



Pocket Parker: An Android Based Car Parking and Booking Application

AkshayMangla, Ritchie Singh, Anshul Baliyan, Bhupendra Kr. Teli
Information Technology
IMS Engineering College
Ghaziabad, India

Abstract: Now days with the increasing lifestyle of people and the availability of new and cheaper vehicles, there is a rapid growth in the increase in vehicle production which demands more and more availability of car parking space in any area. With the increase of the behavior of people's lifestyle and an upgrade in the living standards, more and more people buy the automobile and motorcycles which have given a given a boost to the Metropolitan traffic way more than it used to be. Therefore, parking issues has becomes one of the most challenging issues to tackle in this traffic network and ensure the new life style of the people. Looking for any parking space in today's time is not so easy, especially during the rush hours, is a difficult time for drivers who have the task of parking the car in a safe place where it is easily accessible to the people. The main difficulty arises from not knowing where the parking spaces are at that particular point of time, and even if known, many vehicles may try to use very limited parking spaces to cause serious traffic jams or bring the traffic to a halt. In this project a new parking system called Pocket Parker-An android based car parking application is proposed to assist driver to find vacant spaces in a parking in a shorter time so that the people don't find it difficult to par their cars easily.Different technologies are being developed,studied,being implemented and compared to determine the best technology for developing such type of a system. In this application of car parking system an approach includes vacant parking space detection, display of vacant parking slots and give direction on smart phone application to move towards vacant parking slots.

Keywords: Use of Android Application, Developing Smart Parking System.

I. Introduction

Nowadays, we can see the increase of parking problems have been one of the most discussed topics in the general public today. In India the situation has worsened such that on any given working day we can see that an approximate 40%-50% of the roads in urban places are taken up for just for parking the cars. As the numbers of families are increasing day by day and the number of vehicles increasing day by day as a result of this there is a need for a lot more parking space than the previous ones. Moreover, the parking system plays a key role in the urban as well as rural traffic systems, and the parking problems show a very close co-relation with traffic congestion, increase in traffic accident, and the increasing pollution in the environment. According to a Global Parking Survey undertaken in more than 15 cities (including New Delhi, Mumbai and Bangalore from India), on an average, around 30% of the traffic slowdown is usually caused by the parking difficulties that occur in these major cities. It can take anywhere from 15-20 minutes for a person to find a parking space in any part of the metropolitan city nowadays. The unavailability of parking spaces causes congestion on roads which adds to the plight of commuters. According to our Public Work Department's Minister Satyendar Jain, has said that the government was not in favor of constructing more parking lots for the people. "People buy a car for Rs 3-4 lakh and expect the government to construct parking it for Rs 20 lakh. Why should the government be interested in doing that? The government should not be held responsible for creating any more parking space for people. Parking is the responsibility of the person who has bought the car". With the use of the Android Technology combined with the recent new inventions in wireless applications could be one of the solutions to solve the increasing parking problems. The main intention behind developing such an application of Pocket Parker is to help the registered user analyze the area's where the parking is available and locate him the number of slots that are free in that region. The person using the app can book a slot in the area he desires prior to the time of his visitation if it is available. This will help in reducing the load on the local authorities as their work gets reduced. The registered user can then search for parking slots and Pre-book the slot that he/she wants for himself/herself. So, the main aim or agenda of this application is to develop an easy way to park a vehicle.

II. LITERATURE SURVEY

In the following paper we will have our main focus on developing an innovative and a smart parking system that will help drivers to easily locate car parking slots in the places which he/she desires to park[5][5]. In addition to finding the parking space, an important aim of developing such a system is to reduce the time that people take to find a location to park their car, hence reducing the energy consumption and air pollution in that region[7][7].

A. State-of-the-art Parking Management

There are many traffic searching methodologies for car parking comparison under the different parking helping strategies that are available in the market today. Many parking helping systems have been developed in the past decade [3][3]. Now, we will study about the several existing parking guidance techniques that have been implemented and then explain their limitations. Furthermore, we will also look into the various parking management strategies under realistic traffic and car parking conditions, and then compare their performance with each other. Some of the methodologies are listed below:

- Blind Search- This is one of the simplest strategy applied by the commuters when they have no information regarding the car parking. In such a case, the drivers will continue on searching for parking spaces that are available to him within a certain distance. The drivers will keep on finding the area until they find the parking slot. If he is unable to locate the space within the designated area, he will further increase the searching area and continue looking for any empty spaces in the adjacent parking lots[11][11].
- Parking Information Sharing System – This strategy is most commonly used by the current users of the smart Parking system application who will update the driver or the commuter about the parking availability in certain area in which he is currently available. The driver will then choose the appropriate parking destination where the parking lot have available spaces, according to the information obtained by him through this application[13][13]. However if the number of free spaces in the parking lot is very limited specially in peak hours, it is most likely that the number of drivers in demand for these parking spaces will increase, which is based on parking information to a significant number and create a chaos like situation[4][4]. This phenomenon is called as “multiple-car-chasing-single-space”, which may cause severe congestion and traffic jams creating a lot of problem among the people finding the parking spaces.

B. Performance Metrics of the application

To evaluate the performance of the methodologies implemented in the car parking system, which reflect or show the willingness of the drivers willing to park and one of the major concerns on the traffic is traffic chaos and an increase of environmental pollution. Following are some ways by which one can easily perform the various strategies:-

- Walking Distance- This method is used as means to find out the driver's selected parking space to the destination where he wants to go[6][6]. These factors reflect the view or opinion of the user when selecting such method for parking space. The commuter wants to select the most appropriate parking slot which is nearest to his destination.
- Traffic Volume- This methodology is defined as the amount of traffic that is generated by parking searches. Pocket Parker application is designed to minimize the traffic volume caused by car parking searching, as well as meet the need of commuters when in need[17].
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III. PROPOSED WORK

In the Proposed work, based approach is used to find the available car parking space and can pre-book also. Several methods are used for the development of parking system. Study of these systems shows that humans do not require much efforts for the functioning.

Functionalities:

- Free parking system- In this System people park their cars in the parking area and for this they don't have to pay any charges. They cannot park their vehicles in a proper manner. This kind of parking also creates trouble for other people who want to exit from the parking area or entering the parking area. So this is the main issue of the free parking system.
- Database System – This is another type of car parking method. In this, people have to pay the charges with the help of a computer system which keeps a note of the entry and the exit time of the vehicles. Also there is need of a human at all time. This system is not possible without the involvement of human being.
- Billing System- This system is similar to the database system. In this there is a fixed duration period for the vehicles that are being parked. If the hour of parking period gets increased then the customer has to pay extra charges for that.
- Show Vacant Slots- In this system the parking area is enclosed with sensors present at the car parking slots which keeps a record of the vacant as well as filled spots present in the parking area. The customer is then able to easily locate the parking slots where he would easily get the parking facility without wasting any time. This system is widely used in malls or places where there is a need to park a lot of vehicles.

- Pocket Parker Application** – This application is the combination of almost all the parking system that are available in the market today. This application helps the customer to search through the GPS system and choose the parking slot that he/she wishes to book for himself/herself. This allows the customer to save the time that they would have wasted to search for parking. Also the customer can choose the duration of his entry and exit timings according to his requirements and pay through the application itself. The customer will then receive a confirmation mail of his booking slot and the transaction that he has made through the application. This would help a lot of customers in the upcoming time with the increase of vehicles.

There are some systems in the market like the smart parking services which are based on the wireless sensor networks [1] which uses wireless sensors to effectively find the available parking space. But to use this system, additional hardware needs to be installed in the car which is not feasible. Well our Pocket Parker is based on Resource Allocation and Reservation [2] which has the facility to reserve the parking slot for a fixed duration of time. However, if the driver does not follow the timings as per the slot that he had booked, it may cause inconvenience for other commuters. So the solution proposed in this project works when user wants to park car at the designated parking slot, the user will then use the Android application to check for any available parking slots. The availability of the slots is continuously updated by the server when the availability is checked by the registered user. If the slot is available, the registered user then enters the payment mode and payment details through which he will make the transactions. These details are stored on the server and an OTP (One Time password) is generated, which is given to the user after payment is verified.

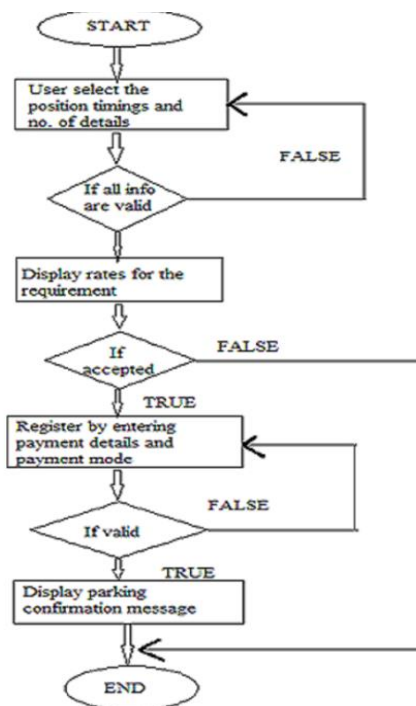


Fig. 1 FLOW CHART

This OTP is the valid for a certain amount of time after which it expires. The user when reaches the parking, is require to enter the valid OTP and based on the current availability of the parking slots, the nearest available parking slot is allocated. The proposed solution provides an efficient method for providing parking space to the user as they are allotted specific and unique OTP (One Time Password) on successful booking of parking slots. This eliminates the need of human intervention at the parking lot, as the user simply needs to enter the OTP at the console provided at the entrance of the parking lot. Also the provided OTP remains valid for a pre-defined amount of time which eliminates the problem of the user booking the space and not showing up which can result in under utilization of the parking lot.

Above is a flowchart that describes the working of our android application.

Step 1 -Initially the user will select the position and timing with the required details.

Step 2 -If all the above requirements are filled then it

Will display rates for the parking slots else go to step 1.

Step 3 -If the above step is true then the customer registers by entering payment details and payment mode else the else the parking won't be successful.

Step 4 -If step 3 is valid then the customer receives a parking confirmation message. If not valid then the customer will be redirected to step 3.

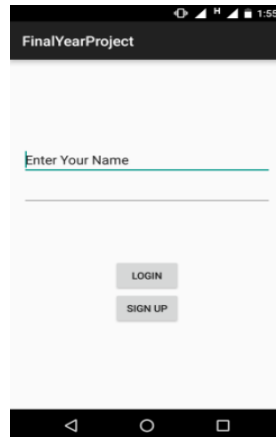
Step 5 -You have successfully booked your parking slot

IV. SIMULATION OF APPLICATION

Client Side:

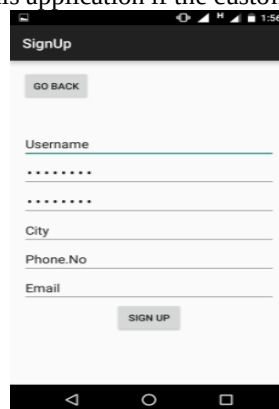
1. Starting of the Application-

The registered user need to start the Pocket Parker application in his smart phones. After downloading of the application, the following screen appears



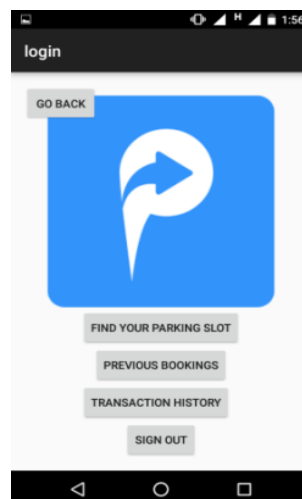
2. SignUp page-

In this page the customer will sign up in this application if the customer is not signed in.



3. Homepage-

This is the page that will get opened after the user will login into the application.



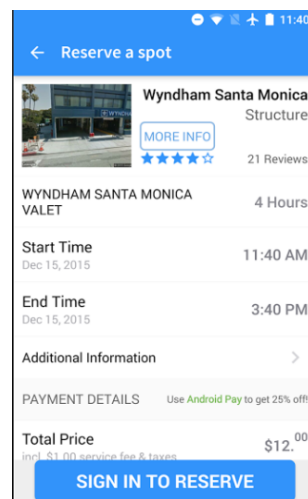
4. GPS System-

Through the GPS system the customer can choose the location where he wants to find the car parking slot.



5. Reservation Area-

In this the user can book his slot and pay from the application itself.



Server Side:-

In the server side most of the processing is developed using java and MYSQL technologies. The user will have to register with his detail in the server side of the application. The user has to note that this is only a one time registration process. Whenever a new user wants to register with his android phone, all of his records will get stored in the server side of the database. When the registered user sends his location, the server side will immediately respond to the client's request. After receiving the request for the desired location, server processes accordingly and responds to the customer.

V. MICRO CONTROLLER

The Micro-controller is a system architecture that consists of a GSM Module, an Arduino Uno Board, RFID tags/cards, an RFID card reader, a SIM card and a LCD Device to keep record of all the vehicles entering or leaving. The Arduino Uno Board is used as a micro controller. The RFID technology is used to store or keep a record of the car number, car owner's name, mobile number and the amount that is to be payed or transferred. The card reader will store all the information that can be stored which is the entry time to the exit time of the vehicle, amount of time the car is staying in the parking lot and then display that information on a LCD screen. This keeps a record of the total no of vehicles that are parked in the parking area. An Ethernet shield is used to connect the Arduino to the internet in order to access the website. The GSM module is used to send the message to the owner of the car.



VI. CHALLENGES

Some of the challenges are:

- Fake Parking Request- This system will collect and store the data about the various factors including the status of the available parking space, reservation time, car parking location and driver's identity as well. Since the registered user is allowed to book only one slot at a time from one id, it is a big challenge for us to see if the user is trying to book one or more requests at the same time from that id. To remove this problem we need to implement a queue buffer which will continuously check the new requests and compare it with the existing id requests. If any pending id matches the existing id then the request is rejected and a message is shown 'no more parking space available' is displayed.
- Users Identity Verification- One of the major security concern is that a user with no reservation can enter and occupy someone else parking space without seeking any permission. In our proposed work system, the registered user can open the application and verify their identity via the received QR code. The Reservation authority team sends an instant QR code to the user as soon as the user reserves his parking space.
- Delay in parking- The registered user reserves a parking space for a specific duration of time. What if the user is unable to reach the parking spot at the allotted time? So to overcome this challenge, we provide a time extend option to the user, but user can only extend the time by 15 min from the specified time. After that the user has to pay some extra money to extend his time.
- Timer- As soon as the reservation time is about to expire, the user needs to be notified about this situation. To deal with such a situation, Pocket Parker application gives the customer a prior notification at regular intervals of time. For example, if there are only 30 minutes left to reach the expiration time, the user will get a notification when 20 minutes are left to reach at the location and when 10 minutes are left for the car to be removed from the car parking slot.

VII. CONCLUSION AND FUTURE SCOPE

In India, the problem of car parking is not so old as there is no proper planning in parking areas. There is a wide difference between the total no. of vehicles produced each year and the no. of parking slots available in the country. In this paper, an efficient car parking application is proposed which will help reduce the car parking issues. So, this application would result in less traffic and handled the situations at crowded places especially in the parking areas. By using this application user/client can find the availability of the parking slot and reserve that particular slot so, that without wasting the time in searching a parking slot and reach the place within the time slot allotted by themselves.

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