ADVANCED VEHICLE PARKING SYSTEM: "PARK ME"

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Abstract: In this paper we are aiming to provide an advanced car parking slot booking system using IoT and embedded system. We have named the mobile application and web application as "PARK ME". Using this type of system, provides the user to book a parking slot prior to the time of arrival and the system helps in providing optimized parking slots which helps in reducing the traffic which occurs usually during weekends in the cities. This application helps us provide an enhanced user experience and also helps in decreasing management cost .Consistent efforts have been made in the field of embedded system and IoT for helping shape a better future in order to provide faster and reliable services. Finding parking spaces in metropolitan cities are becoming a bane for the vehicle users, so developing this application will help in saving time for the user.

Index Terms – **car parking, easier access to parking, traffic reduction and pre booking system**

I. INTRODUCTION

In the development of traffic management system we are able to create a fully optimised parking system which will help in reducing the cost of hiring people and help in optimising the parking resources to its maximum. From this system the user is able to prior book his parking slot in order to avoid wasting of time and reduce the traffic that might be generated in metropolitan cities. Currently the parking systems that are being used are the ones where the driver himself visits the parking lot and checks for the parking slots. As we use the current technology the driver may fail in the worst case scenario to find a parking slot in a city which has high vehicle density. Or the alternate method for the user is to find a parking lot which has higher parking capacity.

Android is an operating system which has been used to develop some of the major application for the smartphones. In the last couple of years, we are developing some applications which help in connecting and adding logical solution to different problems faced in day to day life. Parking problems has become a major problem and has been rising at an alarming rate as the population of each of these cities are growing day by day. Each household now in this society has a minimum of two vehicles which results heavy load of traffic and difficult to find parking slots in various parts of the cities. IoT has been able to provide interfacing of network in order to have a faster process. The block diagram of the proposed system is shown below (Figure 1).
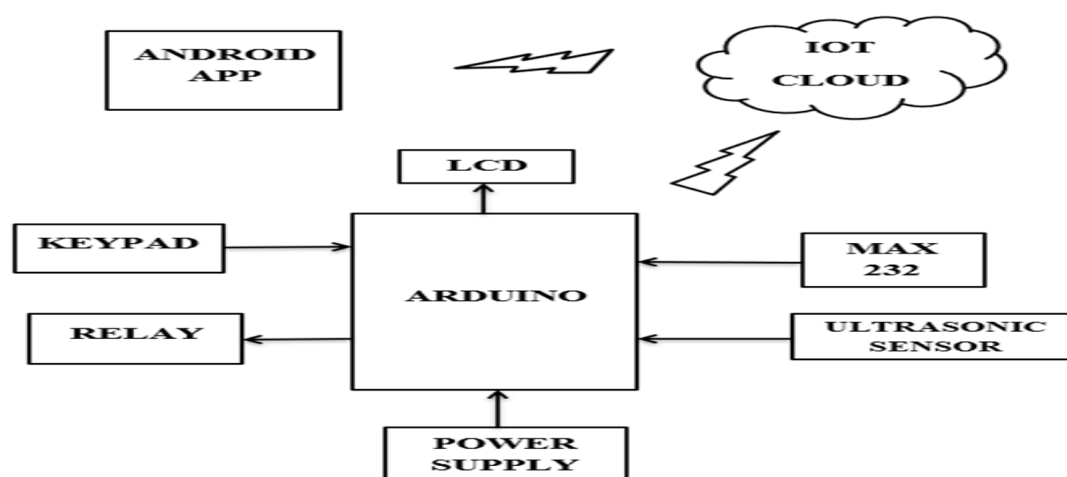

Figure 1

II. Literature survey

[1] Smart Parking System using optic Wireless Sensor Network

This system experienced the use of video cameras where they are deployed in the parking slots and are able to capture the license plate of the car and also monitor the parking spaces. The system can then inform drivers of the number of available parking space and in which area should they be directed to. This kind of system should avoid driver's frustration in trying endlessly to find a parking space in a crowded parking garage. The advantages of this method are they are cost-efficient because of usage of optic WSNs, Optic WSNs are easy to maintain and to install, Optic WSNs gives better accuracy and Implementation pricing is cheap. And Disadvantages of this method is They are not much powerful as there is a high chance of failure in the device, Accuracy of the license plate detection is quite impossible Also, the size of the vehicles are predicted which is not much beneficial, It gets distracted by various elements like blue-tooth.

[2] Smart Parking System using RFID

The proposed system uses infrared transmitter receiver pairs that remotely communicate the status of parking occupancy to the raspberry pi and display the vacant slots on the display at the entrance of the parking. This system uses RFID to match the vehicle's unique RFID tag with the value in the database when it is read by the RFID reader in the parking lot entrance. An advantage of this is a fast method of identification and quite cost efficient, No wastage of time and requires less manpower and Improve customer service. Disadvantages of this method is If the RFID tags are damaged or more than one tags are read at a time, the system fails to work accurately and When card is lost then this card can be used by another person.

[3] Smart parking reservation system using short message services (SMS)

A parking reservation system is developed in such a way that users book their parking spots through short message services (SMS). The SMS sent will be processed by a wireless communication instrumentation device called micro-RTU (Remote Terminal Unit). This micro-RTU will reply the confirmation of booking by giving the details of reservation like password and lot number. The password will be used to enter the parking area and valid for a certain period of time. Advantages are firstly it Enhanced security due to password requirement and System can be used and applied anywhere due to ease of usage. Disadvantages are the Cost of implementation is high, GSM feature creates bottlenecks, The microcontroller will have to take a lot of load which can crash the system, and In places where there is no provision of GSM networks, it is difficult for communication.

[4] ZigBee and GSM based secure vehicle parking management and reservation system

This system includes three modules, parking lot vacancy monitoring module, parking lot reservation module, and security module. Parking lot vacancy monitoring module includes infrared sensors and ZigBee modules which are interfaced with PIC microcontroller. Vacancy monitoring module detects the presence of vehicle in parking areas and provides the status to the users in real time. Reservation module includes GSM modem user can book their parking spots through SMS. The major Advantages of this method are Parking lot vacancy module uses ZigBee along with PIC, ZigBee provides transition time and power advantages over Bluetooth and Wi-Fi, and Security Feature: The exit password must be entered else the user is not allowed to get out of the parking bay as the barrier gate will not get open until correct exit password is entered. As well as Disadvantages of this type of method is The GSM and SMS module makes the system expensive, The SMS contains entry/exit password to the parking lot may not be received due to network congestion and The coverage of ZigBee network is limited.

[5] New "Smart Parking" System Based on Resource Allocation and Reservations

The system assigns and reserves an optimal parking space based on the driver's cost function that combines proximity to destination and parking cost. While also ensuring that the overall parking capacity is efficiently utilized. Advantages are Reservation of the desired parking slot is available and efficient resource allocation and management. Also Disadvantages are A parking spot is reserved by a driver, but it is occupied by a different driver, A parking spot is reserved by a driver, The driver parks his vehicle but forgets to confirm. The system requests confirmation and until the driver says YES

III. PROPOSED SYSTEM

The figure shown below (Figure 2) represents the system architecture of the car parking slot booking system. This system shown above prevents the dispute in the car parking lot and also helps in using the time that is required for look for a car parking slot. After logging into the system, the user can choose a suitable parking space. Information on the selected parking location will be confirmed to the user via SMS/Email. Then, the system updates the status of the parking space to ''pending'' during which time the system will not allow other users to reserve it.If after sometime if the car has not been parked in the parking lot after it was in "pending "phase then the slot will be in "available" phase for others to book it. The system will update the status from the WSN node (the status of car park spaces) when a new car joins in the system. Therefore, the status of the overall parking system is always updated in real time. This system has been arranged according to the Time stamps the user has selected during the booking of the time slot which will be started once the user enters the booking OTP at the opening of the parking lot.

As shown in the (figure 3) below this project consists of two parts HARDWARE and SOFTWARE. It has been explained using the flow chart of how the user interface will be once the user enters the parking lot. Firstly the user will book a time slot as well as a parking spot using the web application or mobile application. Then after the first step the user gets a confirmation mail about the parking slot that has been book as well as an OTP (one time password) which the user will have to punch in at the time he arrives at the parking lot using the key pad of the system. Then the user will be given either an RFID Tag if the user already possesses one he will not need to enter the OTP to get into the parking lot he can just tap the RFID on the RFID card reader and enter the parking lot. In case the user has not brought the RFID card with him he can always use the OTP which has been sent on his Email or SMS.

Once the user has entered the OTP at the parking booth the system then verifies it and then allows the user to access the parking lot, otherwise the user will be denied the entry. When the user has parked in the slot at that point of time the slot will be full and the other users will not be able to access it.If an user has not picked up his car even after the time slot is completed then

the user will be charged the amount for the next hour as well and that will be need to be payed online or at the parking booth. If any other user has booked the same slot at timing where the car has not been removed then the car which has booked that slot will be allotted with a Buffer slot. These are slots which have been kept if the user has not removed his vehicle at the time when another user has booked the same slot. RFID card need to be recharged every time when we need to access the parking system, which will then automatically deduct the required amount from the card. Algorithm that is needed to follow is as shown below.

STEP 1: Initialization is done by powering up of the sensor and Node MCU.

STEP 2: Two ultrasonic sensors is placed in each slot to detect the presence of car in that particular slot.

STEP 3: If the car is not detected in the slot, wait until the car is sensed.

STEP 4: If the presence of car in the slot is detected, the corresponding data is sent to the Node MCU.

STEP 5: The Node MCU with the help of the processor pushes the data into the cloud.

STEP 6: This procedure is followed for all the slots in the parking lot.

STEP 7: This process continues until the power supply to the sensor or Node MCU is stopped.
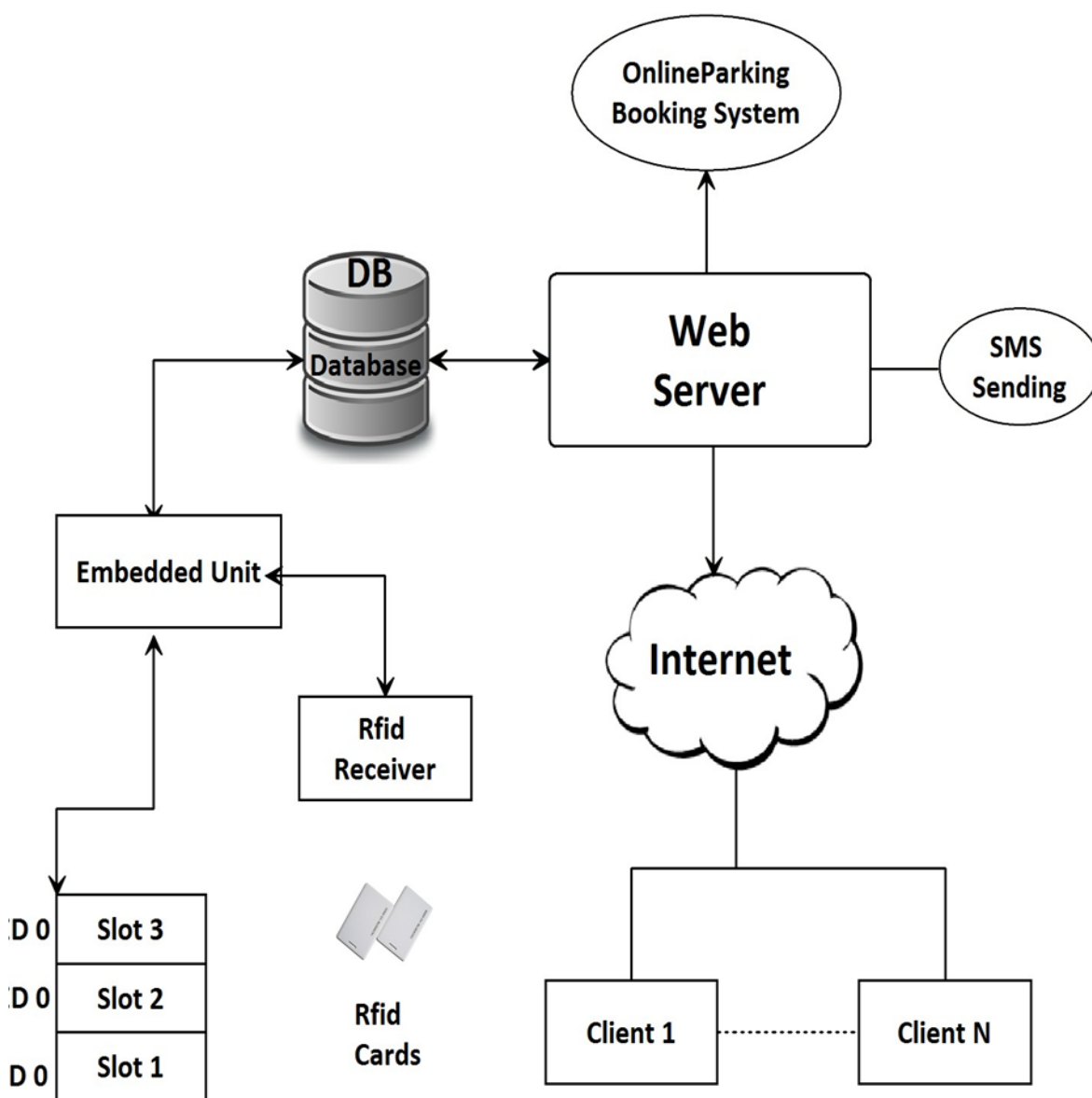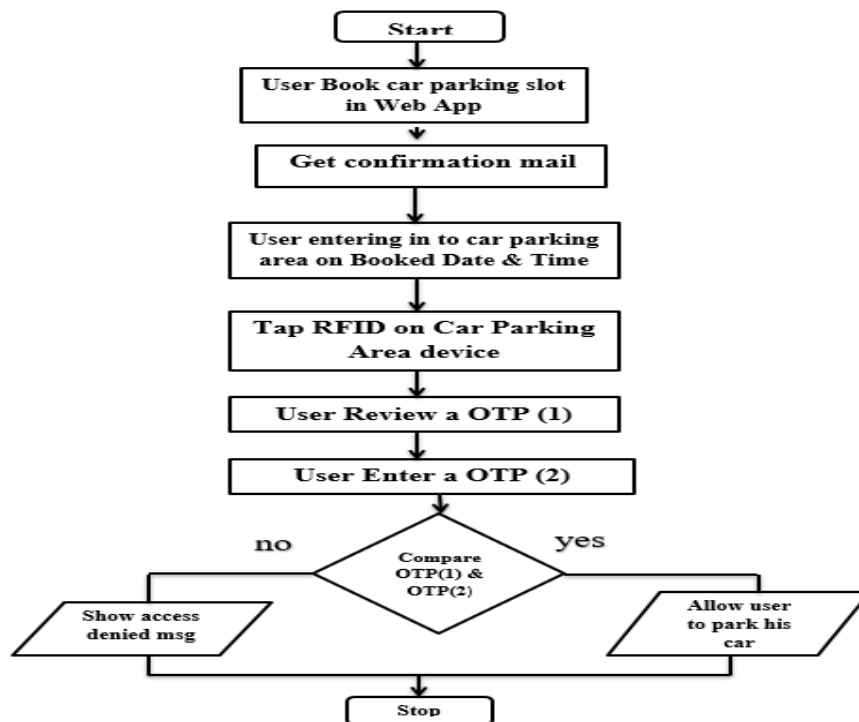
System Architecture

Figure 2

Figure 3

IV. RESULTS

In this step of implementation we are able to find out if the parking slots are available or occupied using Ultrasonic sensor.(figure 4) We are using the arduino mega adk board and it is connected to the arduino software which has been installed in the computer.If the car has been parked in front of these sensors it will result in giving a message to the management that the parking slot is full otherwise the system will send a message stating that the parking slot is free or available for use.
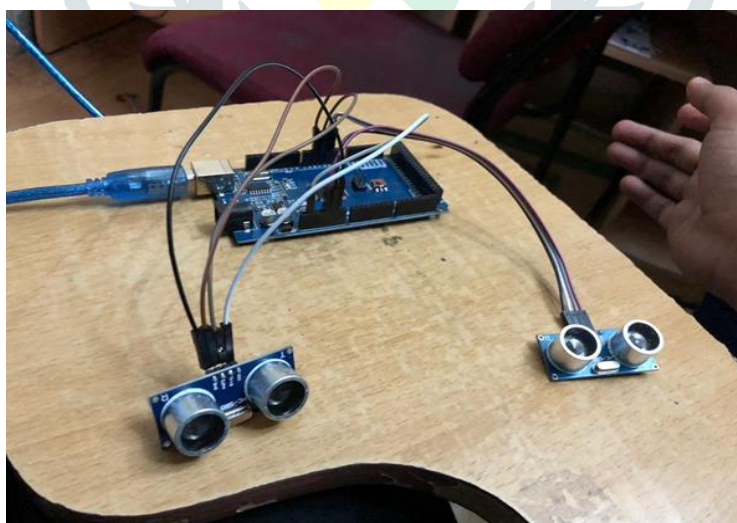
Figure 4

Referring to the below (figure 5) we have implemented the car parking slots using ultrasonic sensors and with the help of relay's with the help of gates for opening and closing using the IR seasons placed at the gate.using this system the magment will be able to see the overview of the parking lot and will be able to monitor the system.when the car enters the system in this stage we will have an rfid system and a keypad for the user to enter in order to access the parking lot.Once the user taps his RFID card on the

reciver and type your otp to the system , the gates will open or close depending on whether the system has recognized or it has rejected then it will end up closing the gates.
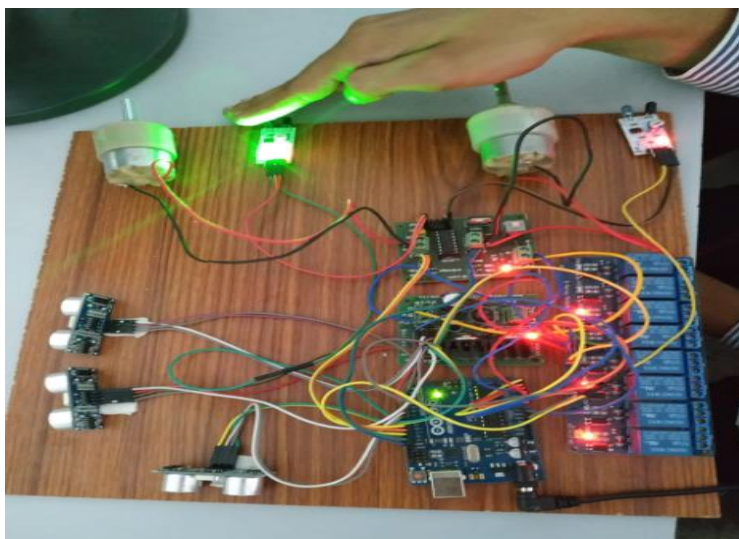

Figure 5

The below step of implementation (figure 6) is about developing the software application and an online portal which the user is able to access when they would like to book a parking slot. As we can see from the below (figure 7) the user will have to register before using the portal using some of his necessary details that will be required to access them.
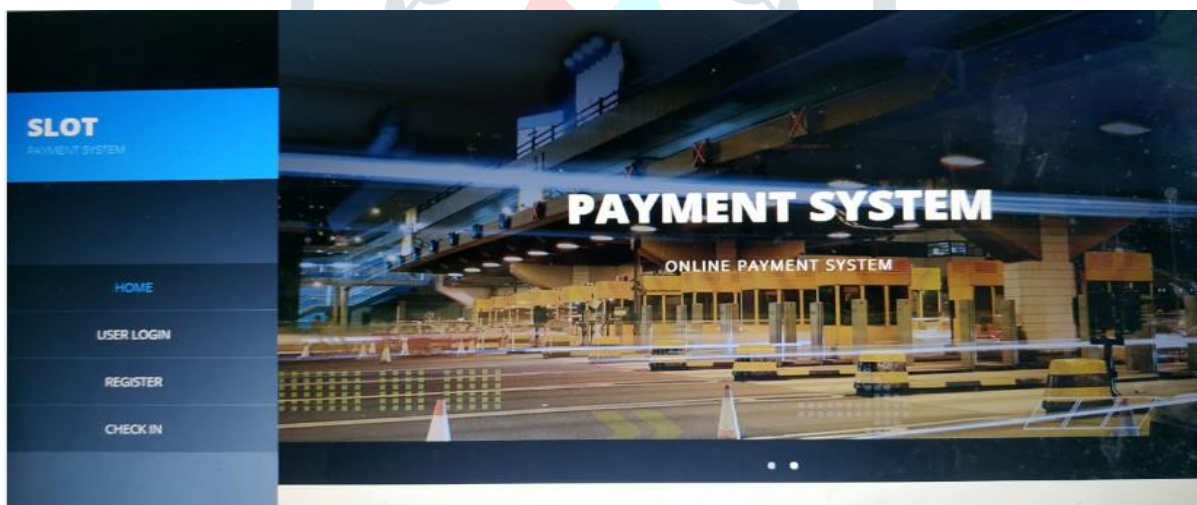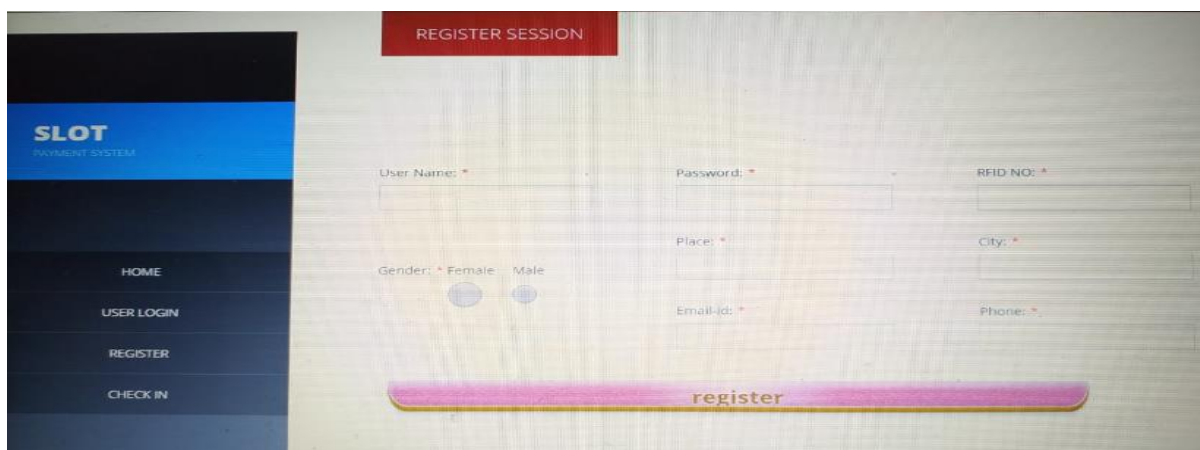

Figure 6

Figure 7

The booking details of the user can be monitored using the web or mobile application and the timing slots of the system can be changed in case of any problems that arise at that point of time. The below shown (figure 8) will represent s the booked slot for the user of our application.
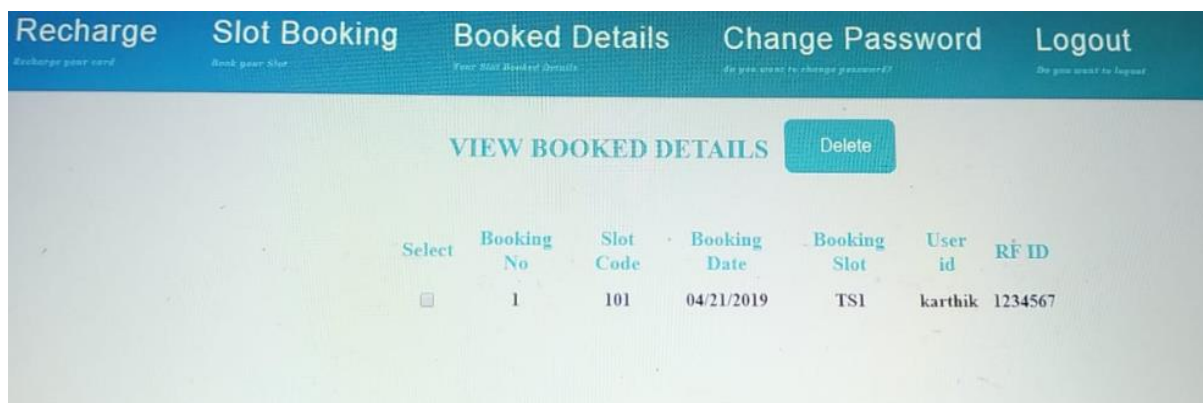

Figure 8

This step of implementation is for the management which will be controlling this parking slot. It contains the database which is required to allot the parking spaces that the user has booked. IN this data base the management controlling the parking lot will have the information about the timing of the vehicles arrival and departure as well as the amount that is needed to be paid if the vehicle has exceeded the time of departure. The (figure 9) dissipates the following as well.
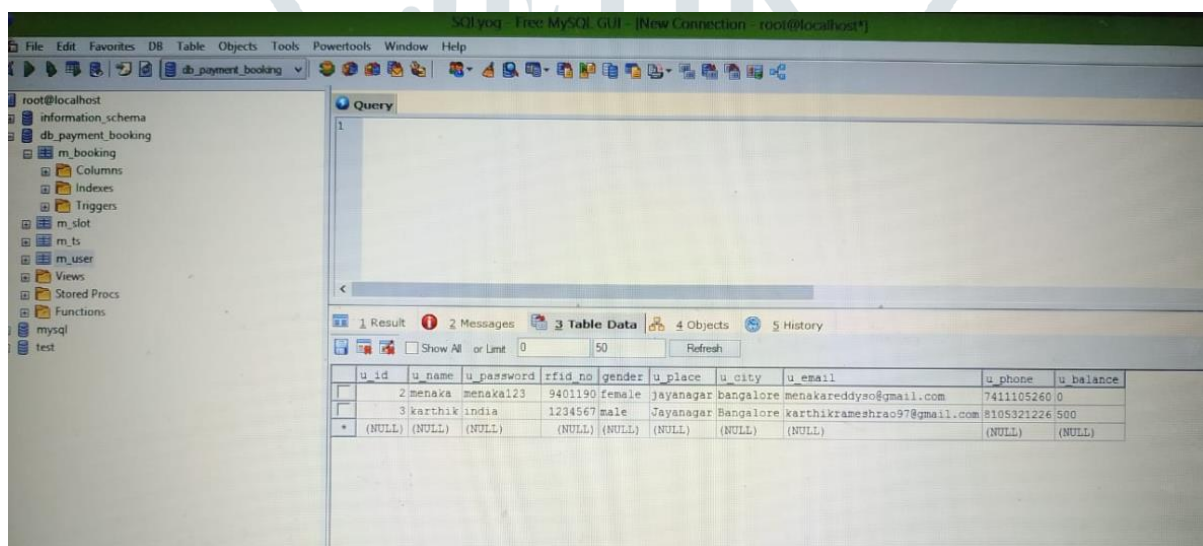

Figure 9

V. CONCULSION

This type of android application and web application is one of the most users friendly application which is very user friendly. It has one of the most low operation and maintenance cost as compared to that of the others which have already been in place with the system. The efforts made in this project are mainly to solve the parking problems in the metropolitan cities and also improving the parking facilities in the city hence leading to better quality of life and time management.

VI . REFERENCES

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