WEBSITE BASED PARKING SYSTEM

A PROJECT REPORT

SUBMITTED BY

P ILLAVENIL	17BEC1046
S RAMNATH	17BEC1107
RAM PRAKASH R B	17BEC1121
G SUDHARSHAN	17BEC1122
SOWDESHWAR S	17BEC1196

A project report submitted to

PROF. REENA MONICA P

SCHOOL OF ELECTRONICS ENGINEERING

In partial fulfilment of the requirements for the course of

ECE3999: Technical Answers for Real World Problems (TARP)

In

BACHELOR OF TECHNOLOGY

ELECTRONICS AND COMMUNICATION ENGINEERING

VIT®

Vellore Institute of Technology

(Deemed to be University under section 3 of UGC Act, 1956)

BONAFIDE CERTIFICATE

Certified that this project report entitled "**WEBSITE BASED PARKING SYSTEM"** is a bonafide work of **S RAMNATH (17BEC1107), P ILLAVENIL(17BEC1046), R B RAM PRAKASH (17BEC1121), G SUDHARSHAN (17BEC1122), SOWDESHWAR S(17BEC1196).**
Who carried out the Project work under my supervision and guidance for **ECE3999: Technical Answers for Real World Problems (TARP)**

Prof. REENA MONICA P

Associate Professor Senior

School of Electronics Engineering (SENSE),

VIT University, Chennai

Chennai – 600 127.

VIT®
Vellore Institute of Technology
(Deemed to be University under section 3 of UGC Act, 1956)

Vandalur - Kodambakkam Road, Chennai - 600 127

TABLE OF CONTENTS

SERIAL NO.	TITLE	PAGE
1	ABSTRACT	4
2	ACKNOWLEDGEMENT	5
3	INTRODUCTION	6
4	COMPONENTS USED	8
5	SYSTEM OPERATION AND ARCHITECTURE	12
5.1	REGISTRATION	12
5.2	RESERVATION	13
5.3	FEEDBACK	16
5.4	NUMBER PLATE OF DETECTION	18
5.5	FINDING AN EMPTY PARKING SYSTEM	21
5.6	NAVIGATION	24
6	CONCLUSION	27
7	FUTURE WORKS	27
8	REFERENCE	28

ABSTRACT

In recent times there has been a huge spike in the growth of technology, The Internet of Things is playing an indispensable role in our life by connecting us with the things we use in our day to day life via the internet. In this paper we will be examining the parking issues faced by drivers, searching for a parking lot in cosmopolitan towns, especially during peak hours is demanding. This study presents a smart parking system that provides a solution to reduce traffic, the amount of time taken to find a parking slot. This also helps in the betterment of our environment as reduced traffic implies low consumption of fuel and pollution, especially in cities. We would be further analyzing how highly correlated traffic and pollution are and how it can be reduced with the help of our prototype. The system we provide is based on reservation, the user is asked to reserve his/her parking slot via the website which is developed using HTML, CSS, JAVASCRIPT, and PHP. The user is asked to input his/her required date and time frame along with the vehicle's number plate details to book the parking slot. User authentication is done using concepts of Image/signal processing by scanning the number plate of the vehicle using a webcam and matching it with the number plate details entered by the user. Infra-Red (IR) sensors are placed in each parking slot. Free slot identification is verified by the help of these IR sensors. Finally, once the authentication of the user and detection of free slot process is completed, the user will receive a message which will give him/her details about his/her parking slot along with a google map link which navigates the user to the location of the parking slot which is reserved for him/her.

ACKNOWLEDGEMENT

We wish to express our sincere thanks and deep sense of gratitude to our project guide, **Prof. REENA MONICA P, ASSOCIATE PROFESSOR, SENSE** for her consistent encouragement and valuable guidance pleasantly offered to us throughout the project work.

We are extremely grateful to **DR. SIVASUBRAMANIAN**. A, Dean of School of Electronics Engineering, VIT Chennai, for extending the facilities of the School towards our project and for her unstinting support.

We express our thanks to our Head of the Department **DR.VETRIVELAN. P** for his support throughout the course of this project.

We also take this opportunity to thank all the faculty of the School for their support and their wisdom imparted to us throughout the course.

We thank our parents, family, and friends for bearing with us throughout our project and for the opportunity they provided us in undergoing this course in such a prestigious institution.

INTRODUCTION

Before our discussion about our proposed smart parking prototype let us try to understand what a smart city means. A smart city uses a variety of sensors, electronics that are connected to the internet (i.e. The Internet of things (IoT)) to collect data and provide useful intuition, understanding, and awareness. This communication or information acts as a catalyst towards enhancing the standard of life for the people of the society. A city that tackles a problem in an efficient way using the aid of IoT is considered to be smart. One such problem we are going to discuss in this paper is about the sharp increase in the number of vehicles even though it provides luxury and comfort to the user but in the same instance the user finds it difficult to locate a free parking lot. Searching for a parking lot in a cosmopolitan town eats a lot a valuable time, it also leads to traffic congestion which in turn leads to air pollution. A survey conducted by the International Parking institute tells us that around 30 percent of vehicles circling a city in order to look for a vacant parking lot. Many drivers out of frustration decided to park their vehicle in an illegal parking slot (such as roadsides). Illegal parking is considered a primary traffic offender, not only does it occupy road space also leads to frequent traffic jams.

The sole purpose of this project is to understand the problem at stake and to develop a web application through which the users can book their parking slots beforehand from any place. Not only does this web applications gives detail about the parking lot it also helps the user navigate to his/her assigned parking lot. With the help of our proposed prototype, we can transform the old not so efficient manual parking system to an automated system. In order to completely minimize the

waiting time e-payment method is available on our website with which we can circumvent long waiting queues. In our website, the users are supposed to enter their required time frame and date for parking their vehicle as per their needs they are also asked to enter their vehicle number plate. With the use of Image/Signal processing technique, we have developed a number plate detector which uses the image captured by a webcam which is installed at the entry gate to detect number plates, with the help of this we can detect if the user has reserved for a parking lot or not. As soon as authentication is done, a vacant parking slot is found with the assistance of the Infra-Red (IR) sensor which is installed in every parking slot. After the identification of the free parking, the user receives details about his/her parking slot number along with a google map link which navigates the user to the location of his/her parking slot number.

The Organization of our paperwork, Section two we shall elaborate on the problem and compare our model with existing prototypes. Section 3 elucidates the detailed structure of our prototype. The future work we discussed in section four and section five deals with the conclusion with reference.

COMPONENTS USED

ARDUINO:

Arduino is an open-source platform used for building electronics projects. Arduino consists of both a physical programmable circuit board (often referred to as a microcontroller) and a piece of software, or IDE (Integrated Development Environment) that runs on your computer, used to write and upload computer code to the physical board.

The Arduino platform has become quite popular with people just starting out with electronics, and for good reason. Unlike most previous programmable circuit boards, the Arduino does not need a separate piece of hardware (called a programmer) in order to load new code onto the board -- you can simply use a USB cable. Additionally, the Arduino IDE uses a simplified version of C++, making it easier to learn to program. Finally, Arduino provides a standard form factor that breaks out the functions of the micro-controller into a more accessible package.

IR SENSOR:

An infrared (IR) sensor is an electronic device that measures and detects infrared radiation in its surrounding environment. Infrared radiation was accidentally discovered by an astronomer named William Herchel in 1800. While measuring the temperature of each color of light (separated by a prism), he noticed that the temperature just beyond the red light was highest. IR is invisible to the human eye, as its wavelength is longer than that of visible light (though it is still on the same

electromagnetic spectrum). Anything that emits heat (everything that has a temperature above around five degrees Kelvin) gives off infrared radiation.

There are two types of infrared sensors: active and passive. Active infrared sensors both emit and detect infrared radiation. Active IR sensors have two parts: a light emitting diode (LED) and a receiver. When an object comes close to the sensor, the infrared light from the LED reflects off of the object and is detected by the receiver. Active IR sensors act as proximity sensors, and they are commonly used in obstacle detection systems (such as in robots).

ESP8266:

ESP8266 is Wi-Fi enabled system on chip (SoC) module developed by Espressif system. It is mostly used for development of IoT (Internet of Things) embedded applications.ESP8266 comes with capabilities of

1. 2.4 GHz Wi-Fi (802.11 b/g/n, supporting WPA/WPA2),

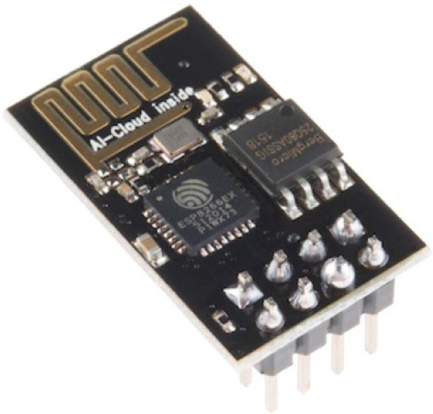
2.general-purpose input/output (16 GPIO),

3.Inter-Integrated Circuit (I^2C) serial communication protocol,

4.analog-to-digital conversion (10-bit ADC)

5.Serial Peripheral Interface (SPI) serial communication protocol,

6.I^2S(Inter-IC Sound) interfaceswith DMA(Direct Memory Access) (sharing pins with GPIO),



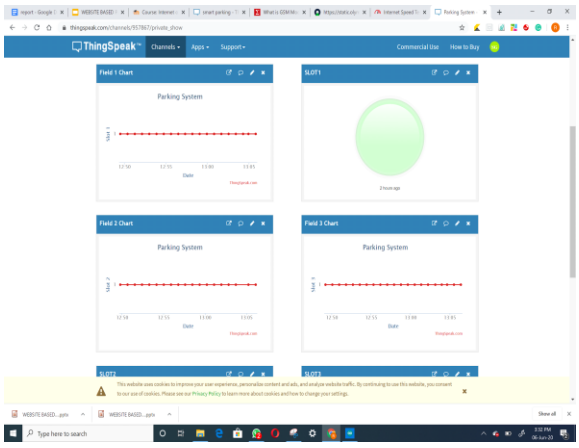
7.UART (on dedicated pins, plus a transmit-only UART can be enabled on GPIO2), and

8.pulse-width modulation (PWM).

GSM MODULE:

A GSM Module is basically a GSM Modem (like SIM 900) connected to a PCB with different types of output taken from the board – say TTL Output (for Arduino, 8051 and other microcontrollers) and RS232 Output to interface directly with a PC (personal computer).A GSM module or a GPRS module is a chip or circuit that will be used to establish communication between a mobile device or a computing machine and a GSM or GPRS system.

Thingspeak:



ThingSpeak is an open data platform for the Internet of Things. Your device or application can communicate with ThingSpeak using a RESTful API, and you can either keep your data private, or make it public. In addition, use ThingSpeak to analyze and act on your data. ThingSpeak provides an online text editor to perform data analysis and visualization using MATLAB. You can also perform actions such as running regularly scheduled MATLAB code or sending a tweet when your data passes a defined threshold. ThingSpeak is used for diverse applications ranging from weather data collection and analysis, to synchronizing the color of lights across the world.

000webhost:

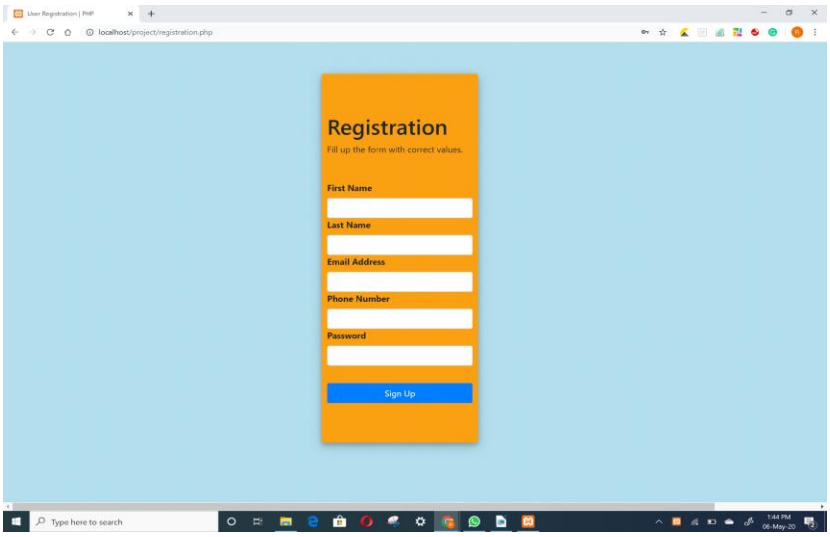
000webhost provides free hosting that comes with an impressive set of features, like an easy-to-use website builder, support for WordPress, and zero ads on your site. The (paid) premium hosting plan boasts more disk space and a free domain.
When you click any of the special discount links in this review, you get massive savings on a premium 000webhost package.the advantages are Free hosting services come with rich feature set,Manage your account easily with the intuitive cPanel control panel and Even entry-level plans support PHP and MySQL.

SYSTEM ARCHITECTURE AND OPERATION

This section deals with architecture and working of our proposed prototype

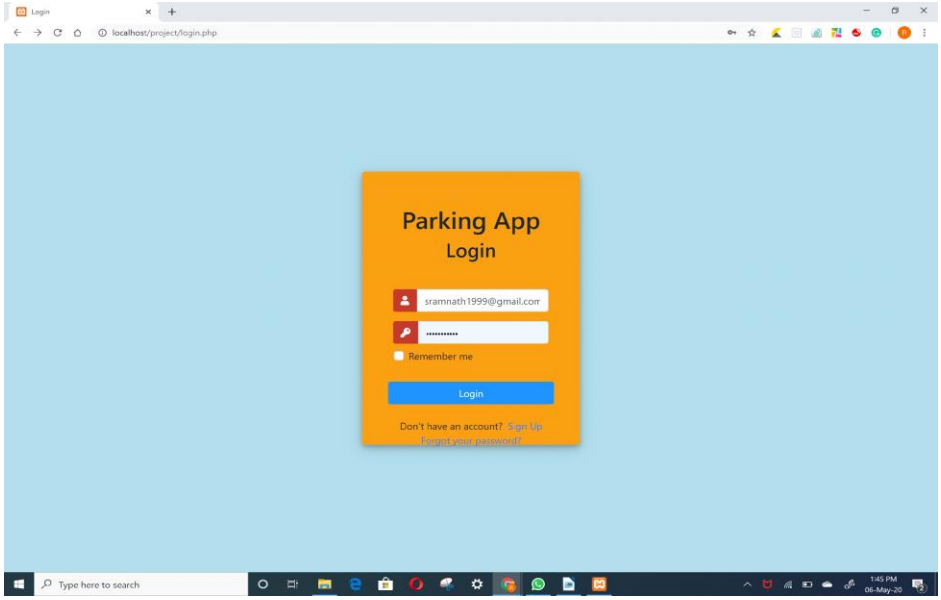
5.1 Registration:

To access our smart parking website, the user should be a part of our system (i.e.) register as a member of our website. The user needs to create a personal account which requires the customer/user to enter their first name and last name), create a strong password for login into his/her account, the user also needs to submit details such as mobile phone number, e-mail ID.



Registration Window

After the submission of these details, the user is re-directed to the login page where he/she is asked to enter their username and password.

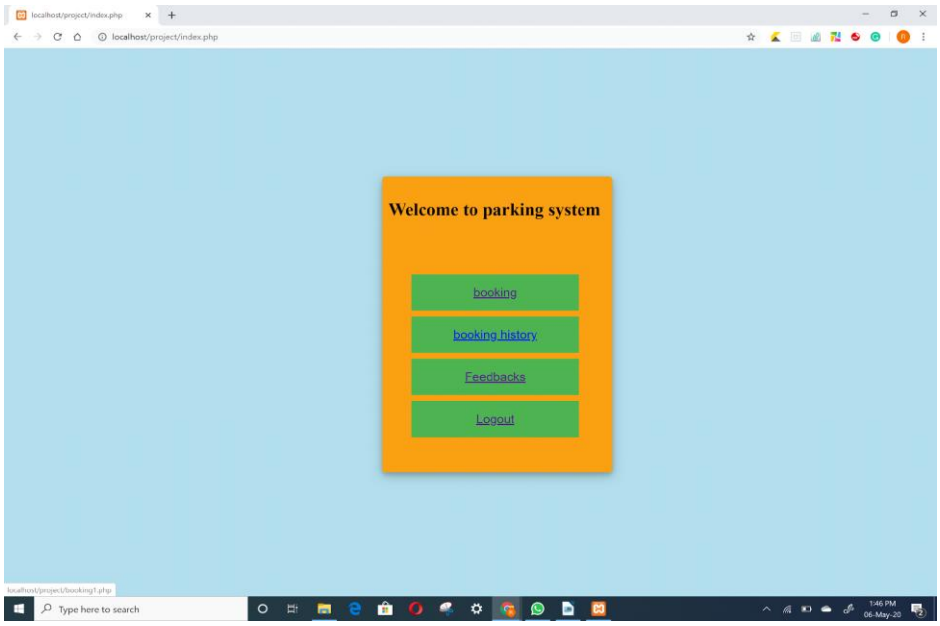


Login /signup window

5.2 RESERVATION (BOOKING REQUEST):

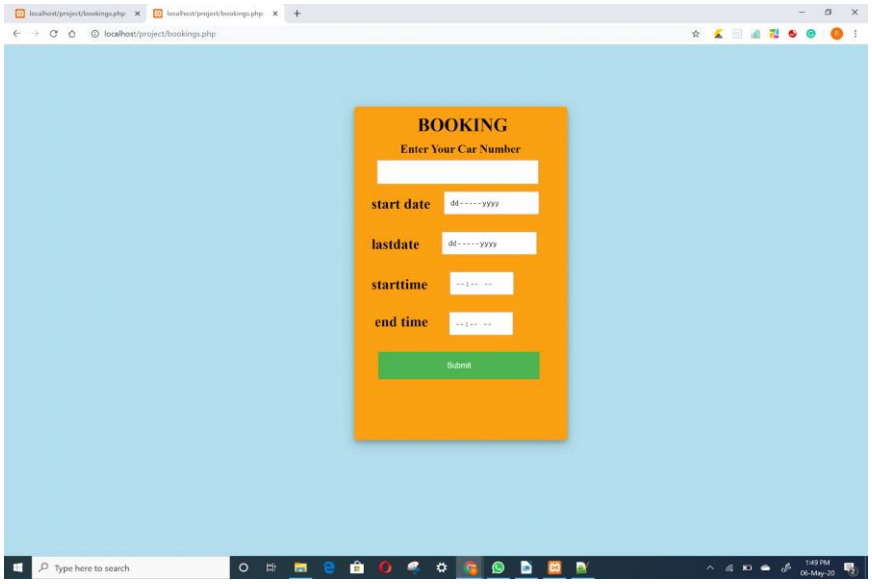
After login into their respective account, the user has four options:

- To Book a parking slot
- To view Booking history
- To write feedbacks
- Logging out



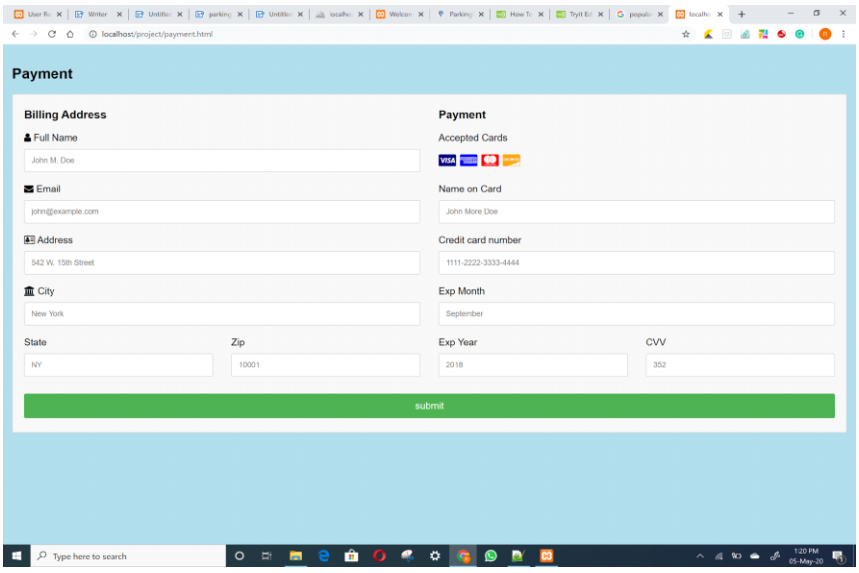
Welcome page

If the user decides to book a parking slot he/she needs to click option (i) they would be directed to the booking page where the user needs to fill up details such as License plate of their vehicle, entry date, exit date, and the time frame they require for their slot as per their needs.



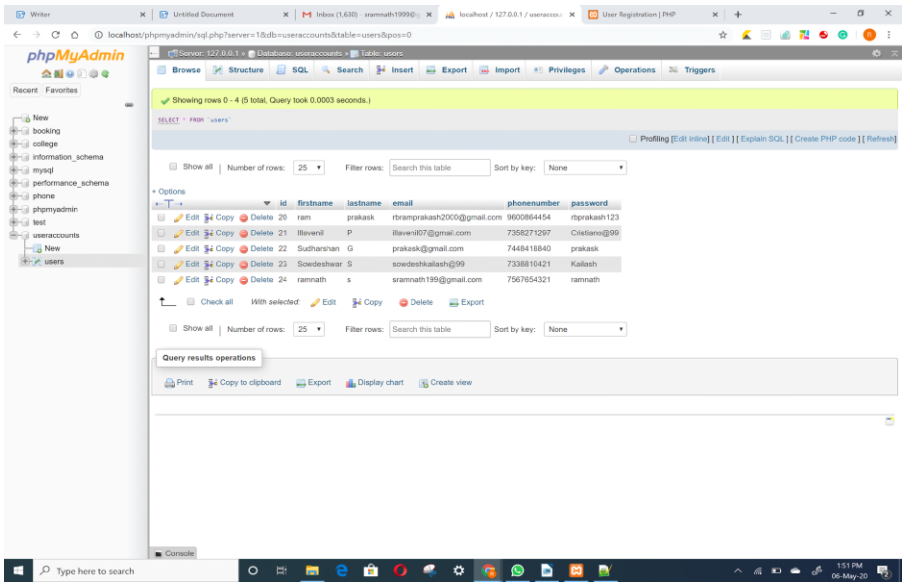
Bookings page

After Submission, the user directed to the payment portal where he/she can transact the amount needed.



Payment portal

On completion of the booking process, a message sent to the corresponding mobile number of the user about the location of the parking space with the help of a GSM module. (NOTE: details about the parking slot number will be available only after authenticating the user at the entrance of the parking space/entry gate). Now that we glanced at our front end let us discuss our back end briefly; MySQL database used to store the information collected from the users.

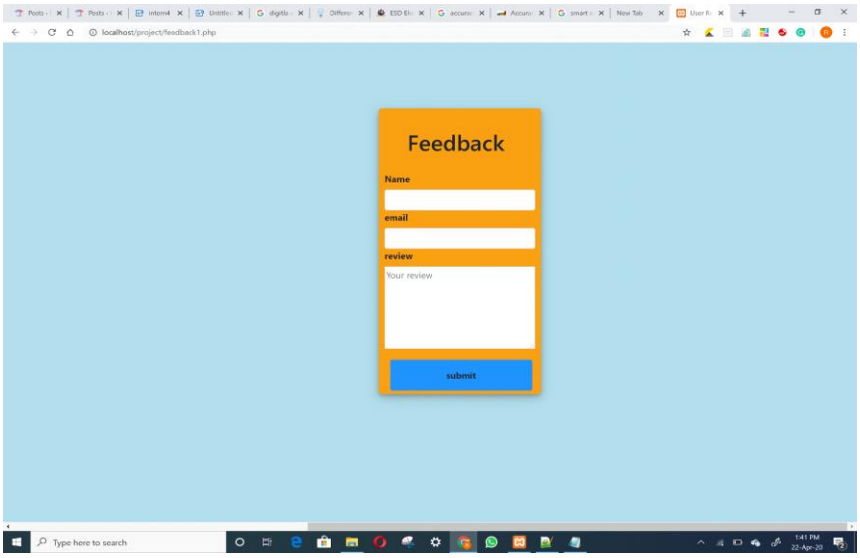


User details

5.3 FEEDBACK:

Whatever be the prototype a person is developing without evaluating the effectiveness of the system, there will neither be an advancement nor there will be any rectification.

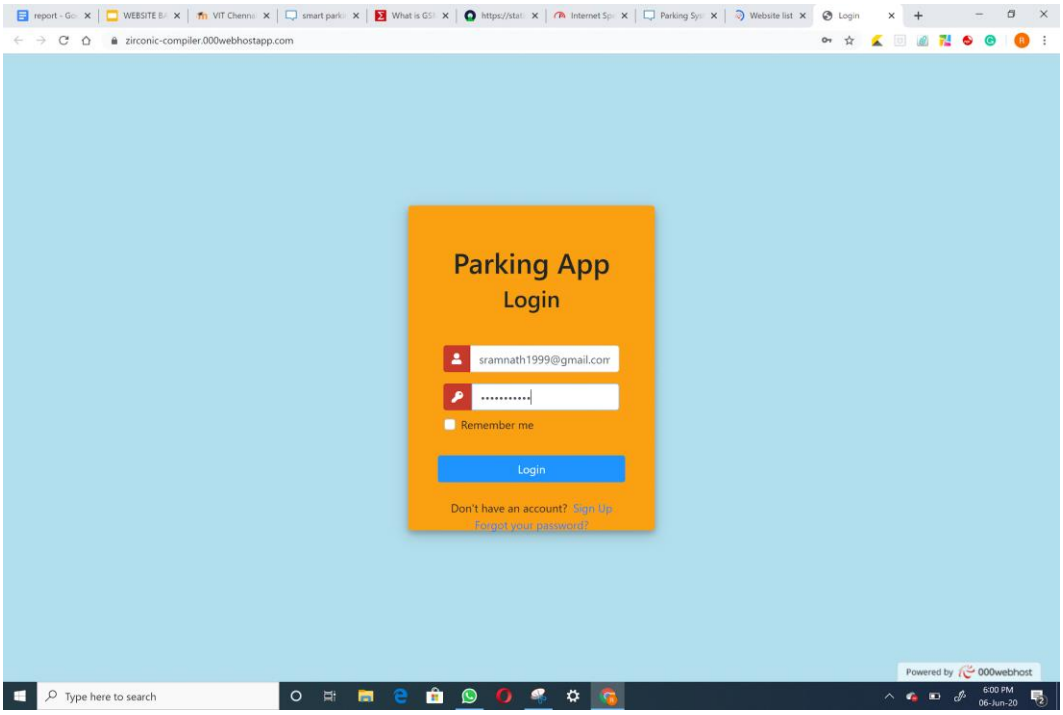
Users suggested leaving their comments on the feedback section independent of the nature of the comment (positive or negative), therefore if the user wishes to comment about any discrepancies, they are encouraged to do so.

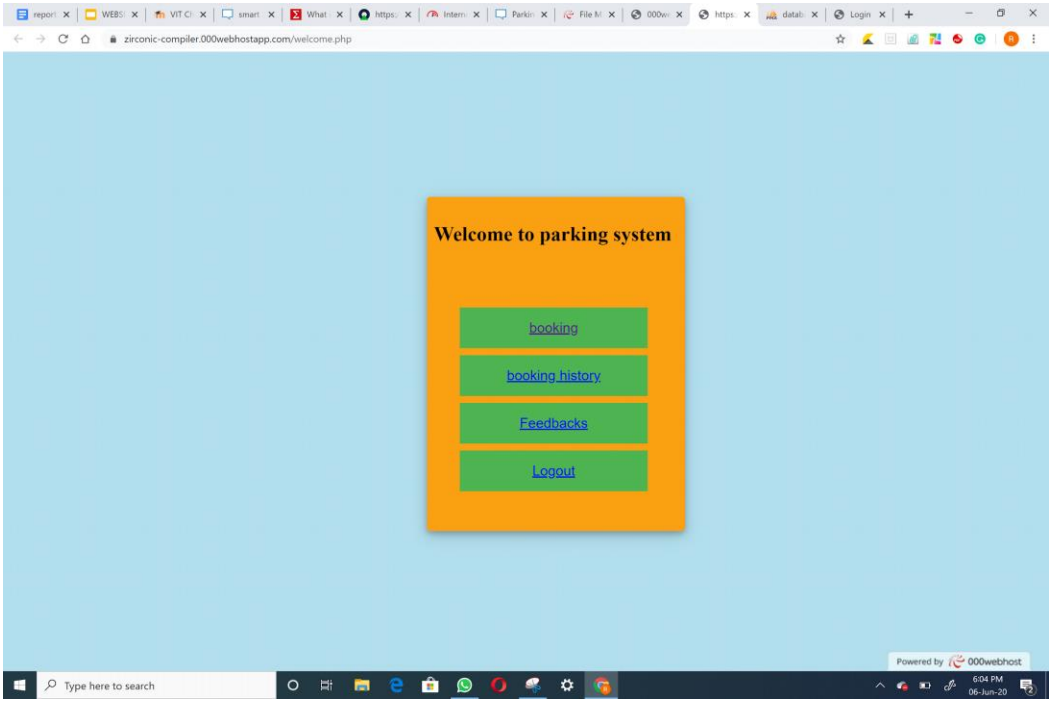


Feedback form

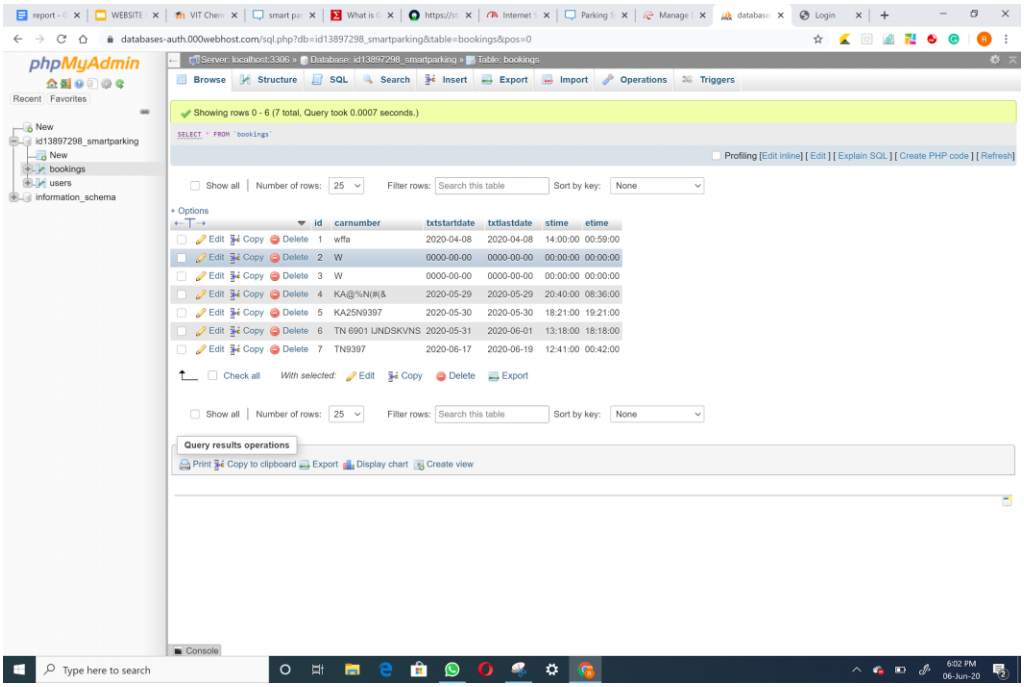
After implementing in the local host we uploaded the code in the online server (000webhost). Examples of our online server running effectively are given below.

Online homepage:


zirconic-compiler.000webhostapp.com
Parking App
Login
sramnath1999@gmail.com
Remember me
Login
Don't have an account? Sign Up
Forgot your password?
Powered by 000webhost
Type here to search
6:00 PM
06-Jun-20


zirconic-compiler.000webhostapp.com/welcome.php
Welcome to parking system
booking
booking history
Feedbacks
Logout
Powered by 000webhost
Type here to search
6:04 PM
06-Jun-20

Online database:



5.4 NUMBER PLATE DETECTION:

Users with no prior reservation might enter the parking space and occupy a parking slot, which might be assigned to another user by booking. It is a significant security concern, therefore in our proposed prototype, An IR sensor placed at the gateway detects the presence of a vehicle with activates the webcam installed in the entrance with the help of this webcam and MATLAB image processing tool we have designed a number plate detection system that scans the license plate of a car with and compares it with the vehicle numbers stored in the database if there is a match the entrance gate of the parking space opens.

5.4.1 WORKING:

To design the license plate detection system successfully, we have used the following functions in the MATLAB image processing tool to convert the number plate to text format:

(i) Template _creation.m: Used to call the saved images of alphanumerical and store them in a new template

(ii) Letter_Detection.m: Reads the characters from the input image and match it with the highest correlated alphanumerical

(iii) Plate_Detection.m: It does a variety of processing on the input image and then calls the above two functions

5.4.2 CREATING TEMPLATE AND DETECTING LETTERS:

Images are stored into variables using the imread() function in MATLAB; this gets the pictures from the folder and stores it in MATLAB.

```
A=imread('folder name'/A.bmp');
```

BMP- bitmap graphic format

Similarly, we are supposed to read every single alphanumerical and store it in a new template.

To compare the template image with the input image, we re-size the input image with the aid of command 'imresize('filename,' size). We iterate through every image in the template and compare it with our input to get the perfect match. The template image that has a high correlation for our input is considered the best fit.

```
cor=corr2(NewTemplates{1,n},snap);
```

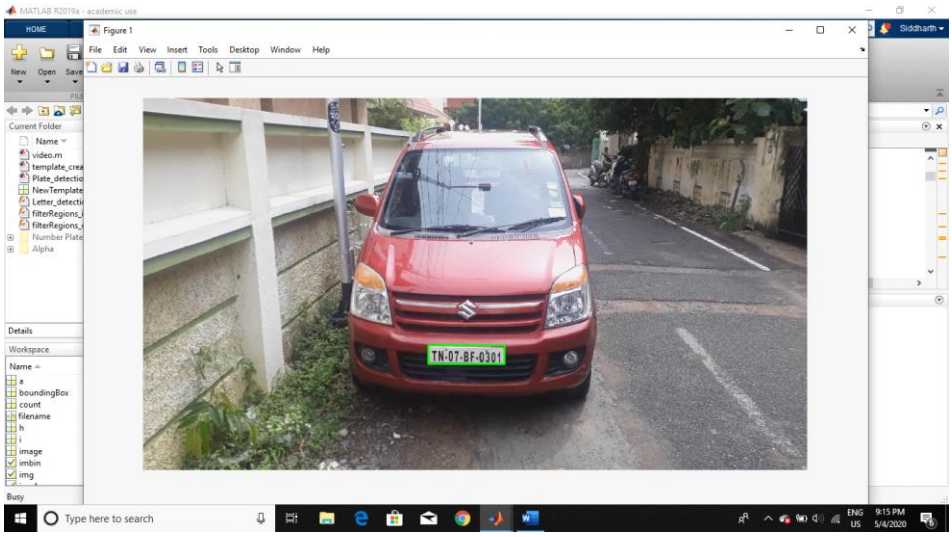
5.4.3 Plate_detection.m :

The input image processing takes place in this function. The image converted to grayscale format using the command rgb2gray(). We binarize or convert images to black and white using imbinarize(), we also perform various other image processing techniques such as spotting edgesby the Prewitt method using the edge command. To detect the location of the number plate, we use the bounding box algorithm. The minimum bounding box is the rectangle that covers all points in a given set and has the least area when compared to other enclosing rectangles.

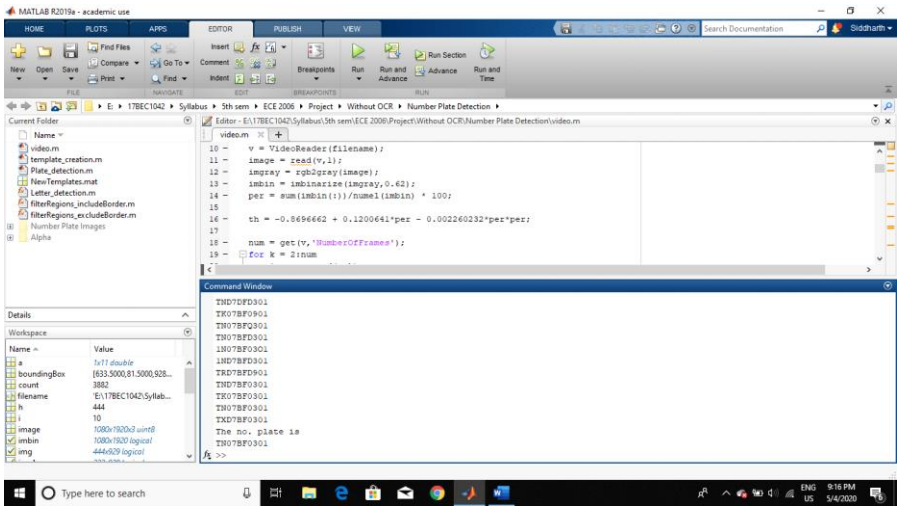
Algorithm to detect the location of the number plate

```
Iprops=regionprops(im,'BoundingBox','Area', 'Image');

# regionprops is the command used to measure properties of the image

area = Iprops.Area;

count = number of elements in Iprops ;

max_area= area;

boundingBox = Iprops.BoundingBox;

for i=1:count

if max_area<Iprops(i).Area

max_area=Iprops(i).Area;

boundingBox=Iprops(i).BoundingBox;

end

end
```

RESULTS:



After detecting the position of the number plate, we can crop the image and remove unwanted noise using ‘imcrop()’ and ‘bwareaopen()’ commands, respectively. We then call upon the letter detection function and display the detected values in the command window.



Therefore with the help of a webcam attached to the entry gate and our license plate detector, we can reduce burdensome caused due to users with no prior reservation.

5.5 FINDING AN EMPTY PARKING SLOT

We are using an InfraRed sensor to detect the availability of a free parking slot. An infrared sensor is an electronic device that emits light to sense objects or surroundings. The emitter is an IR sensor that is an IR LED, and the receptor is a simple photodiode that detects IR radiation. The presence of a vehicle in a slot reflects the IR rays to the sensor, which then creates a variation in the output voltage. IR sensor voltage encoded in such a way that value ‘1’ tantamounts to a vacant parking slot and value ‘0’ means the parking slot is full. The IR sensors, along with the wifi-module, GSM module, and LED connected to an Arduino board. This data is sent to ThingSpeak(An open-source IoT application) via the wifi-module.

AT commands are instructions used to control a modem. AT is the abbreviation of ATtention. Every command line starts with "AT" or "at". That's why modem commands are called AT commands. With the help of AT commands we connect the esp8266 wifi module to our wifi and use those commands to send value to thingspeak.com by establishing a TCP connection over the internet.

CODING:

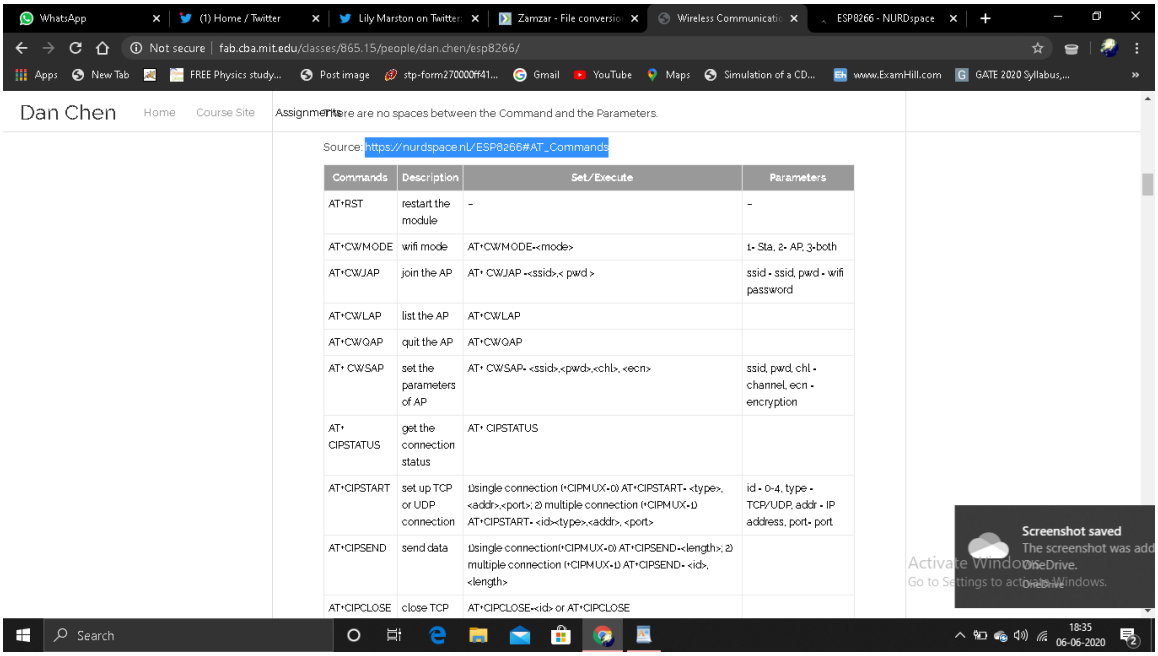
```
espData("AT+RST", 1000, DEBUG);                    //Reset the ESP8266 module
  espData("AT+CWMODE=1", 1000, DEBUG);              //Set the ESP mode as station mode
  espData("AT+CWJAP=\""+ mySSID +"\",\""+ myPWD +"\"", 1000, DEBUG);   //Connect to WiFi network
```

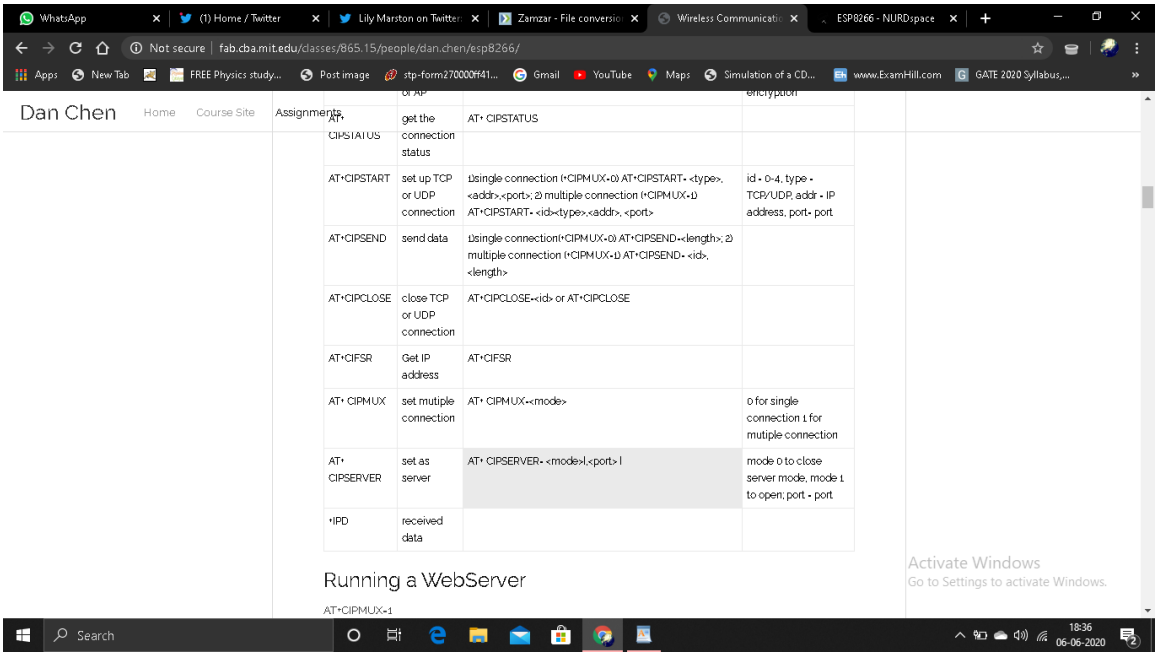
With use of these command we are able to connect the arduino with the wifi module

```
String sendData1 = "GET /update?api_key="+ myAPI +"&"+ myFIELD1 +"="+String(sendVal1);
    String sendData2 = "GET /update?api_key="+ myAPI +"&"+ myFIELD2 +"="+String(sendVal2);
    String sendData3 = "GET /update?api_key="+ myAPI +"&"+ myFIELD3 +"="+String(sendVal3);
    espData("AT+CIPMUX=1", 1000, DEBUG);       //Allow multiple connections
    espData("AT+CIPSTART=0,\"TCP\",\""+ myHOST +"\","+ myPORT, 1000, DEBUG);
    espData("AT+CIPSEND=0," +String(sendData1.length()+4),1000,DEBUG);
    espSerial.find(">");
    espSerial.println(sendData1);
    espData("AT+CIPMUX=1", 1000, DEBUG);       //Allow multiple connections
    espData("AT+CIPSTART=0,\"TCP\",\""+ myHOST +"\","+ myPORT, 1000, DEBUG);
    espData("AT+CIPSEND=0," +String(sendData2.length()+4),1000,DEBUG);
    espSerial.find(">");
    espSerial.println(sendData2);
    espData("AT+CIPMUX=1", 1000, DEBUG);       //Allow multiple connections
    espData("AT+CIPSTART=0,\"TCP\",\""+ myHOST +"\","+ myPORT, 1000, DEBUG);
    espData("AT+CIPSEND=0," +String(sendData3.length()+4),1000,DEBUG);
```

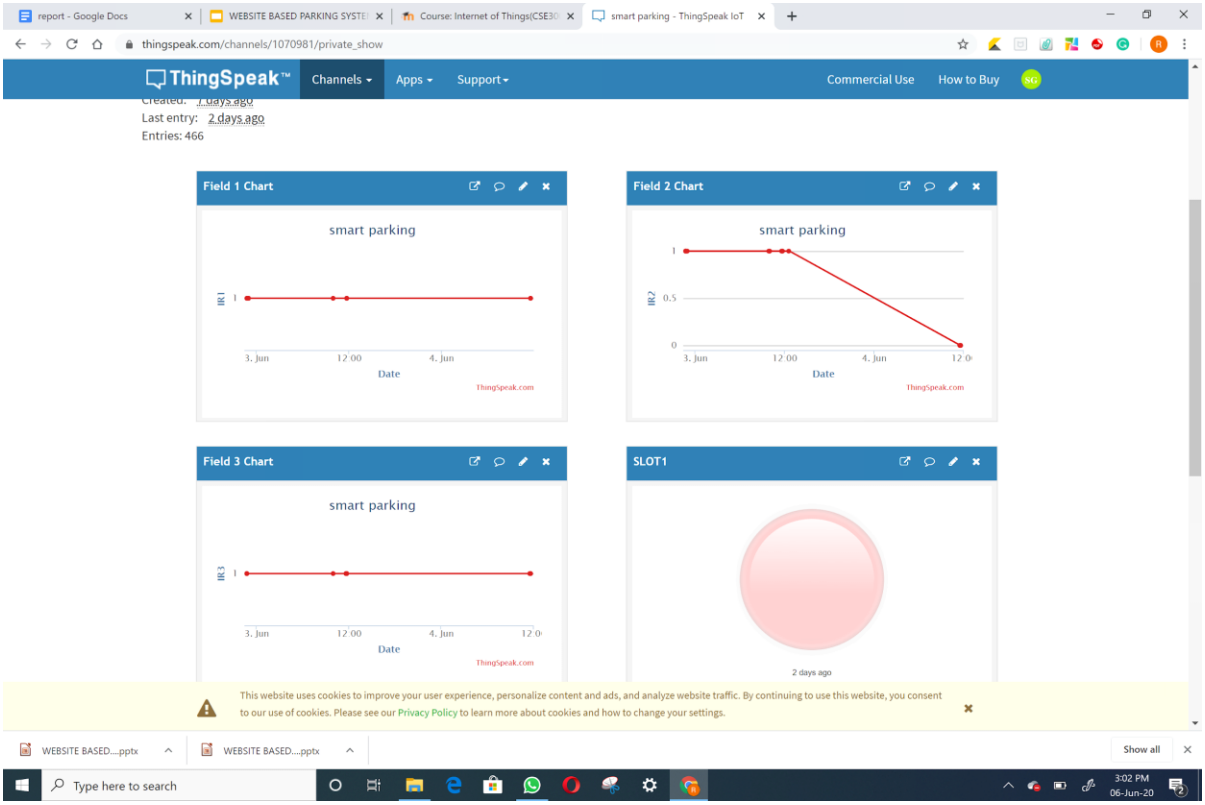
```
espSerial.find(">");
espSerial.println(sendData3);
```

Snapshots:





From this figure, we can understand that slot1 which corresponds to field chart one in the figure the value is one throughout indicating vacancy of the parking slot; similarly, we can see a down spike n field chart two and three which corresponds to parking slot two and three at a particular time interval mean the parking slot was not vacant at that point of time.

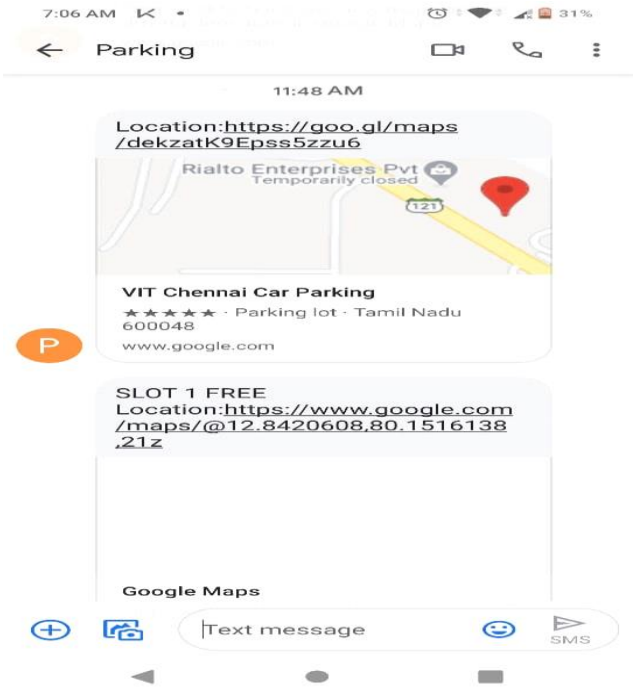


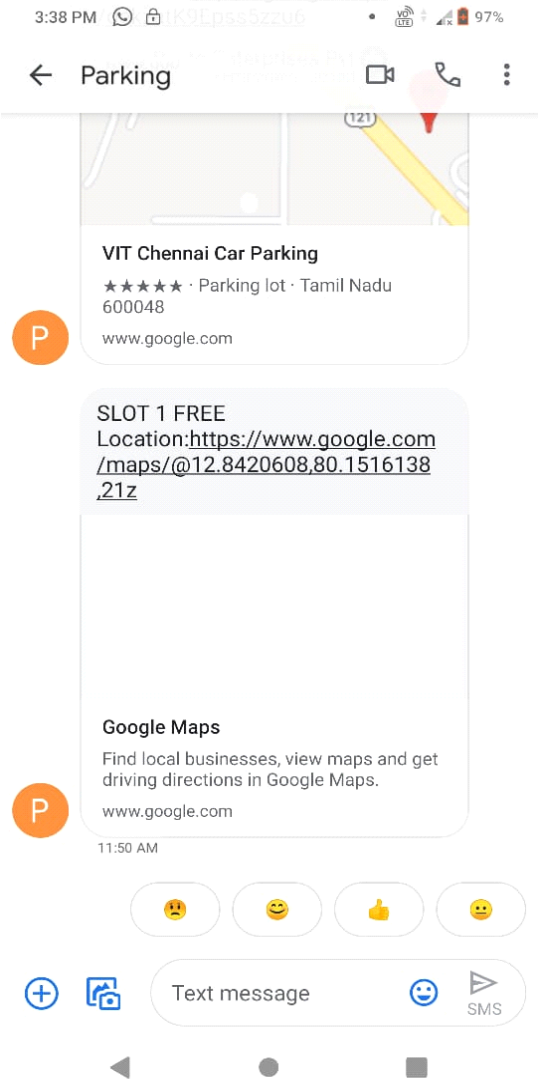
Thingspeak window

5.6 NAVIGATION

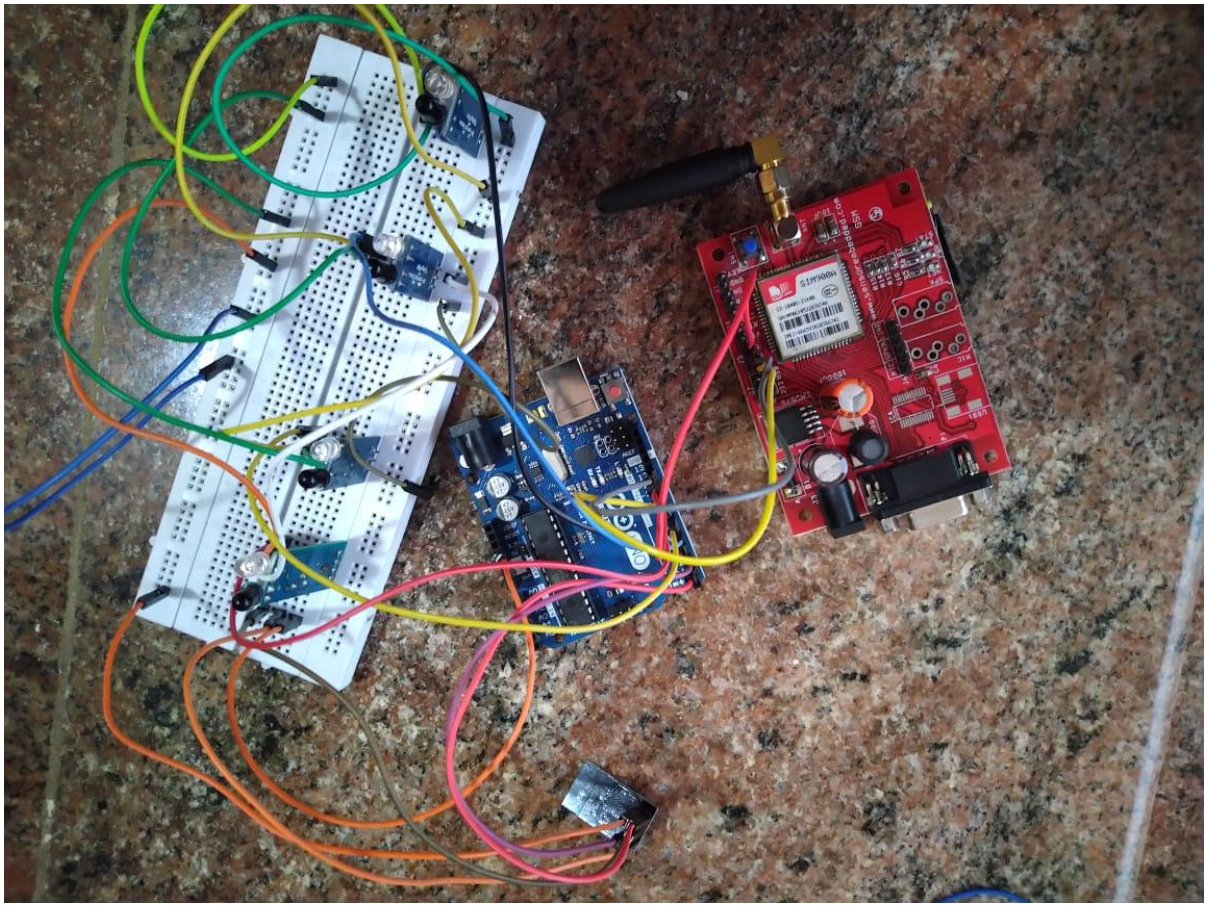
Once the vehicle at the entrance gate is verified, a message is sent with the help of a GSM module giving to the user providing him/her with an empty slot number and a google map link of the exact location of the parking slot thus navigating him/her to the slot.

OUTPUTS:


7:06 AM
31%
Parking
11:48 AM
Location:https://goo.gl/maps/dekzatK9Epss5zzu6
Rialto Enterprises Pvt
Temporarily closed
121
VIT Chennai Car Parking
★★★★★ · Parking lot · Tamil Nadu 600048
www.google.com
P
SLOT 1 FREE
Location:https://www.google.com/maps/@12.8420608,80.1516138,21z
Google Maps
Text message
SMS


3:38 PM
97%
Parking
121
VIT Chennai Car Parking
★★★★★ · Parking lot · Tamil Nadu 600048
www.google.com
P
SLOT 1 FREE
Location:https://www.google.com/maps/@12.8420608,80.1516138,21z
Google Maps
Find local businesses, view maps and get driving directions in Google Maps.
www.google.com
P
11:50 AM
Text message
SMS

HARDWARE IMPLEMENTATION



CONCLUSION

In this paper, we developed a new model of an IoT based smart parking system that overcomes a few drawbacks in the existing technology. In our prototype, we implemented a reservation-based parking system with an improved and efficient verification system which satisfies both the user's needs and also deals with mitigating traffic issues caused due to parking problems. We have given a detailed structure and an elaborate working of our system in this paper. It can be positively concluded that our proposed work will undoubtedly help improve the current parking system and pave the way to a fully automated parking without human intervention and also reducing the efforts and time taken by the driver to find a vacant parking slot which in turn reduces the amount of fuel used, traffic and air pollution when a user tries to find an empty spot.

FUTURE WORK

1. Creating an app instead of a website.

2. We will start including all the parking spaces (on-street and off-street parking) into a single app.

3. Dynamic pricing per hour.

4. We can start the parking facility for bikes and heavy vehicles.

REFERENCE

- https://www.researchgate.net/profile/Mahir_Kadhim/publication/328615718_Arduino_Smart_Parking_Manage_System_based_on_Ultrasonic_Internet_of_ThingsIoT_Technologies/links/5bd8ce7f299bf1124fae46cd/Arduino-Smart-Parking-Manage-System-based-on-Ultrasonic-Internet-of-ThingsIoT-Technologies.pdf
- https://www.ijrte.org/wp-content/uploads/papers/v7i4s/E1996017519.pdf
- https://www.researchgate.net/publication/303842610_IoT_based_Smart_Parking_System
- https://www.researchgate.net/publication/329686583_IoT_Based_Smart_Parking_System
- https://www.ijraset.com/fileserve.php?FID=17585
- https://www.ijser.in/archives/v2i6/SjIwMTMyOTk=.pdf
- https://www.ijert.org/research/Review-Paper-on-Smart-Parking-System-IJERTCONV7IS08017.pdf