



PARK MY RIDE: Your True Parking Companion

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Abstract:

Having a smart-phone for the people of any age is common these days. These smart-phones not only provide entertainment to customers but also help them work in a way to make their lives better. In recent times, many daily life problems have been addressed by using smart-phone technology. One of those problems is parking the vehicle. Due to the increase in population and the number of vehicles, the parking issue is getting worst day by day in many big and crowded cities of the world. People have to spend more money and time to find safe parking for their vehicles. The street and roadside parking causes various troubles like fines and damages to the vehicles. So, the paper presented here suggests the best possible solution for parking lots in Pakistan. By using android technology, an android application named "Park My Ride" has been introduced that will help its users to see parking spots near them with the space availability and a complete map navigation to access that parking lot. The administrator panel for parking owners will also help them to manage the booking of vehicles in their parking lots. It would not only save time but also ensures the safety of the vehicles.

Keywords: Android Application; Parking Issues; Pakistan; Mo- bile Application; Simulation

1. INTRODUCTION

All around the world, one of the main challenges facing by the people in many big and crowded cities is to find parking vacant spaces for vehicles [1]. According to statistics provided by the global vehicle ownership and vehicle production, the number of vehicles are rapidly growing in the world and this number is expected to exceed 1 billion before 2020 [2]. This increase in number of vehicles will further boost the problem of finding free parking slots [3]. To address this issue and decrease the damage caused by parking space shortage problem, numerous countries are working to develop a smart parking solutions [4].

From the past few years, Pakistan big cities are over- crowded due to the huge influx of human population who are settling in cities in search of better employment opportunities and

good educational and medical facilities. The increase in the population of cities raises numerous challenges/problems. The parking of the vehicle is one of the severe problems because most of the old residential areas, hospitals, universities, colleges, schools, public places, and commercial areas have narrow roads and lesser parking facility [5], [6].

It is reported that in past few years the number of total registered motorbikes in Pakistan has been increased up to 439% since 2000-2015 [7]. By this huge number of increase in traffic, we can easily understand/measure the situation of parking problems in Pakistan. According to a report in 2000, the number of total licensed vehicles was 4,701,600. But, in the year 2015, this number of total licensed vehicles was grown up to 17,317,600 which is nothing but an immense increase in the field of automobiles. Figure 1 shows the total numbers

of vehicles registered in year 2000 and 2015.

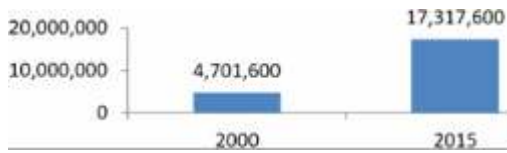


Fig 1: Total registered vehicles in 2000 and 2015

Keeping 2000 as the base year to measure the progress in the number of registered motor vehicles, from 2000 to 2015, there has been a 439% increase in the number of registered motorcycle, 413% increase in the number of registered auto rickshaws, 114% increase in the number of registered motor cars (Jeep, Wagon etc.), 95% increase in the motor cabs (where Karachi holds the big numbers of cabs in the world), 48% increase in the number of registered buses, 73% increase in the number of registered trucks, 88% increase in the number of other registered vehicles and 268% increase in total number of registered vehicles [7]. This is a big number for any country to see parking issues growing every day. Figure 2 illustrates the percentage change in number of registered vehicles from year 2000 to 2015.

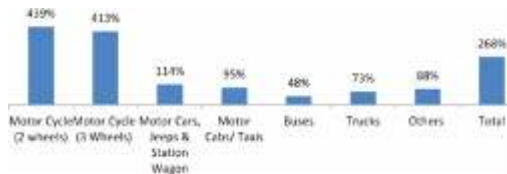


Fig 2. Percentage change in number of registered vehicles (2000-2015)

The existing parking lots are overcrowded and mismanaged as shown in Figure 3. People are bound to look around and find a better and safe place for their vehicles everywhere whether it is a residential area, shopping mall, hospital or a well-established institute. It is roughly estimated that the car runs on an average of 400 hours only out of 8,760 hours in a year, leaving 8,360 hours when it is parked [8]. It is the desired of every owner to park his vehicle closest to his destination. But, the problem is how people can know the exact location of the parking lots? What will be the alternative parking place near to them if the parking lot is full? The situation is more critical for visitor or newcomer.



Fig 3. Parking place

In this era, where the technology has flourished a lot, the people's life has become more comfortable and convenient. Every day new products, new tech gadgets are being invented by genius brains to facilitate human beings. In this work, technology is used to solve the parking issues for people living in the cities who visit these big cities for certain purposes. The proposed solution is a web-based Android parking application. This application will help its users to see parking spots near to them and will also navigate people to that parking lot with map activity. For the very first time in Pakistan, a person would be able to know that the parking he/she is going to use has enough space to park their vehicle or not. The proposed application has the following main features:

- Find/Determine the nearest parking locations to its users.
- Show space availability of those parking lots so the users can reach to only available locations.
- Parking owners login so they can manage the entries of vehicles to keep their parking lots updated.
- Save time to find that parking by enabling suggesting the best routes.
- Dual login functionality in the application for both parking owner and end-user.

The rest of the paper is organized as follows. Section II covers the previous works that have been done in this area. The proposed application is presented in Section III. Section IV describes the functionality of the proposed solution. Finally, the conclusion is drawn in Section V.

2. LITERATURE REVIEW

The existing solutions targeting parking issue does not work in Pakistan but holds the benefits and functionalities that can be provided to Pakistani citizens. The Sharjah Parking app works only in United Arab Emirates books parking lots for specific time [9]. People are able to book scheduled parking lots. The application has Short Messaging Service (SMS), the user can be notified with a text message on the standard career network. Parking.sg is another application that takes its user to the selected parking lot through maps navigation and calculates parking charges at the end of the trip [10]. This application works only to navigate users and calculating their bills. The user will be able to pay bills through smartphone by entering the account in the application.

There are numerous solutions either act as parking guide or related to smart parking system [11-12] but in best of our knowledge, none of them provide space availability information for users. This information is helpful for the user to select the parking. Before approaching, the user knows that the selected to the parking lot has free space. Moreover, the proposed solution comprises a little management system for parking owners as well so here's the plus point again that none those applications does that for the ease of parking owners.

3. PROPOSED SOLUTION

The proposed application consists of three modules which are Administrator (admin) Panel, User End Application, and Database.

A. Administrator Panel

In this work, the .NET framework is used to build the admin panel of application. The Model-View-Controller (MVC) application design model is used to shape the admin panel. The following are the main features of the admin panel:

- Managing Admin
- Authorization of new parking lot
- Managing parking lots
- Creating a separate panel for every parking owner so he/ she can track their records
- Managing users
-

In this work, seven different types of controllers are used that will help to manage the admin panel. These controllers are:

- Admin Controller.
- Booking Controller.
- History Controller.
- Login Controller.
- Parking Controller.
- Parking Owner Controller.
- Home Controller.

Every controller has its views that show the tasks and features that the controller performs. There are two master pages every controller is linked through. One master page is linked to the admin side and the other one is for the parking owner side. Figure 4 shows the admin panel.



Fig 4. Administrator panel

B. User End Application

The end user application is developed in android. The main functionality of the android application is demonstrated in figure 5. A login page is restricted to allow only valid users. For using the application the users have to register with a valid email address.

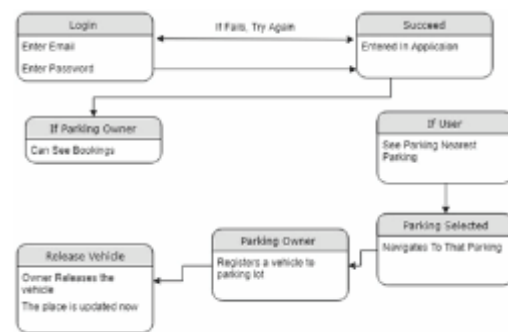


Fig 5. User end functionality

No duplicate registration is allowed i.e, an email address can be used once. The admin panel is only for administrator and parking owners. The end user would not be able to access the admin panel. The login is enough intelligent to distinguish between parking owners and end users through emails addresses registered/stored in SQL database. If the email belongs to a parking owner, it will redirect it to the parking owner page. This page consists of details about how many vehicles are currently using a parking lot. If it is an end user, the system will redirect it to features that are built for the end user in this android application. The user will be seeing (P shaped) Blue parking markers on his/her screen that are actually parking spaces. When a user clicks on marker, brief information about the how many cars and bikes can be parked in that selected parking lot. When a user wants to park the vehicle in the nearest selected parking, click on navigate to that parking location and Google Maps API will find the best route for that user to reach that parking spot. The user will reach the exact parking location with the help of navigator and will park his/her vehicle in that parking lot. When a user has parked the vehicle, the number of available slots will be decreased for other user searching for available parking. This is a big ease for any customer who is finding a parking spot in other cities or new to a place. The owner has limited feature available on their Android application as it has only the information about how many vehicles are currently using their parking lot and information of those vehicles like License Plate Number, Parking in time and vehicles type (Car, Bike).

C. Database

To maintain the user record and to check whether a person is entering the wrong password or email id an SQL database system is connected to both admin panel end users application. This SQL database consists of four tables named Booking, History, Parking, and User. Although some validations are added as well about email strings and parking owners/users that it will validate the email string and navigate users or parking owners to their application user interfaces. Tables are connected to each others via primary and foreign keys relations as it is a relational database. The entity relation diagram of the database system is shown in figure 6.



Fig 6. Entity relation diagram of database system

4. FUNCTIONALITY

A. Login and Registration

The login page of the application is the same for both user and parking owner. The distinction between user and parking owner is made on user ID. The only thing that a parking owner can see in the application is a detail of bookings. The login page of the proposed application is shown in figure 7.

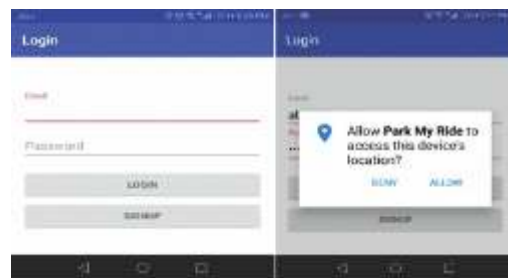


Fig. 7. Login page

B. Location Accessibilities

Location and accessibilities options are helpful for customers to get the exact location and maximum accuracy on the maps. It is a good practice for using maps accurately therefore always use GPS at high accuracy to get the best user experience of any application that supports and facilitates maps navigation. This application always notifies users before using maps activity to enable location however it's up to the user to set GPS accuracy from device settings. Figure 8 shows device setting to allow the application get user location.

C. Maps, Space availability and Navigation

The "P markers on the maps in left screen in the figure 9 shows available parking lots for a user.

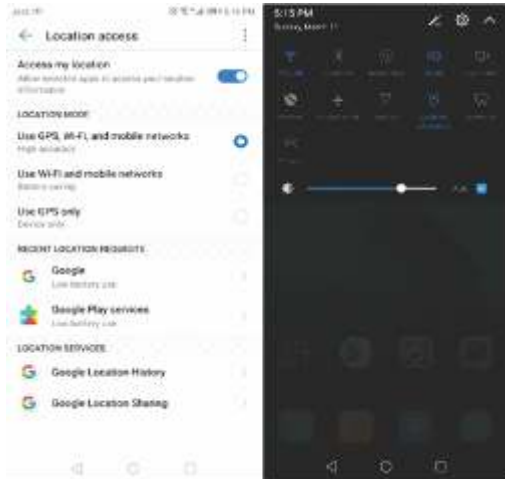


Fig 8. Location accessibilities

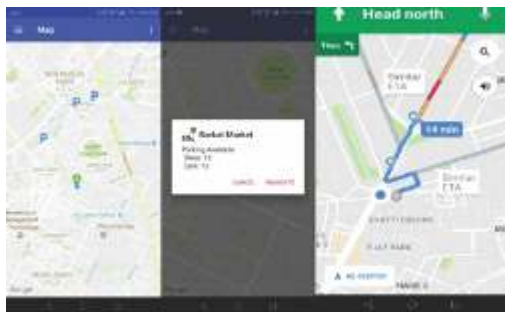


Fig 9. Maps, space availability and navigation

The middle screen show space availability feature that how many vehicles can be parked in that parking lot. The right screen shows the Google maps activity to navigate the user to it is selected parking space by finding the best way for access that parking lot fast and accurate. This maps activity also gives alternate routes that a user can use to reach his selected parking lot.

D. Parking spot reservation

The user can reserve a parking space in parking lot after providing necessary information including vehicle type and number. The acquired information is stored into the SQL database to manages the users record. This feature is linked with space availability feature. So, whenever a reservation is made for user the number of available parking slot decreases for other users that used application to find parking lots. Figure 10 shows the reservation page.



Fig 10. Reservation page

E. Exit vehicles

At exit point, the parking lot owner or operator search the vehicle record with the help number plate from database. The application automatically generate the bill based upon stay time. After charging the bill the status of vehicle will be changed to release. This will update the database and space availability features on the maps too. After that, the parking owner can see the updated number of vehicles on their Android application screen as well. Figure 11 shows the page used to exit the vehicles.



Fig 11. Exit page

5. CONCLUSION

An efficient car parking solution is presented which targets the convenience and safety for its users. It would defiantly reduce the pressure of parking issue in the crowded cities of our country. The best part of it is its simplicity and usability. The map would be helpful for the strangers in finding the actual parking place nearby. It is helpful not only for the users but also eases the management and security of parking lots.

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