough to check each and every sensor is properly functioning and hence maintenance cost is quite high in case of sensor based detectors.

D. Benefits of Smart-Park over existing systems:-

SMART-PARK mainly focuses on the direct relation between the parking Finder and parking Provider. It facilitates

the provider to design the layout of its own parking lot. Whenever the Finder books the parking space and pays for it, the money is directly transferred into Provider bank account; there is no third party involvement in whole process. It will charge a particular amount of money for a particular amount of time called static fare calculation or per hourly called dynamic fare calculation.

Features of Smart-Park:

- a) Finder and Provider direct relationship.
- b) Easy drag and drop layout design for parking provider.
- c) Static and Dynamic parking fare calculation.

III. PROPOSED WORK

In Smart-Park environment, we are more focused on the following three topics to make the parking system more manageable and convenient for the users:-

1. The Provider giving the overview of his/her parking layout to the finder, by using the drag and drop UI, through which the Finder can directly reach to his/ her reserved parking spot. Users can describe their logic by means of drag and drop [6], users don't have the time to calculate the exact amount of space required by an individual car and how many cars they can fit into their parking layout. In the drag and drop Provider layout designing, the users just have to provide the dimensions of his/ her and then drag the icons of the cars into the generate sample of their parking lot. Also the end-to-end navigation, as shown in fig.2, provides the exact location of the parking spot to the Finder to reduce both the time and the fuel generally wasted for searching their parking spot.

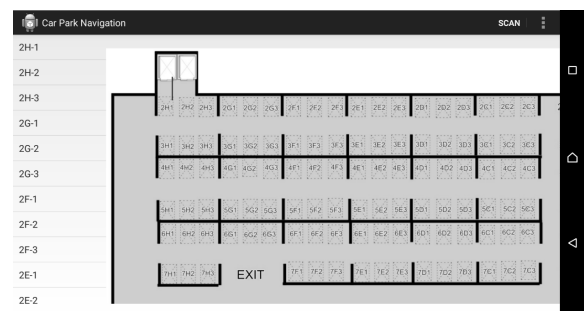


Figure 2. Example of navigation [2]

2. Existing smart parking systems involve third party character that act as a dealer between the parking provider and the admin of the system. Every time a user wishes to be the provider for his avenue he/she needs to contact

third party character, which is simply a waste of time and money. Smart-Park is an open system, any user who wishes to be a provider can directly interact with the system by just signing up as a provider and has to fulfill all the necessary procedure needed to be a provider without involvement of any third party. way for any provider to directly interact with each other without the involvement of any third party. Many of the existing parking application charge some amount to the user either to provide or find the parking space, but the Smart-Park is an open system in which any user can become a Finder, a Provider or both without paying any extra charges.

3. The real time updating of the vacancies of the parking slots. With the availability of various real time cloud platforms to store and retrieve data, such as Firebase platform it is possible to show the vacant and reserved spots of the parking places to the user in real time.

IV. SYSTEM MODEL

A. System Architecture

The system architecture of SMART-PARK is very simple, it consist of an android application, a database and the users of the application the Finder and the Provider. The user of the application whether it is a finder or provider of parking space will use the application as the interface to access the parking space and the database is used for the storage and retrieval of data.

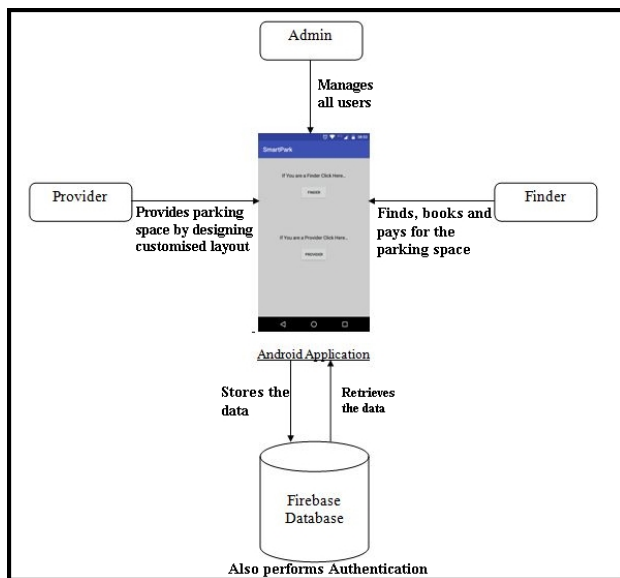


Figure 3. System Architecture of Smart-Park.

Both the users first need to login to the application so that the basic details of the finder can be directly fed to the parking booking form and the basic details of the provider are

visible to the finder whenever he searches for the vacant parking space.

B. Working of Smart-Park

Smart-Park uses Firebase platform for storing data and user authentication.

The working of Smart-Park is divided in three parts:

a) Finder Side:-

Whenever the user selects finder side of application, the app provides a map showing the nearby parking lots. The Finder (user) then selects the parking lot he/she want to visit from the map and then choose the parking space available at the particular parking lot. The Finder then pays for the selected space and get the receipt generated on his/her device containing the QR-code which is scanned at the parking place by the security guard present at the parking place.

b) Provider side:-

Whenever the user selects provider side of application, the app asks for some details about the providers place and then the Provider (user) can design the layout of his/her parking place by the drag and drop interface. These details are stored on the Firebase database which can be shown to the Finder while booking a parking space. Then the Provider has to fill in his/her bank account details in which the money paid by the Finder is deposited. And finally after submitting all the details the parking space of the Provider is visible on the map shown to Finder while searching for parking.

c) Admin side:-

The Admin can delete the credentials of the user from the database in case of any fraud cases. Also the Admin can provide support to the Finder and Provider in case of any issue occurred while using the application.

Working environment of Smart-Park can be understood from the given diagram:-

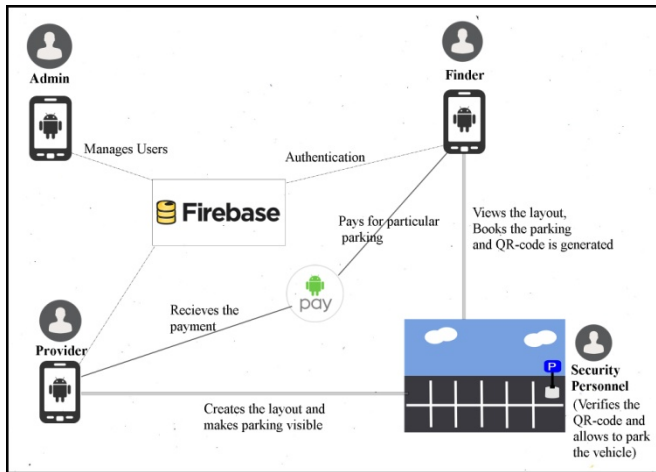


Figure 4. Working of Smart-Park

V. CONCLUSION

In this paper, we have developed a new prototype of Smart Park– an Android Application on Parking Management to optimize parking management. The motive of the application is focused on providing the facilities to the household vehicles. It is expected that there will be an update of the application for commercial vehicles also. The Smart-Park could be a path of motivation for the Smart-City dream. Through this approach we can efficiently manage the parking system and at the same time we can monitor the statistics of the income generated by parking via this approach. It is expected that through this application the Provider will be more beneficial as in this application dynamic fare calculation is used. The person could view the status of the car parking space in advance with the help of the app, before they reach the place they intended to visit and hence pre-plan their visit as per their own comfort.

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