A Synopsis on

ParkMania : The Parking Management System

Submitted in partial fulfillment of the requirements
of the degree of

Bachelor of Engineering

in

Information Technology

by

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CERTIFICATE

This is to certify that the project Synopsis entitled ***"ParkMania : The Parking Management System"*** Submitted by ***Saurabh Sharma (16104001),Srinivas Vishwanath (16104010)"*** for the partial fulfillment of the requirement for award of a degree ***Bachelor of Engineering*** in ***Ïnformation Technology*** to the University of Mumbai,is a bonafide work carried out during academic year 2019-2020

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Abstract

Due to the increasing population in urban cities, there is an exponential rise in the number of vehicles which is leading to major problems leading to poor traffic management and congestion. Another major problem face by the vehicle owners is the availability of parking space. The idea of Smart Cities is slowly gaining pace with the ever increasing technologies. Therefore, in the proposed parking system we are developing an application which can be used to either book or pre-book a slot. The vehicle owner will be able to reserve a slot for his/her vehicle from anywhere and will be provided with a QR code which will be scanned on the entry of the parking area. This QR code will be displayed on the e-receipt of that particular vehicle owner. The the problem of finding a vacant parking areas in big cities will be taken care of by our system as the vehicle owner will be guided to the particular parking area by the app itself with the help of maps. This application can therefore prove to an blessing to modern cities which will drastically minimize the chaos which is caused and help improve the traffic conditions. The corresponding user details and the details of their vehicles will be stored on the database which can be referred to anytime, thus providing security.

Introduction

In this system we focus to eradicate the problem of improper vehicle parking and unavailability of parking area. This will be achieved with the help of an android application which will be used to book or prebook a parking slot. The user can select the day and time as per preferance and accordingly make the booking. If the user is new, he/she will first have to sign up and create an account and the corresponding login details will be stored in the backend database i.e. Firebase. Firebase is a mobile and web application development platform developed by Firebase, Inc. in 2011, then acquired by Google in 2014. As of October 2018, the Firebase platform has 18 products, which are used by 1.5 million apps. In our system the successful scan of QR code will be used to detect the presence or absence of a vehicle in a particular slot. Further, the vehicle will be guided to the parking area with the help of the application. The details of the vehicle owners and that of the vehicles are stored in the backend database and thereby the identity is verified right at the entrance. Therefore our system provides security. This will be again be achieved with the help of Firebase. Payment will be calculated on the basis of time and a payment gateway will be available for making the required payments. Our system provides the flexibility of booking a parking slot through the application so they will not have to wander in search of a vacant slot in the parking area. Real time booking of slots will be visible which will eradicate the problem of clashes during booking a particular parking slot.

Objectives

Following are the major objectives provided by our system:

- Faster reservation of a parking slot anytime and from anywhere.

- Providing information about nearby parking slots that are vacant.

- Online payment portal integration making it easier for the vehicle owners to complete the transaction.

- Graph Analysis depicting the typical peak hours when the parking area is most/least occupied.

- QR code for verifying the user who has booked/reserved the parking slot.

- Payment calculation based on time for which the vehicle was parked.

- Storage of the vehicle and owner details in the backend.

Literature Review

The papers referred are mentioned below:

[1] Low Cost Smart Parking System for Smart Cities, D.Vakula and Yeshwanth Krishna Kolli-2017 International Conference On Intelligent Sustainable Systems(ICISS).doi:10.1109/iss1.2017.8389415.

This papers discusses about a vehicle parking system developed using the Internet of Things (IoT). The major technology used here is the Wireless Sensor Network Technology (WSNT). From this system we found out how ultrasonic sensors can be integrated with Raspberry Pi and Node MCU and how the information from Raspberry Pi can be transmitted to the front end GUI and back end database. The information is fetched from the ultrasonic sensors that detect the presence or absence of a vehicle. This information is forwarded to the Node MCU. A single Node MCU takes care of 4-5 parking slots respectively. The Node MCU transmits this information to the Raspberry Pi that has an on-board Wi-Fi module which helps for internet connectivity. Hence the information of whether a parking slot is available or not is forwarded to the Front End (application/website) and the user/administrator gets to know about the availability of the parking slot. Additionally, the vehicle entries are stored in the backend database hence keeping a record of the vehicles that have entered in the parking area.

- Advantages:

It provides GUI so that you can see the available slots.

- Disadvantages:

No solution if parking slots are full. Does not display nearby parking area within the vicinity of the original parking area.

[2] Advanced car parking system using Arduino, Hemant Chaudhary, Prateek Bansal, Dr.B. Valarmathi-2017 International Conference on Advanced Computing and Communication Systems (ICASS-2017).

This system focuses on Vehicle Parking System which is developed using IR sensors. An infrared sensor is an electronic instrument that is used to sense certain characteristics of its surroundings. It does this by either emitting or detecting infrared radiation. Infrared sensors are also capable of measuring the heat being emitted by an object and detecting motion. IR sensors prove essential in detecting an obstacle within its range. The major concern of their system was security. Therefore, they made use of RFID to authenticate a customer before he/she enters the parking area. Also, their system consisted of a gate at the entrance which would only open when the RFID scan was successful. For displaying if a slot is vacant or not, a LCD is used to display this information. If car is allowed to park, then mobile notification

will be send to user about parking. It solves the parking issue in urban areas, also provides security to a vehicle and an unauthorized user is not allowed to enter into a parking place. It helps to park vehicle in multi -floored parking also as it will display which floor has free space.

- Advantages:

Every user gets an authorization RFID card which is verified and thereby only authentic car owners are allowed and only then will the gate open. Security is thereby taken care of.

- Disadvantages:

No GUI provided to see the available slots. Since Arduino was used external Wi-Fi module was required to transmit data to application.

[3] Automatic car parking system with visual indicator along with IoT, Sarthak Mendiratta, Debopam Dey, Deepika Rani Sona-2017 International Conference on Microelectronic Devices, Circuits and Systems (ICMDCS).

This paper focuses on the concept of car parking detection mechanism using the ultrasonic sensor, in combination with the usage of Internet of Things i.e. sending the status of the parking slot to the Internet. Through which the user at any place in the world can see which parking slot is empty and where to park. This is done by sending the data of ultrasonic sensor through our Wi-Fi module that is ESP8266 to any open source easy to use IOT platform that uses HTTP to display our data (thingspeak.com in this case). LEDs were used to display the availability status of a particular slot. If a particular slot is vacant, then green LED would glow and if the slot is occupied a red LED would glow. To switch between Red Bulb and the Green Bulb a relay module is used which is triggered by the 5 Volt pin of the Arduino Board and to glow the bulb, an AC power supply is used, which will be connected to the relay module. The two Ultrasonic Sensors are used to eliminate and minimize any manual or human interference thus increasing the efficiency of the overall system. Since they had used Arduino, so Wi-F connectivity was a major problem, so to eradicate this problem they had to use external Wi-Fi module i.e. ESP8266 for connectivity purpose. The ESP8266 is programmed using AT commands; when received, it replies with an acknowledgment. AT commands are a bit strange at first but with a little usage become easier to understand. These are run commands that run directly on the ESP module and are responsible for controlling the interaction between the ESP module and the Wi-Fi source.

- Advantages:

GUI is provided which helps the user to know beforehand which parking slot is empty. This system is cost effective.

• Disadvantages:

No online payment feature included. Nearby parking areas are not displayed in case the parking is full.

[4] IoT based Vehicle Parking Manager, Desai, J., Bhanje, A., Biradar, S., Fernandes, D - (2017) IoT based vehicle parking manager. 2017 7th International Conference on Cloud Computing, Data Science Engineering - Confluence.doi:10.1109/confluence.2017.7943153.

The main objective of this project is to design solution for overcoming the parking issues that exist in public places such as malls, multiplexes, etc. especially on weekends. The aim is to achieve this by using the concept of Internet of Things (IoT), wherein an Android Application is created for the customer, whose details are constantly updated by the hardware/server at the location. The features include unique identification for each vehicle, display available parking slots on the mobile application, possibility of making reservations for the same, maintenance of a database (for the management).

Features of the proposed project for a customer are: Display of total parking slots in the parking lot, number of parking slots, available, occupied parking slots and the reserved parking slots. Assigning of a unique identification to a customer/car in the form of QR code through which a user can view the balance, view the transaction 'records of the earlier parking done by them in the parking place, make reservations along with the timings. Features of the proposed project for managing the parking system are: A QR Code reader at the entry of the parking system to identify the unique ID associated with the vehicle and do the corresponding transactions (entry time, rate deduction etc.), An LCD at the gate to display the car number and the parking slot selected by the user, Parking slots status (fully reserved, total time slots), Earnings -Total/Per Customer/per week, View database of all the cars which entered the parking system along with the timings and the slots occupied., Recharge the customer's ID at the entry if required and Special reservations for VIP's (no time limit) Allow one time entries for vehicle without any unique ID.

• Advantages:

Provides a feature to view the availability of the parking slots through an application real time. QR code scanning for authorization.

• Disadvantages:

Does not provide a solution when the parking area is full.

[5] IoT based Smart Parking System, Khanna, A., Anand, R. (2016). IoT based smart

parking system. 2016 International Conference on Internet of Things and Applications (IOTA) .doi:10.1109/iota.2016.7562735

This paper mainly focuses implementing a vehicle parking system using Wireless Sensor Network. The main sensors that were utilised in their system were the IR and the Ultrasonic Sensors to detect the presence or absence of a vehicle in a particular slot. Additionally, an application was provided to the users for interactive experience and for the ease of booking the parking slot from any location. The application shows which slot is currently vacant and can be booked while the ones which are occupied as well. Also, the user could be able to select the time for which the particular slot he/she is going to occupy (2 hours, 3 hours. . . 5 hours.). The major highlight of this project that we learnt was that the server was deployed on cloud. Therefore, all the storage of user and vehicle information was done on the cloud database. In case of a system failure, since cloud was used, it provided quick recovery thereby increasing the uptime and also provided the backup for the data. Time out notifications were sent to user through the mobile application thereby keeping them updated. The cost calculation was done on time basis. The timer used to start as soon as the vehicle occupied a particular slot. Once the driver had parked its car in the selected slot he/she needed to confirm its occupancy. This very scenario in which the driver had to specify its presence. This feature was added so that only a genuine driver can park its car in a particular parking slot. If a driver failed to confirm his occupancy in the next 30 seconds of parking its car, an alarm would start ringing causing the authorities to know that a car has been parked in the wrong place. If by any chance a genuine driver failed do so he could stop the alarm any time by confirming his occupancy

- Advantages

Provides cloud for the storage of vehicle and vehicle owner details. High detail view of system infrastructure. An application is provided through which customers are notified.

- Disadvantages

Does not provide a solution if the parking area is full.

Problem Definition

As the city is developing and with increase in population, people are finding it difficult to park their vehicles. In some parking place there is no safety for the vehicle. There is a chance of theft or vehicles may get damaged. People waste their time to search vehicle parking place. To solve these problems Online Vehicle Parking Monitoring is used. The basic concept behind this project is that it reduces the time of the customer by providing proper parking facility. Any customer can book the available parking slot at particular time. This provides security to the customer. People keep roaming around in search of vacant parking slots, and after a lot of struggle, they find one. Due to lack of a proper mechanism to identify free parking slots, they move randomly in search of parking space wasting a lot of time. This problem can be solved if the drivers could check the availability of parking spaces in and around their intended destination.

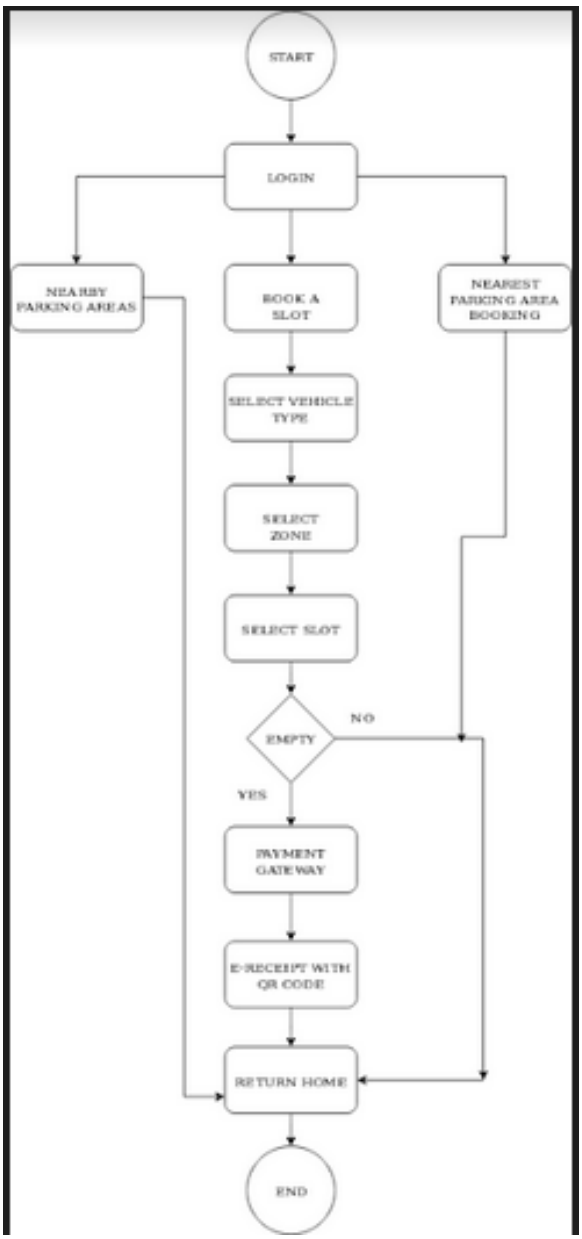

Figure 1: Proposed System

Our proposed system works in the following way:

1. Vehicle Owner books/reserves the parking slot using the mobile application by selecting the date and time.

2. In turn the user will get a QR code which will be used for verification later.

3. A window of 2 hours will be provided to the user within which he/she has to reach the parking area else, reservation is cancelled.

4. At the entrance, the user verifies the identity using the QR code and is assigned a particular parking slot based on the type of vehicle (car/bike).

5. The details are stored at the backend when the QR code is scanned.

6. An additional feature our system provides is that it displays the nearby parking areas. This feature is included because if the current parking area is full, the user can check for the nearby area where the vehicle can be parked.

7. The application contains two zones A and B for bikes and cars respectively.

8. The application displays booked, prebooked and occupied slots with the help of GUI.

9. Additional amount is imposed if a user extends the parking time.

10. If the user does not have an application or internet connectivity, then booking for that particular user will be done right at entrance of the parking area by providing a receipt or ticket.

Therefore additional features our system is providing is:
• Pre booking a slot based on time.
• Real time updates of slot occupancy,
• Information about nearby vacant parking slots within the vicinity of the main parking slot.
- Booking the slots in the nearby parking area.

Design and Implementation

The design of our application consists of the following:

1. Login and sign up screen for identifying a user uniquely.

2. On successful login, the user is guided to the home page where user get three options where he can book a slot, check for nearby areas and book a slot in nearby area.

3. On selecting book a slot, the next page will give you to the option to select the type of vehicle i.e. is either two wheeler or four wheeler.

4. Next you select the zone (A or B) and the slot where you want to park the vehicle.

5. The available slot will be displayed using green.

6. The occupied slots are displayed by red and the user would not be able to select that slot.

7. When the vacant slot is selected you need to provide the necessary time and date.

8. Next you are guided to the payment gateway where you can pay as per the time which is calculated on the basis of time.

9. On successful payment an e-receipt is generated which contains a QR code which will be scanned during the entrance for the unique identity of the user.

10. On selecting nearby parking areas, a map displaying the nearby areas is selected.

11. On clicking 'Book nearest parking area' you can book a parking slot
in a area which is in vicinity to the main parking area.

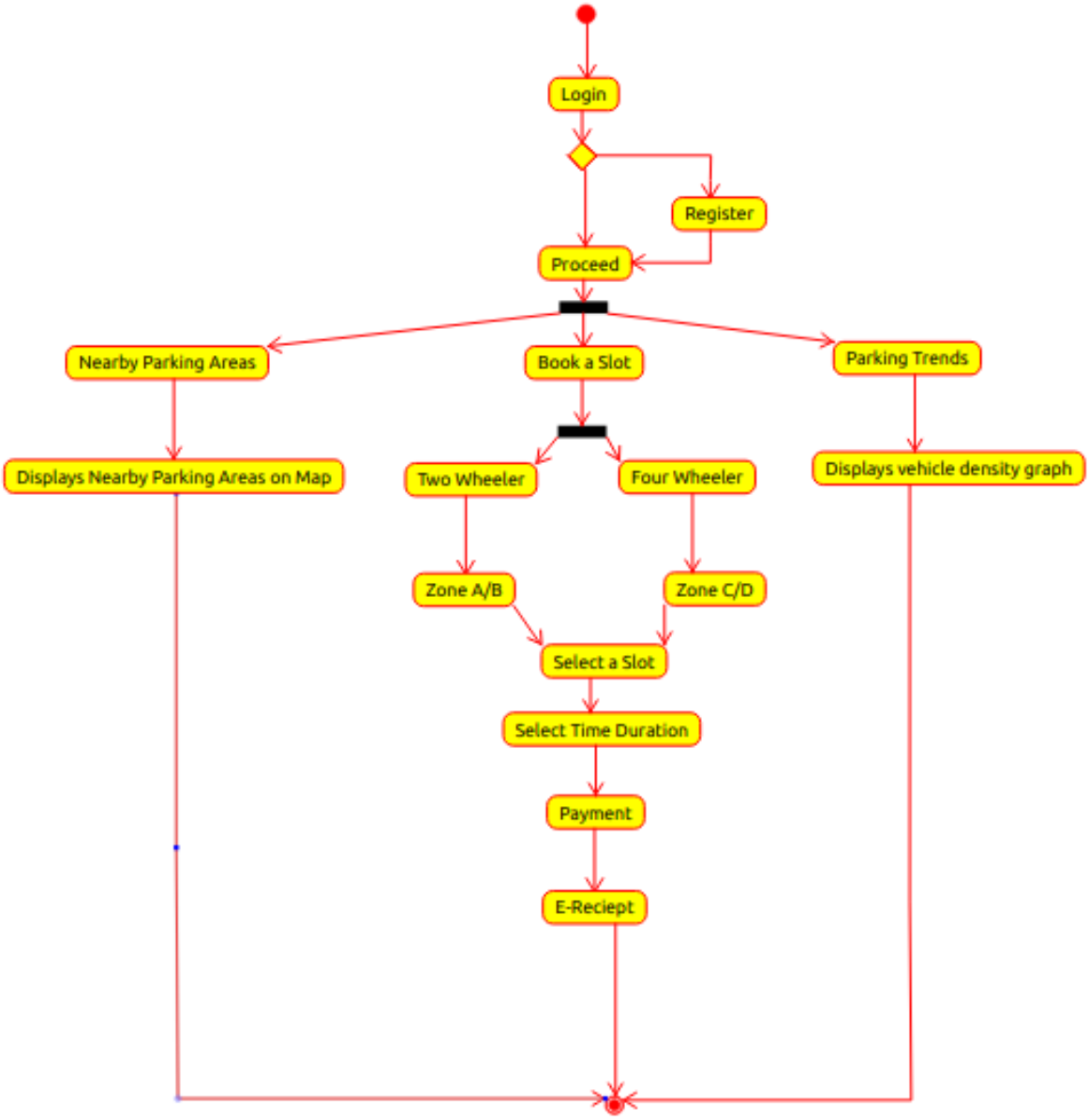

Figure 2: Activity Diagram

Figure 3: Usecase Diagram

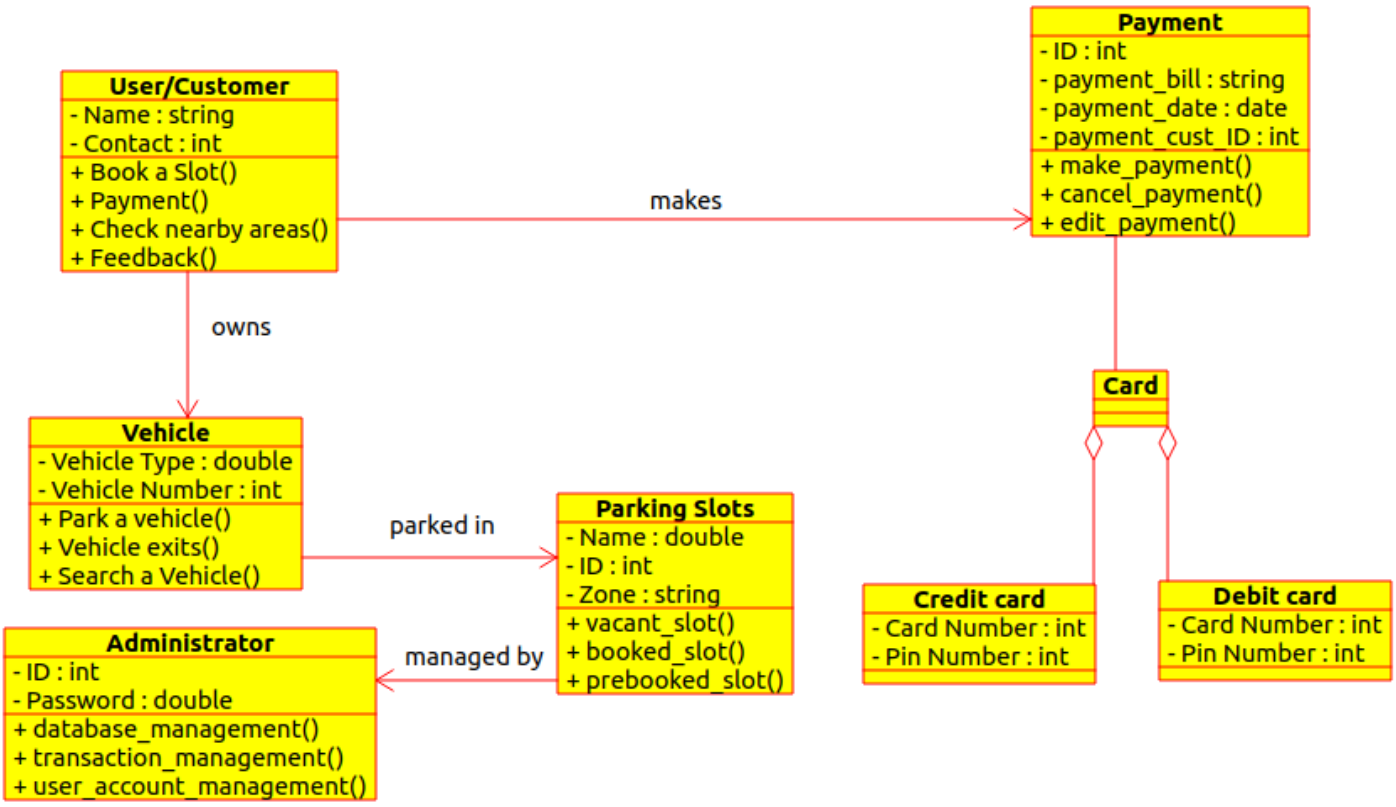

Figure 4: Class Diagram

Summary

The work presented in this report is related to Vehicle Parking Management System.

- PreBooking : Helps the user to pre-book a parking slot in a parking area.
- Nearby Parking Area : Helps explore nearby parking areas and get a slot there for the vehicle.
- Nearest Parking Area : Helps the user to e=find the nearest parking area in vicinity and book a slot there.

References

[1] D.Vakula and Yeshwanth Krishna Kolli, Cost Smart Parking System for Smart Cities", Department of Electronics and Communication Engineering National Institute of Technology, Warangal Telangana, India.

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[5] Khanna, A., Anand, R. (2016). IoT based smart parking system. 2016 International Conference on Internet of Things and Applications (IOTA).