An Android Application for Parking Management and Dissemination System

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Abstract- **Parking is a problem for almost everyone today so there has to be a solution, which helps getting rid of problems arising due to the lack of a proper parking management system. Although various traditional PGIS (Parking Guidance Information System) exist, they can serve only a few users because it is difficult for such static systems to disseminate information on a wider scale. So the aim of this study is to provide a dynamic solution by introducing the concept of parking guidance system over the internet and also using one of the latest techniques available today i.e. the QR code for the user's ease. The system is basically designed for a college parking which can further be extended as required. This system enhances the components of existing parking system available in the colleges. This system runs on a mobile phone platform and provides a visual display of parking lots available to the user so that the user can book or reserve a space. Six parking spaces were gathered within Sanjivani College of Engineering, Kopargaon and were published on the web map server. The Quick Response QR code is affixed at every parking space. The user can thus select the parking space from the visual display. The user needs to scan the QR Code while parking and unparking the vehicle. The action of the user is then reflected in the database. The android application was thus developed that can incur the parking information which was uploaded on the web map server. This system reduces the time which is involved in searching the parking space thus reducing the fuel consumption, user's frustration. It reduces vehicle travel time and parking time.**

Keywords-PGIS (Parking Guidance Information system),QR code, Android ,web map server.

I. INTRODUCTION

Use of automobiles is increasing day by day which leads to various parking issues. Vehicular population is shooting out the roof, no amount of space is sufficient to accommodate stationary vehicles. Management of parking has grown to large extent. The main problem is to manage parking in congested areas. One of the congested area is college campus .However improving parking on campus is important. The problem is parking spaces are either insufficient according to the demands of students or these spaces are poorly allocated. Colleges have to try almost every possible way to deal with problem of campus parking. Parking on campus needs improvement. Users entering the university are allowed to have a car on campus. With every new freshmen entering parking possess a problem in campus. Problems in parking campus results in users inconvenience, which results in frustration.

Parking the car today need parking policies for safety and security reasons. There is always competition for the parking space [6]. A good solution to overcome parking crises would be by increasing the number of parking spaces or else enlarge the parking lots, but this will lead to huge investment. However better management of existing parking spaces will be wise method. The availability of parking spaces should be improved.

Another approach for managing parking in campus is by improving the efficiency of the use of existing parking spaces, by informing user about available parking space and guiding him accordingly [1]. Now a day there is growing popularity and affordability of internet –enabled smartphones and because of data available online we can step to solve parking problem. Android smartphone enables user to virtually carry the internet with him.

A. *Mobile web Map*

It is a service application providing maps. By using map user can find spaces on his phone [1]. Maps act as communication language of distinct information for viewing whether parking space is engaged or not. It will inform user about current status of parking lot [4].

B. *Quick Response(QR) code*

It is 2-D barcode which encode numeric and alpha numeric value. QR code encodes binary information into a square matrix of black and white pixels. QR code scanner application is able to decode information encrypted in QR code [1]. QR code is used for allocation and de-allocation of space.

Hence this paper focuses on use of user interface including navigations for enhancing efficiency of parking system.

The main goal of this paper is to maximize the occupancy of parking lots and develop a user-friendly mechanism that helps user find and reserve available parking in the campus, in advance [1]. At times of peak parking in the parking lot, the only primitive way is to accurately provide users with available parking spots inside the parking lot.

II. RELATED WORK

Now a day the common parking guidance approaches are adopted by drivers. Blind search is the most common approach which is adopted by every driver [3]. Drivers search the parking spaces randomly. If the driver gets the vacant space he parks his vehicle else his search for the parking space goes on. Parking Information sharing is another way which is adopted by the drivers [3]. It represents the current state of the parking spaces .If the driver obtains the information regarding the parking lot

which is near to his destination, then the driver will automatically know regarding the spaces available in the lot. So the drivers by their own make the decision of parking .If the parking spaces available in the lot are very few during the busy hours then more drivers struggle for the parking spaces.

This phenomenon is called "multiple-car-chasing-single-space", which further causes severe congestion [3]. To alleviate the "multiple-car-chase-single-slot" phenomenon, some designers have devised a solution to use a buffer that publishes the live availability information. The threshold of the buffer is determined [3]. Therefore, if a parking lot has very few unoccupied spaces than a threshold, then the system will display that the parking lot is fully engaged. But it is not easy to determine the threshold for the buffer. If the buffer is too small, the problem of "multiple-car-chase-single-space" will not be eradicated. If it is too large, the usage of parking spaces will be low.

So to overcome the disadvantages of the above parking approaches we have designed a system that can be used on Android Smartphone. By using this system the user can determine the availability of parking spaces prior to entering the parking lot. The system provides a visual display to the user regarding the available parking spaces by which he can book or reserve a space whenever he needs. The system significantly reduces traffic snarl up and the resulting environmental pollution by decreasing the time required for users to locate parking space.

III. MOTIVATION

Use of automobiles has increased tremendously in today's world. The available parking slots are not utilized properly. The main reason for this is the insufficient information the user has regarding available parking spaces. The driver usually follows a guess based approach to find a parking space and most of the times get frustrated. The driver finds himself in a great puzzle searching a parking space in his busy work schedule. Many a times he parks in undesired and inconvenient places. Lack of proper facility to help him park his vehicle leads to his migration to remote places for parking, thus causing wastage of fuel and user's time. Increasing the number of parking spaces is a solution to this problem but it is not a easily feasible solution because it requires huge investments and is a time consuming process. Additional parking spaces also impact area traffic and local residents.

Moreover, most of the parking management systems which are presently available are static and serve only on a small scale. There needs to be a system to solve all these discouraging issues of parking vehicles. Use of internet would make the system more flexible as anyone can access and use such a system from anywhere. With the advent of technology geographic information systems help in getting information related to geology of the earth. So such systems contribute a lot in collecting information for developing a parking management system with a huge database of maps. Almost everyone today has an internet

enabled smartphone, so making such a application available to the user on his smartphone is very efficient. Without wasting so much of user's time such application helps him to search the parking space.

IV. METHODOLOGY

Figure shows how the system is assembled .Initially parking spaces with their longitude and latitude in the college campus were registered on the web map server to make the system more dynamic by using internet .Each parking space is uniquely identified by QR Code.

The QR code was generated using fields like space id, latitude and longitude of the space [2]. The QR Code was printed and affixed at the corresponding parking spaces. A database that shows all the mapped parking spaces with their attributes is created. A web server Application Programming Interface, API is established and published over the internet. The user can then access the API using the application.

The user willing to use the application must be connected to the internet via his phone. The user has to download the application and install the application on his android smartphone [5]. He has to register himself to the system by giving details like name, password, email id, phone number. He can then log in to the system whenever he needs to reserve a parking space or use the available space.
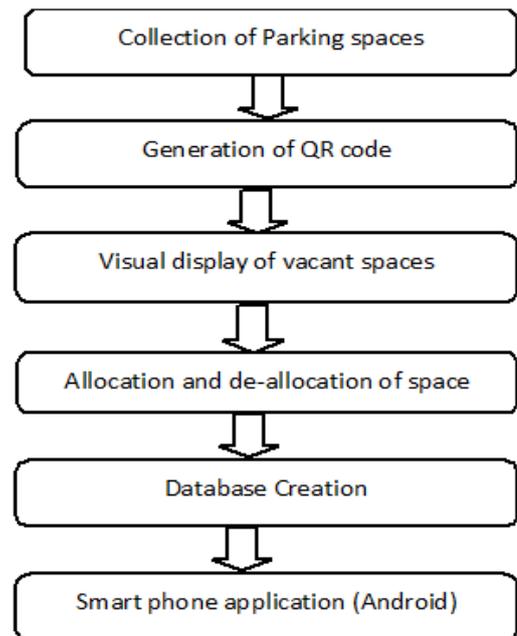

Fig. 1: System Flow Chart

The system provides visual display of available parking spaces in a particular region. The user will have to select the desired parking space by just clicking on the space.

After reaching on the space user scans the QR code which is affixed at the space by using the scanner in the application and parks his vehicle on the space. While departure he rescans the QR Code and leaves the space. Here the internet acts as a communication medium that captures the activities of the user in the application.

These activities are then reflected into the database that maintains the status of every parking space i.e. whether it is available or allocated.

V. EXPERIMENTAL RESULTS

A shortcut icon of the application appears in the main menu of the screen. Figure 2 shows the application shortcut icon which appears on the screen of the smartphone.
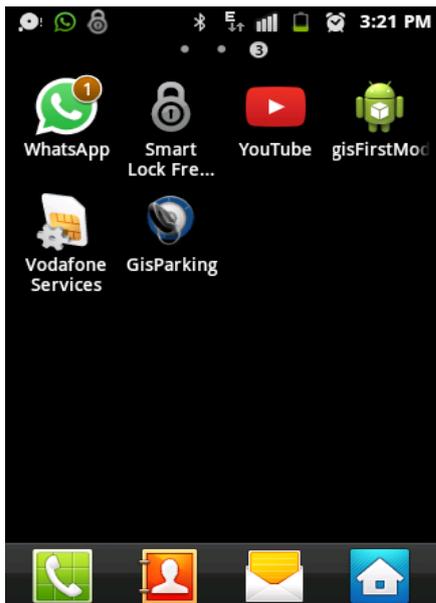

Fig. 2: Menu of a smart phone showing the smart phone application short cut icon marked as GisParking

When clicked on the icon of the application the first page appears as shown in the figure 3 below which prompts the user to enter mobile number and password and then log in to the system if he is already registered else the user will have to click on registration button.
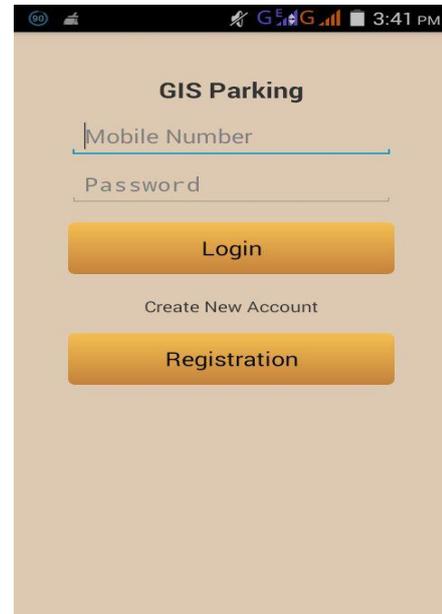

Fig. 3: Log in page of the application

After clicking on registration button the user will have to register himself by entering the appropriate details into the fields as shown in the Figure 4.
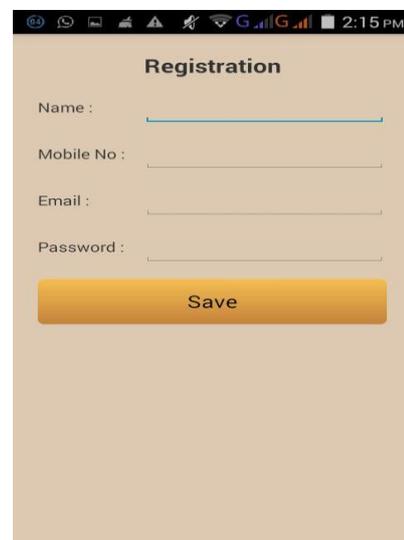

Fig. 4: Registration page of the application

After submitting the details the login page will appear with fields mobile number and password. User will have to enter correct mobile number and password same as he entered while registration.

After successful login next page which contains the menu including options that are map, list, QR Code scanner and logout as shown in the figure 5 will be displayed.

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Fig. 5: Main menu of the application

A web map page for Sanjivani College was created showing vacant parking spaces as shown in Figure 6. This web map interface is connected to the database which stores the status of every parking space and accordingly reflects it on the web map. The changes in the parking situation are reflected on the web map via internet. This page allows the user to know the number of vacant parking spaces within the college.

Fig. 6: Web map interface showing number of vacant spaces to user

After clicking on the red mark the next page will be displayed as shown in the Figure 7. It gives the actual parking situation within the college. The space is marked as green if it is vacant as shown in the Figure 7.
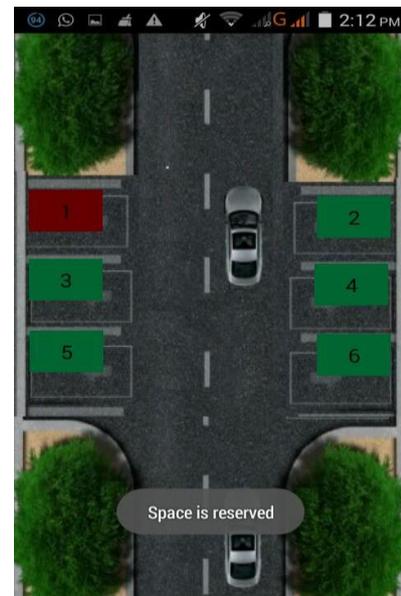

Fig. 7: Visual display of the available parking lots marked with green color and allocated parking lots with red color

Once the user selects the particular parking space, the space will be marked as yellow as shown in Figure 8. The user will have to reach the parking space within 30 minutes so as to actually accommodate the space by scanning the QR code due to which the space then will be marked as red. If he does not reach the space within 30 minutes the space will again be marked as green.

Fig. 8: Visual display of the booked parking lots marked with yellow color and available parking lots with green color

Whenever the user parks or unparks his vehicle he will have to scan the QR code affixed at the space by using the QR code scanner option as shown in the Figure 5 which is displayed in the main menu. The camera of phone is invoked to scan the QR code which is affixed at the parking space as shown in the Figure 9.

Fig. 9:QR Code Scanner which scans the QR code affixed at the space

On clicking the space option on the main menu a dynamically updated list of parking spaces with number of vacant spaces is displayed as shown in the Figure 10.

Logout option on the main menu of the application as shown in the Figure 5 helps the user to sign out of the application.

Parking Name	Empty Space
Central Bus Stand	5
Nashik Road	1
Gangapur Road	5
College Road	6
Sanjivani College	5

Fig. 10: List showing the number of available parking spaces in a particular area.

VI. CONCLUSION

The system gives a visual display to the user regarding the current parking scenario. The system reduces work of manual parking process by converting the entire parking process to automation. The system makes it easy for the user to book or reserve a space on the smartphone. Thus smartphone acts as a park finder .This ultimately reduces the time that every driver spends for searching a parking space which then reduces the fuel consumption, traffic volume and environmental pollution by increasing the efficiency of transportation.

VII. FUTURE WORK

The system can further be enhanced by providing various options. In manual systems it is nearly impossible to collect the right amount from the user according to the amount of time for which he parked his vehicle. Thus by providing automation, the system can be further enhanced by providing option for billing where the collection of fee will be totally based on the time for which the user parks his vehicle. The system can be further enhanced by providing options for payment of bill by various modes such as credit card etc. Displaying maps with price tags on each parking space and distance in kilo-meters from the user's current location will make the system more user friendly.

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