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## Android Based Smart Parking Reservation

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**ABSTRACT:** The main aim of this research paper is to present a mobile-based system that enables users to view and reserve a parking slot. Although there exist many such systems that provide similar facilities, our project aims to achieve zero human intervention by incorporating features like online payment options to the already existing systems. Besides we also propose a system which guides the user in choosing the closest available parking slot based on his current location.

**KEYWORDS:** QR Code, GPS, Android

### I. INTRODUCTION

With a rapid increase in the vehicle usage in the recent past, finding and reaching a free parking slot has become time-consuming and tedious, especially in the metro cities. This creates a necessity to introduce an automated system that allows users to book their spot just by making a few clicks! And with the advent of newer and newer technologies this has been made possible; with the help of a mobile-based app that helps you in locating a free parking slot and then guiding you all the way to the empty slot found, also eliminating the conventional physical currency payment; rather making the payment through a easy-to-use mobile application. This paper describes in detail how such a system can be implemented. It does not make use of any sophisticated devices or gadgets thereby ensuring it is economical to implement at a larger scale too!

The prime aim of this research is to develop an application that allows the user to book a parking slot for him using his smart-phone and also make the payment online using internet banking. Besides this system would be very handy for large parking systems where it is difficult to locate the allotted slot; the user can see the shortest route to the allotted slot on the mobile app itself and hence reach there easily. The best part of the system lies in the fact that the entire system is connected to the cloud, so user can access the database, know the current status of the parking and book a slot for him accordingly from anywhere in the world. Also the database keeps track of the frequent users and accordingly offers discounts and offers.

Basically, the entire parking space is divided into slots, and every slot has a unique QR code associated with it whose significance has been elaborated later in this paper. In order to book a parking slot, the only thing that user needs to do is one time registration and verification on the mobile application. Based on the current location of the user, the app provides with all the nearest parking slots available. Then the user can pick the default shortest parking as provided by the app or pick any other custom location of interest.

This mobile app facilitates the user to make payment through net banking or any other online means (like wallet, free-charge etc.), hence ensuring that no human intervention is needed to complete the task.

In order to ensure reliability, a timer is set as soon as the user books a slot based on the user's current location. The user is expected to reach the allotted slot before time runs out and scan the QR code corresponding to the slot which was selected (as mentioned earlier). In case the user fails to reach the spot in time then either the user needs to book the slot again or the user is liable to pay an extra amount as fine in order to use the same slot. Once the QR code is successfully scanned the user can park his vehicle.

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## II. RELATED WORK

Currently there are many smart parking systems that aims to implement similar techniques. However the system that we propose includes online payment option and features like QR code scanning that ensures that user parks his vehicle in the same slot that the user had chosen.

One such system is proposed by [1], which collects information about available parking spaces, process it and then park the vehicle at a certain position. However, this system does not give options to user to book the slot rather it is based on image processing technique.

Similar to [1], [2] automatically senses the entry and exit of the cars, and number of cars is displayed on the LCD. The prime aim of it is just to reduce the time taken to check the space for the vehicles. Again the user has got no means to book space for him.

[3] elaborates the concept of vertical multi-level parking system rather than conventional systems.

Automated parking system using android app [4] has many resemblance to the system that we have implemented and it has been the prime source of motivation for our project. It proposes a design of an Automated Car Parking System driven by an Android app which regulates the number of cars being parked in the parking by automating the parking and un-parking of the car with the help of commands of an android application.

The research paper [5] proposes a smart parking system based on wireless sensor network technology that provides advanced like automated guidance. It also shows that the already existing CCTV cameras can be used as a sensing node to identify vacant parking space.

[6] describes a system that aims at allocating optimal parking space to the user using a combination of parking allocation and smart parking.

The research paper [7] has also been a good source of motivation for our research paper which provides user interface that includes navigations for enhancing efficiency of parking system. Similar to this, our app has simple to use features to facilitate user to easily park the vehicle.

## III. FLOW OF MODULES

The sequence of events taking place in the app has been depicted through the given flow-chart in Fig.1.

All the slots in the parking space has a unique QR code which is fixed adjacent to every slot, which the user needs to scan through his app, in order confirm the slot. At the time of leaving, based upon the time duration for which the car was parked the bill is generated and is displayed to the user.

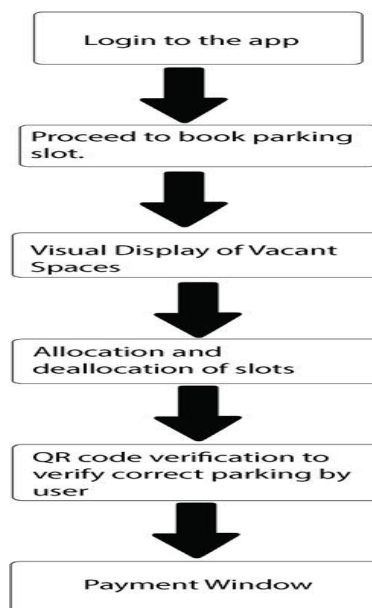


Fig-1 : Flowchart depicting overall working

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## IV. PROPOSED METHODOLOGY

On successful installation of the app the user is provided with two options – register (for new users) or login (if already registered). As soon as the user logs in to the app as shown in Fig.-2, his current location is determined using GPS and is sent to the server. Basically, the GPS returns the location of the user in terms of the latitude and longitude.

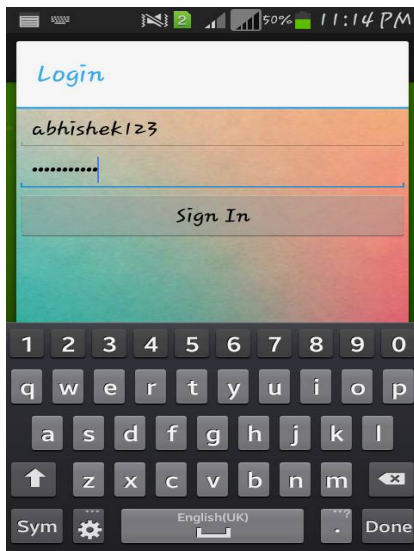


Fig-2 : Login Screen



Fig-3 : User's Current location on map

Based on the latitude and longitude returned, the app finds the name of the landmark corresponding to that coordinates as shown in Fig.-3. This location is set as the current location of the user as shown in Fig.-4.

Then, the distance between the current location and the various parking areas in the neighborhood areas is calculated. A list of all available parking spaces is displayed to the user. Also, the nearest parking is selected and displayed to the user as default choice; however the user can select the parking slot as per own convenience.

Apart from displaying all the parking spaces based on the current location, the user can also make a custom search, input any location of his choice and look for vacant parking spaces. The various options are as in Fig.-5.

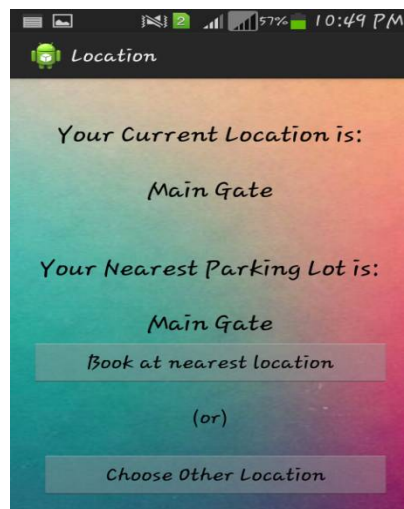


Fig-4 : Input location from user

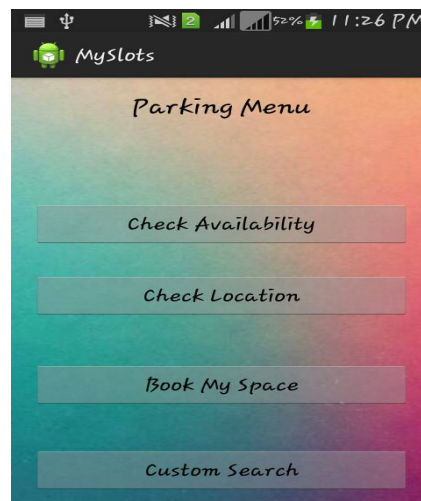
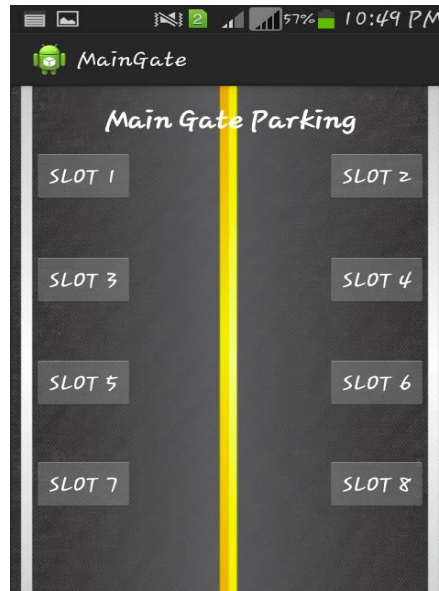


Fig-5 : Main Parking Menu

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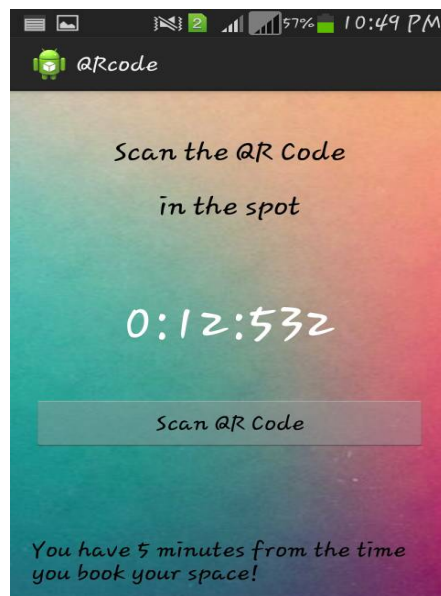
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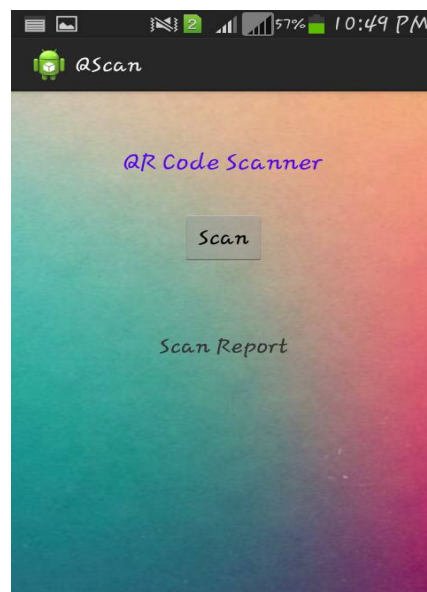


**Fig-6 : Slot Selection Window**

The custom search would ensure quick searching for a given parking location input by the user. As soon as the user selects the parking area, the app connects to the cloud and fetches the latest information about the availability of slots in that parking and presents it to the user as shown in Fig.6. After the user selects a slot, a timer starts to run and the user is expected to reach the slot before the timer runs out (as in Fig.-7) and scan the QR code (as in Fig.-8) available adjacent to every slot. This ensures that the user parks the vehicle in the slot that was chosen while booking. If the QR code scanning fails then the user needs to book the slot again and so the user is taken back to the main window to reselect the slot.



**Fig-7: QR code Scan Timer**



**Fig-8: QR code scan**





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Once the QR code is scanned successfully, the user is redirected to the payment window. The total bill is generated and the payment can be made in multiple ways including net-banking, free-charge or wallet, whichever is convenient to the user.

## V. CONCLUSION

Thus we proposed and implemented an app based parking reservation system which facilitates the user to book a parking slot. It also searches for the nearest parking slot and includes features like QR code scanning in order to ensure consistency. At last the online payment option eliminates the need for human intervention and making the system automated in real sense.

Also the proposed system is very economical and easy to implement as it does not involve any expensive hardware or devices.

## VI. FUTURE SCOPE

The proposed system can further be upgraded by including features like sensors and CCTV camera so that the latest status of the parking can be checked by the user through the same application, rather than providing statistical data(in the current system). Also, navigation facility can be added to guide the user at each step to make sure that the user reaches the destination slot in the minimum possible time.

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## BIOGRAPHY

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