Implementation for Android 'Pay & Park' Application

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Abstract- Among the challenges that we face in our day to day life one of most unavoidable challenge is parking the car wherever we go. As our need increases our travelling increases but due to drastic increase in usage of vehicles and increase in population we face the tough task of parking our car particularly during busiest hours of the day. During peak hours most of the reserved parking area gets full and this leaves the user to search for their parking among other parking area which creates more traffic and leaves them with no indication on availability of parking space. To overcome this problem there is definitely a need for designed parking in commercial environment. To design such parking slot we need to take into the account of reservation of parking slot with optimal parking space which depends on cost and time. Additionally, four hours prior to his expected arrival, the user can pre-book a slot in the area he desires if it is available. This will help reduce the load on the administrator as his physical work reduces drastically and user can search the parking slot through Android Application. Payment services are made available using Google Wallet, so the user is required to own a credit card or debit card. Application relieves the user from the hassle of manually searching and waiting for empty slots to park the vehicle.

Keywords- **Text Here Your Keywords.**

I. INTRODUCTION

1. Motivation:

The increase in city traffic is one of the major effects of population growth especially in urban areas. Due to this searching for a vacant parking area during peak hours is not only time-consuming but also results in wastage of fuel. The drivers keep searching for suitable parking lot which leads to increase in traffic. Increasing volume of vehicular exhaust creates a negative impact on the environment.

Hence reservation-based smart parking has become the need of the day. Parking is an essential component of the transportation system. A typical vehicle runs for one hour on an average and is parked for 23 hours in a day. It is also important to consider that a typical vehicle usually needs three different parking spaces-one at the owner's residence, second at owner's office/business place and third at recreational/entertainment facilities.

2. Problem Definition:

The Smart Parking Application aims at helping users to find the most suitable area for parking make reservations and extend them, if required. It enables parking administrators to define and manage parking spaces as well as enables parking operators to authenticate users against their reservations when users enter the parking area. User's access location based information and request system services via mobile applications and parking operators verify reservations via mobile applications whereas parking admins may manage the parking area details via a web application.

3. Relevance of project:

In order to satisfy the increasing demand for the parking areas, parking management organizations are trying to implement better and technologically

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advanced solutions. A variety of methodologies have been implemented abroad to disseminate parking availability information through various platforms. The smart parking application will enable real-time parking availability checking and reservation thereby providing a hassle-free parking solution for users.

II. LITERATURE REVIEW

Current Systems for smart parking includes: Smart parking using RFID [1]: RFID technology is an automation technology with main components as RFID readers, labels, computers, barriers, software etc. The software is for management, controlling, transaction reporting and operation tasks for parking lots. This vehicular data is fetched from database to verify a vehicle when it enters the parking lot using RFID reader. When a vehicle wants to check out, the authentication is done by analyzing check-in details. The drivers will be notified about the availability of parking lots at the entrance itself. Hence, no time is wasted looking for park space.

Reservation based smart-parking [2]: Reservation based smart parking system aims at broadcasting real time parking information to drivers via an application. The system mainly uses Zigbee sensors and smart phone support for deployment. This system enables the users to reserve a particular parking space in advance by accessing its availability information in specific parking district. It is also equipped with payment option including dynamic pricing for users. Light and vibration sensors detect whether a vehicle is present in the lot. Bluetooth module is responsible for communication between user and the sensor information. The major disadvantages include shorter range of bluetooth and bottleneck situations may arise in case of heavy traffic.

Smart parking reservation system using SMS [3]: This system enables users to reserve their parking places using SMS. Once the reservation is confirmed, the users will receive the one time password (OTP) to enter the parking area and the lot number for parking. If they exceed the time to reach the parking area, the password will expire and the reservation will be cancelled. The system is subdivided into Reservation and Access system. The reservation is handled by a micro-RTU (Remote Terminal Unit) configured with SSE OPC (OLE for Process Control) Server. The access system is handled by a

microcontroller-IC16F877- which measures time periods for validity of passwords, stores/provides information on the availability of parking spaces as well as allowing or denying access to the parking area. A weight sensor is positioned at the lot area to sense the presence of the vehicle.

ParkNet: Drive by sensing road-side parking statistics [4]: ParkNet is a mobile system comprising of vehicles that collect parking space occupancy information by driving by. The vehicle includes a GPS receiver and passenger-side facing ultrasonic rangefinder to determine vacant parking spaces. The data collected is integrated at the central server producing a real-time map of parking availability thereby serving user's requests. In order to achieve accuracy of location, environmental fingerprinting approach is devised.

It makes use of GPS module and ultrasonic sensors for end to end communication. A real-time map is generated to reflect the occupancy with respect to a timestamp. The drawbacks are mainly due to limitations of sensors and complexity involved in cases of multi-lane parking.

III. DRAWBACKS OF EXISTING SYSTEMS

1. RFID System:
This system is considerably expensive. The RFID tags are application specific, no one tag fits all, more than one tag can respond at the same time. This system fails in case of internet disconnection. If two vehicles enter a parking lot side by side, being within the range of the RFID reader, the system will not read their identification information and process it. Electromagnetic spectrum signals are relatively easy to jam using energy at the right frequency.

2. Reservation based Smart Parking System:
The reservation based smart parking system is expensive and also difficult to maintain. The problem of bottleneck may occur due to heavy traffic.

3. Smart Parking Reservation System Using SMS:
The system is a standalone system i.e. the system is designed for individual use by parking areas, and not a centralized system encompassing reservation for all parking areas within a region. As the system uses CMOS flash memory for storage of parking information, the database can be scaled within hardware limitations.

4. Parknet:

Drive by sensing roadside statistics Errors in providing accuracy of locations and occupancy. It is expensive and more complex due to lane detection mechanism. If the vehicle does not move within a specified speed range there may occur failure of ultrasonic sensors to detect distances.

Current parking systems contained in office buildings, malls or public parking lots using automated parking gate systems use systems that only provide information on the length of the driver's parking and the vehicle images used to obtain cost information to be paid. In the existing system there are some problems where drivers sometimes do not get parking because parking attendants do not know that the parking lot is full.

In addition, the other problem is that drivers sometimes do not know whether when he gets into the parking lot he will easily get an empty parking lot so it does not take long to park and does not make the driver exhausted to find parking. The current system still leaves the driver confused whether the parking lot is full or available. So when the driver picks up a ticket, he thought that the parking lot is available.

IV. PROPOSED SYSTEM FOR IMPLEMENTATION

1. Starting the Application:

The user needs to install the application on his android based device. After installation, the icon of the app will feature on the home screen of the user's device. Welcome screen will be flashed to the user on opening the application. The proposed system is the combination of smart parking and the Slot allocation with the Android application. In the existing system, a dynamic algorithm is carried out, which is a random allocation method. It randomly allocates parking lot to the users.

2. Registration:

Initially, the user has to register his details with the application for the first time. This is a onetime registration. The user has to enter details like username, gender, phone number and email-id. All this data will be stored on server. Booking for slots mandatorily has to be done four hours prior to arrival.

3. Selection of location for parking:

The client is provided with multiple parking locations. Client has to select one of the locations provided where he desires to park the vehicle.

4. Select vehicle type:

After selecting the location, options for the vehicle type is provided i.e. 2-wheeler or 4- wheeler alongside the rate chart for parking charges is prompted.

5. Availability status of the slots:

Based on the type of vehicle selected availability of the empty slots will be displayed along with the total slots reserved for that vehicle type. Colour coding is used to indicate empty v/s reserved slots. Green indicates empty slots and Red indicates that currently there are no empty slots for reservation.

6. Enter user's details for slot reservation:

In case the slot is available, the client can proceed further with the reservation & payment process or else he can go back to change the location/vehicle type or else can terminate the entire process.

7. Confirmation:

On successful reservation, a confirmation page with user details is shown which is editable. The smart parking application is collectively implemented in following modules:

7.1 Website for the Administrator: Website enables Administrator to perform functions: Add, View and Edit a parking area.

7.2 Mobile Application for the End-user: Mobile Application for the Operator helps in Authentication and Billing functions.

7.3 Mobile Application for the Parking Operator: Mobile Application for the End-user provides functions – Search, Book, View, Cancel slots.

A single database stores information regarding parking areas, users and their reservations. The database consists of tables: admin, operator, parking area, parking lots, parking session, user, user_cars.

8. Administrator functions:

8.1 Add Slot: On selecting an area on the map, its latitude and longitude is obtained by the system

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and then the admin has to fill in the remaining details.

8.2 View slot: On selecting a marker on the map, the admin can view the details of that parking area.

8.3 Edit Parking Area Details: The admin can edit the parking area details by editing the form displayed after viewing the slot.

9. Operator functions:

9.1 Authentication: When user enters parking area, operator verifies reservation using session id and car number of the user. Before Authentication (when the user arrives at the parking area), the status of parking lot is „booked" which is later changed to „occupied" when the user enters the parking area after authentication.

9.2 Billing: The operator enters the car no and session id to get the bill generated for a particular through the mobile application. On billing, out-time registered, bill amount calculated and updated, status changed to „finished" and Parking lot status changed to „available" and total number of parking lots in the given parking area are incremented.

10. End-user functions:

10.1 Search parking area: On selecting a location, user can view detailed list of parking areas, their availability and the pricing.

10.2 Book Parking lot: The user is required to enter id of the required parking area and duration of reservation to book a lot as per availability. After booking, a unique session id is given to user to confirm booking.

10.3 View booking: The user can view his current booking details like location, session id and status of booking through the end user's application.

10.4 Cancel booking: The user can also can his current booking. On cancelling, parking session status becomes "cancelled" and availability of slots gets automatically updated.

V. FUTURE DIRECTIONS

The Application can be developed for other popular mobile operating systems. In future, our application can be implemented on the existing operating systems like iOS, Windows and BlackBerry also on the upcoming and promising operating systems like Firefox OS, Jolla and Tizen.

Our application can be used as an alternative to the present parking systems in malls, at railway stations, near airports, theatres, etc. as an efficient means to park. Online Wallet can used to make secure payments fast and convenient.

Electric vehicles, which add another measurement to in determining how quickly cars leave their parking spaces, with charging credits (such as accessibility of charging stations, time and charging term, and evaluation and energy markets) becoming a key factor. Autonomous vehicles, which will generally change the use of vehicles and how they leave parking spaces through self-leaving abilities and mechanical valets.

VI. CONCLUSION

The present time brings us a constant increase in the intensity of road traffic. This problem brings strong negative externalities of urban transport, such as environmental pollution, noise, congestion, and traffic accidents resulting from high traffic density. Solutions for this problem are always time-consuming and expensive. In historical centers of Slovak cities, it is not possible to build new parking areas anymore. There is no more space, so there is only one more option.

We should improve the efficiency of parking. Due to advancement in technology, drivers are demanding easier and less time-consuming parking facilities. There are various methodologies of smart parking that have been implemented to provided better services to the end users and improve the overall management of the existing parking system. The real time monitoring of available parking lots and allotment of the suitable parking area by advanced reservation are some of the characteristic services provided to the customers or end users through a user friendly interface like a mobile application or using SMS services.

After analyzing the different solutions, it is observed that there are some drawbacks of each system like excessive use of expensive sensor modules, difficulty in sensing accurate parking availability data due to speed constraints of the vehicle, use of certain modules like Bluetooth that function efficiently only for short distance, inefficient user authentication techniques and centralized management of the database of parking areas in different regions.

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These drawbacks need to be eliminated to enhance the overall performance of the system.

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