SMART PARKING

USING IOT

V.R.S.COLLEGE OF ENGINEERING &TECHNOLOGY
ARASUR

PHASE-5

SUBMITTED BY

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ABSTRACT

Our world has been developing into a digital era since the introduction of technologies which is responsible for the evolution and changes in the lives of many people. However, there are still no development on the issue of parking system that is usually full especially in crowded areas to notify people on the absence of parking spots that ends up wasting their time. The anxiousness and worries of people results in their daily schedule change to fit in the time taken to look for a parking spot. The project that is made to be implemented focuses on a web-application to notify users on the availability of parking and the location of the parking. This project allows users to locate and identify available parking space with the view of just a web application. Light-dependant resistor(LDR) sensor is used to detect the presence and absence of car.The data transferred from the sensor to the web application is sent by using ESP32. The feature available in the web application is the indicator of an occupied parking space and a free parking. To enhance the effectiveness of the web application, we made it available to be used on website to ensure users are able to apply and use the system in real time.

Keywords:

cloud,ESP32,ultrasensor,LED

1. INTRODUCTION

2. The idea came to light after an observation was made in daily life when going to crowded areas. Status quo shows that car parking areas do not have an indicator to indicate vacant parking space to individuals that are looking for a parking space even during this modern era technology-based society. Parking space has been a very crucial on current day and age since most individual owns a car, therefore there are an increase number of parking spots occupied, which makes it harder to find one especially when someone is in a rush. This is a global issue that is not addressed due to the perception of the issue considered as a non-primary objective to be focused on. The anxiety and worries of no available parking spot has a huge impact in people's daily lives to an extend of people rescheduling their daily time table to be able to secure parking to be on time for work . With this project, we are able to help users by having an indicator system through a web-application so that people will be able to find parking spots at a faster rate especially in crowded areas.

   This project uses LDR sensor to identify and indicate free parking, sending the vacant or occupied signal to the microcontroller. Once the microcontroller receives the input, it will then light up an LED at the parking spot so that individual is able to identify free parking from afar, as well as sending the signal on webapp that is accessible by laptops or mobile phones .

   The webapp will display the layout of the parking area, as well as the position of free parking to the users. In addition, the webapp will also display the total amount of parking available, the number of occupied parking as well as the number of vacant parking . This is to easily navigate users on the amount of vacant parking left since the parking area is huge and could easily miss out on any vacant parking. The name of this project is Development Of Internet Of Things(IOT) Car Parking System Using ESP32 because we are using ESP32 as our microcontroller that works the backend of the project.

The problem arises for the project is that when we are entering a parking area, we do not know if the parking area is full or has a few vacant parking. It takes up a long time to circle the area looking for a parking spot that ends up at full parking. Next, when a person exits the parking area, the other person who is waiting for a parking in the area is not notified and miss their parking. This has been an existing issue because people tend to demand for a bigger parking area because they could not find any parking that ends up taking more space rather than easily getting an update of available parking through their phones and plan their journey. Lastly, the vacant parking position is not available for people who wants to park their cars in the area. Due to the uninformed parking position, people will waste their time circling around to find any good parking 137 Journal of Engineering Technology Vol. 9(1): 1-4, 2022ISSN 2231-8798© 2013 UniKL BMI which will end up causing a traffic jam assuming there are a lot of people looking for parking in the area.

3. RELATED WORKS

Currently, many research missions have an excellent parking management in favor of the concept of wireless sensor networks to detect parking information of free spaces.

Tomar, Kaur, and Singh, (2018), explained about the IoT based parking system. An SMS with a personal ID is sent to the customer via the main station, at which time the sensor senses the vehicle entering the reference area. The station will collect information from these centers and display the ID on the display board of the residential area. The path to the free space is appropriately located and will be displayed on the LED screen at the entrance to the available slot road. This system generates an identification number (ID) when the driver approaches the lane to park their vehicle. This ID is a combination of (a) the free parking slot, (b) the last two digits of the vehicle (car) registration number and (c) the last two digits of the occupant's residence number. When a resident sends feet into the area with this unique ID, it mechanically helps the person locate a parking space dedicated to them and helps to park the car. The authority responsible for booking immediately sends an SMS to the user while securing the parking space. The staff in charge of the parking area find the tenant by scanning the unique code in the parking slot through IoT.

Jangid, Verma, and Shankar (2018) discussed the smart private parking solution. The methodology of this study is to (i) detect video on video through the “playback-subtraction method” and (ii) pre-processing methods used to disrupt the noise in the video-image. The moving vehicle is monitored by manipulating the “Gaussian compound model” and a front mask is designed in this process. A snapshot is drawn in order to identify the car’s number plate and explored in the number database on the tray to legalize the vehicle for entry into the parking slot. To calculate them the vehicle is differentiated into ‘cars’ and ‘bikes’ and the driver is taken to the available parking slot.

Stornelli *et al.* (2018) explains how to locate a vehicle using wireless networks. When the sensor detects the vehicle the output frequency changes according to the deviation. These modifications are cross-view through the digital interface, which includes (a) microcontroller and (b) fast analog-to-digital converter. The all-encompassing role of the system is controlled by the growing energy-saving mechanism; In view of the need to allocate tracking time as well as the function of parked parking time. Data from the sensor is transmitted by a Bluetooth Low Energy (PLE) transmitter to any Bluetooth Low Energy (PLE) device and data server in the nearby atmosphere.

Jyothish *et al.* (2018) finds Raspberry Pi a system linked to a website that updates the status of parking spaces. Here, the sensors used are ultrasonic sensors. These sensors help to identify the empty slot by calculating the distance by measurement. These predictions of distance predict whether the slot is empty or booked. All of this information has been updated on the website, which was launched using a local-host. Information about the parking space is collected from the database and displayed on the website under the column assigned to the status. The website has been upgraded under the reload task.

In the work of Owayjan *et al.* (2017), the user manages the parking access system, which he / she will automatically connect to the parking network, establishing the connection between the client mobile and the mall / central network. When the customer enters the parking lot, a map showing the empty and full space on this floor will appear on his / her mobile app so that the customer can choose one of the free places to park his car. The time it takes for the user to park the vehicle is taken into account from the web server so as not to change the time of the user's phone and cause problems with the system. If the customer decides to leave, the navigation begins to show him / her the road to reach his / her car.

Hainalkar and Vanjale (2017) explains the system that uses IR sensors to sense the presence of a car in a car park. The system uses two Android applications for the driver and the traffic police, respectively. When the driver logs into the system, he will receive information about the nearest parking lot, the total number of parking spaces and the number of vacant parking spaces. When the user reaches the parking space, it will be authenticated using an

RFID tag and then the gate will open. When the user enters the parking lot before parking at the booked location, he or she must change the RFID tag, which will then only open at the gate of the respective parking lot. The location of the car park will be detected by the IR sensor and delivered in real time to the local unit. Once the car enters the parking lot, billing will begin based on the time the car was parked.

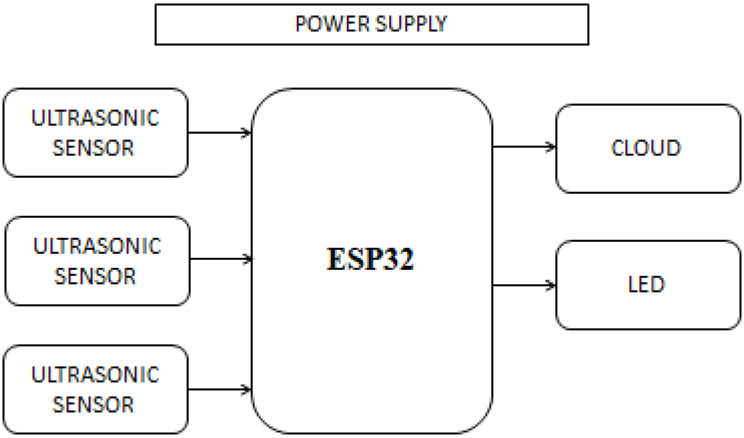
In the work of Wang and He (2011) it is often suggested that ZigBee sensors are widely used to constantly measure parking status for every available parking lot. Each sensor is specifically mixed with (a) 8 MHz microcontroller, (b) 8 channels A／D and (c) 250kbps [802.15.4 wireless radio] with 2 wireless modes. This mode is connected to the contact module via Bluetooth. Communication is connected via a sensor between the Bluetooth module in ZigBee mode and smartphones. If the vehicle is detected in a booked parking lot, the sensor confirms the user's identity. With smartphones, information on parking spaces is available and the specific parking slot can be booked through the web server throughout the area. The Bluetooth module is connected by receiving mobile phones, with the benefit of interacting with sensors when the driver is identified for verification.

In the paper of Nandyal, Sultana, & Anjum (2017), control the parking space using the Arduino UNO. The following tasks will be performed regarding the arrival of the vehicle in the parking area: (1) the driver stops the vehicle in the detected blank slot, (2) when the vehicle occupies the slot, the LED is determined to flash with a certain color, and, (3) when the slot is empty again, this LED The ED lights will turn off automatically, indicating that the parking lot is empty and not yet occupied by another vehicle. These processes are carried out whenever necessary.

Ling *et al.* (2017), in his work, have an effective parking order. The recommended configuration uses a single camera attached to an IoT rim device to monitor the condition of street parking spaces within its view. This system will identify the free slot with camera- based view and this data will be stored in the AWS database.

The work by Nimble *et al.* (2016), proposes a smart parking system powered by number plate authentication technology to improve a sovereign car parking system that uses a number of vehicles to enable image processing concepts. The image of the vehicle license plate is obtained by process and preserved in the database. It is further fragmented to have each and always y character on the number plate for the purpose of authentication. The ultrasonic sensor helps detect empty parking spaces in the surrounding area. These images of the number plate are taken into account, analyzed and considered for future use. Correspondingly, the current parking time of the car is also recorded to calculate the parking fee. The LCD screen displays the status as "Complete", indicating that 'there is currently no free parking slot in this area'.

BLOCK DIAGRA



LITERATURE REVIEW

An occupied parking detection system is a system that is developed to identify a series of parking space and sends data back to alert whether the parking space is occupied or vacant. This system has been developed previously with different ways of implementations on the project. The difference between the projects existed using this system is the sensors used to detect the presence of vehicles and the ways each project utilize the data gathered from the system

Hardware Requirement

ESP32

ESP32

ESP32 is a microcontroller with an integrated Wi-Fi and Bluetooth connection that is able to be used as a wide range communication between devices. It has a small design which can withstand temperature from -40 Celsius to 125 Celsius. It also consumes very low power with a requirement of 5V

ULTRASONIC SENSORS

Ultrasonic sensors are used to give the distance of any object with the help of sound waves. You can add the remote range of the device. It measures sound waves at a certain frequency and measures the distance by listening to the sound waves returning to its wavelength. Formula for calculating distance:

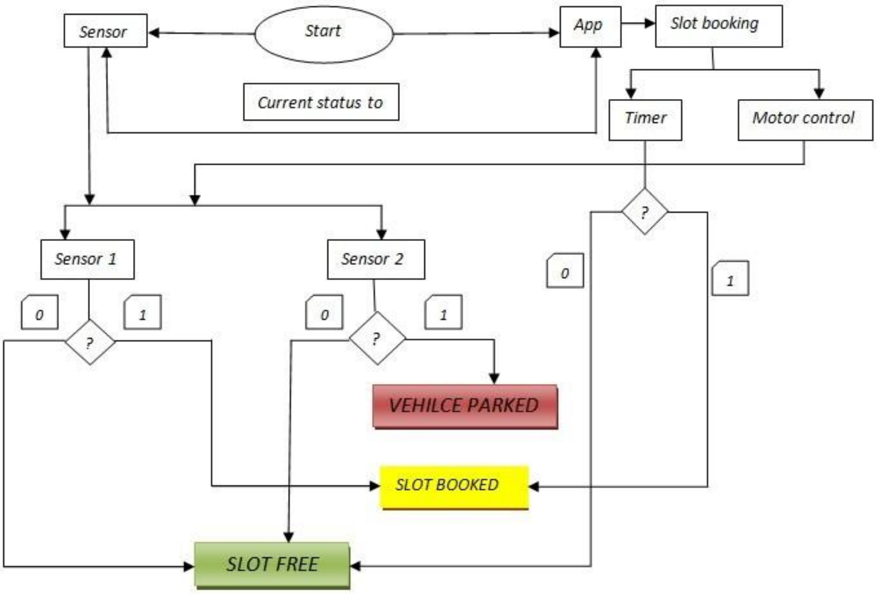
Distance= (Speed of Sound X Time taken)/2.

LED

LED is a light source that is usually used as an indicator in projects.LED produces light up to 90% efficiency which is very efficient compared to an incandescent light bulbs. It lights up when an electrical signal passes through a microchip inside the LED which produces a tiny light source resulting to a visible ligh

METHODOLOGY

The Arduino UNO board is used to control the operation and motor control of the sensors. Motor control is used to indicate the status of the two ultrasonic sensors used.



Two sensors are motor-controlled, which are used to indicate the following:

- Sl slot booked or not.
- Car Whether the car is parked or not.

Once the user logs in through the app, the user can book a free slot available wherever they want. This is a place where you can drive without tension towards that area and have safe and sound parking. When the slot is free, it is marked "green". When a free slot is booked by a user, it is marked with a "yellow" color.

When the car is parked in a particular slot, it is marked as "red". The Android application algorithm works in the following way:

Application of Wireless Internet Networking using NodeMCU and Blynk Application

Well known arduino projects that connects via wireless network usually uses the ready-to-use Blynk Application. Blynk is an application which enables user to control projects related to Arduino, and Raspberry Pi to connect to the Internet and having control over them. Blynk service is offered on iOS and Android platform which is available for both android and iphone users. It is an application that allows users to build a digital dashboard and freely control the graphic interface by using the infamous drag and drop widgets. Moreover, Blynk application is very flexible as it is not tied to any type of hardware devices. Whereas, NodeMCU is known as a controller unit which is known as a very cheap open source IoT platform.It is able to run any wireless hardware related especially if it is based on the ESP module. This project studies the connection between NodeMCU and Blynk application on how responsive, good, and limitations. NodeMCU offers Wi-Fi network in order for hardware to connect to Blynk application. Projects made and analyzed in the research includes Tiny Internet Weather Station and Wireless Light Control.

From the project above, the major problem is the usage of blynk application. Blynk is a powerful tool to make a prototype, but it is a web server that depends on the status of the host. If the host of Blynk application breaks down, we cannot access the data wirelessly even though the project is successfully made.

Performance Analysis of Proximity and Light Sensors for Smart Parking

This project is the evaluation of the effectiveness between proximity and light sensor. Proximity sensor is a sensor that is able to detect objects around the area without the need of physical contact. The sensor emits an electromagnetic field or an infrared radiation around the sensor. When the fieldobserves a change by having interruption on the radiated field, it will send an indication to indicate there is an interference, whether an object or a different magnetic field distorting the emitted signal. Whereas light sensor is a device that detects light energy which is photons or infra-red light and emits an electrical signal if light is present.The sensor sends an output signal to indicate the intensity of light received by measuring the radiant energy exist in light. From the research paper above, I have tested and compare the effectiveness of sensors that is available to be used for my project. PIR sensor is not suitable since it sends and receive analog data, which needs extra coding to convert the input and data to digital. However, proximity sensor is the best sensor to be used but it is too expensive to be made for a project since this project is made with a prototype and not suitable to use an industrial sensor. Therefore, it comes down to two sensors, which are LDR sensor and ultrasonic sensor. The reason I dismiss ultrasonic sensor is due to the fact that it is more prone to noise and external environment. If a trolley is parked at the parking, it will also detect as occupied which is technically is not a vehicle and can be moved.

PYTHON CODE FOR SEMULATION

```
import machine
import time
import urequests

# Constants
WIFI_SSID = "Your_SSID"
WIFI_PASSWORD = "Your_Password"
CLOUD_URL = "Your_Cloud_API_URL"
ULTRASONIC_TRIGGER_PIN_1 = 0  # Define the pins for the ultrasonic sensors
ULTRASONIC_ECHO_PIN_1 = 1
ULTRASONIC_TRIGGER_PIN_2 = 2
ULTRASONIC_ECHO_PIN_2 = 3
LED_PIN_1 = 4  # Define the pins for the LED lights
LED_PIN_2 = 5

# Setup Wi-Fi
import network

wifi = network.WLAN(network.STA_IF)
wifi.active(True)
wifi.connect(WIFI_SSID, WIFI_PASSWORD)

while not wifi.isconnected():
    pass

print("Connected to Wi-Fi")

# Function to measure distance using ultrasonic sensor
def measure_distance(trigger_pin, echo_pin):
    # Send a trigger signal
    machine.Pin(trigger_pin, machine.Pin.OUT).value(0)
    time.sleep_us(2)
    machine.Pin(trigger_pin, machine.Pin.OUT).value(1)
    time.sleep_us(5)
    machine.Pin(trigger_pin, machine.Pin.OUT).value(0)

    # Measure the echo signal
    pulse_time = machine.time_pulse_us(echo_pin, 1, 30000)  # 30ms timeout for measuring

    # Calculate distance
    distance_cm = (pulse_time / 2) / 29.1  # Speed of sound = 34300 cm/s

    return distance_cm

# Main loop
while True:
    # Measure distances from ultrasonic sensors
    distance_1 = measure_distance(ULTRASONIC_TRIGGER_PIN_1,
ULTRASONIC_ECHO_PIN_1)
    distance_2 = measure_distance(ULTRASONIC_TRIGGER_PIN_2,
ULTRASONIC_ECHO_PIN_2)

    # Determine parking space status
    space_1_occupied = distance_1 < 10  # Adjust this threshold as needed
    space_2_occupied = distance_2 < 10  # Adjust this threshold as needed

    # Control LED lights
    machine.Pin(LED_PIN_1, machine.Pin.OUT).value(space_1_occupied)
    machine.Pin(LED_PIN_2, machine.Pin.OUT).value(space_2_occupied)

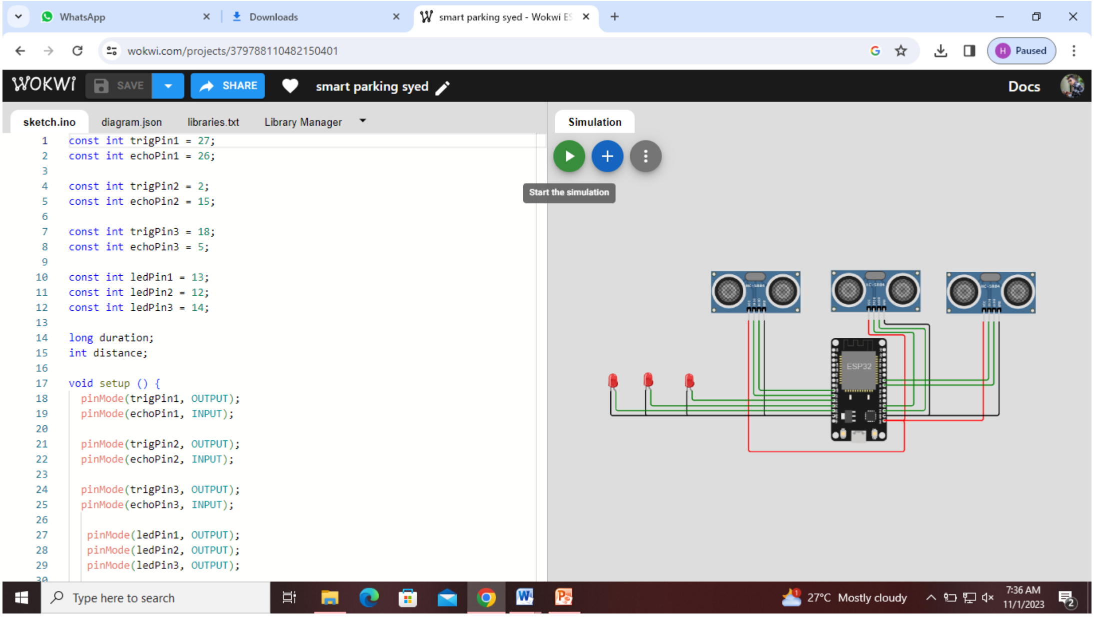
    # Send data to the cloud
```

```
data = {
    "parking_space_1": "Occupied" if space_1_occupied else "Vacant",
    "parking_space_2": "Occupied" if space_2_occupied else "Vacant",
}


response = urequests.post(CLOUD_URL, json=data)
response.close()


time.sleep(1)  # Adjust the delay as needed
```

WOKWI CIRCUIT CONNECTION



```
const int trigPin1 = 27;
const int echoPin1 = 26;

const int trigPin2 = 2;
const int echoPin2 = 15;

const int trigPin3 = 18;
const int echoPin3 = 5;

const int ledPin1 = 13;
const int ledPin2 = 12;
const int ledPin3 = 14;

long duration;
int distance;

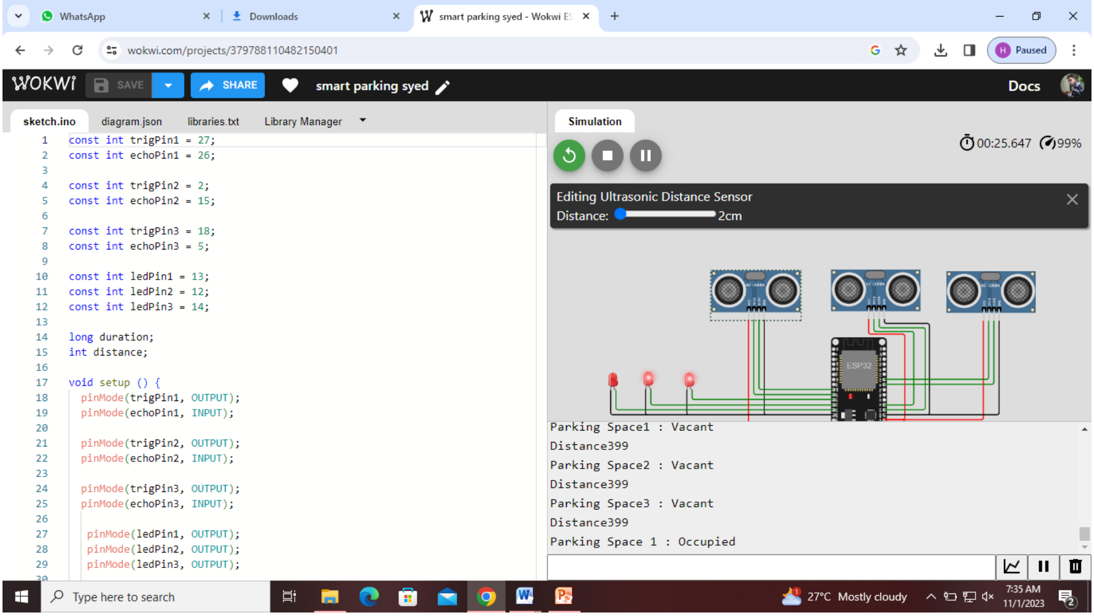
void setup () {
  pinMode(trigPin1, OUTPUT);
  pinMode(echoPin1, INPUT);

  pinMode(trigPin2, OUTPUT);
  pinMode(echoPin2, INPUT);

  pinMode(trigPin3, OUTPUT);
  pinMode(echoPin3, INPUT);

   pinMode(ledPin1, OUTPUT);
   pinMode(ledPin2, OUTPUT);
   pinMode(ledPin3, OUTPUT);
```

SIMULATION OUTPUT



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  pinMode(echoPin3, INPUT);

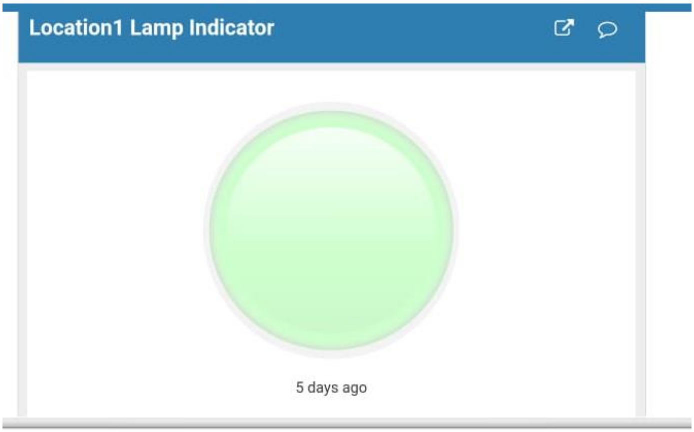
   pinMode(ledPin1, OUTPUT);
   pinMode(ledPin2, OUTPUT);
   pinMode(ledPin3, OUTPUT);
```

Editing Ultrasonic Distance Sensor

Distance: 2cm

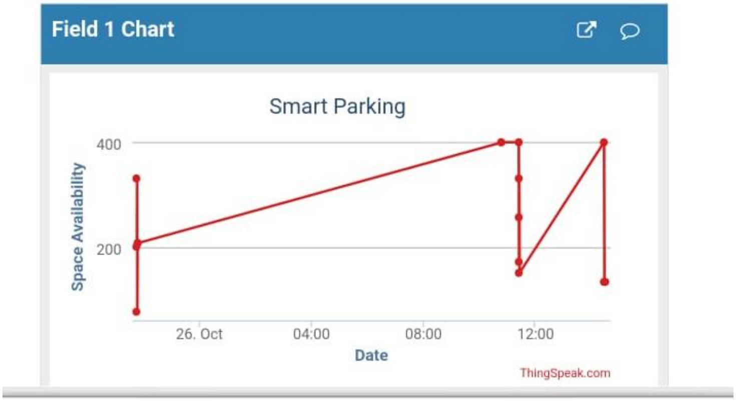
```
Parking Space1 : Vacant
Distance399
Parking Space2 : Vacant
Distance399
Parking Space3 : Vacant
Distance399
Parking Space 1 : Occupied
```

CLOUD OUPUT

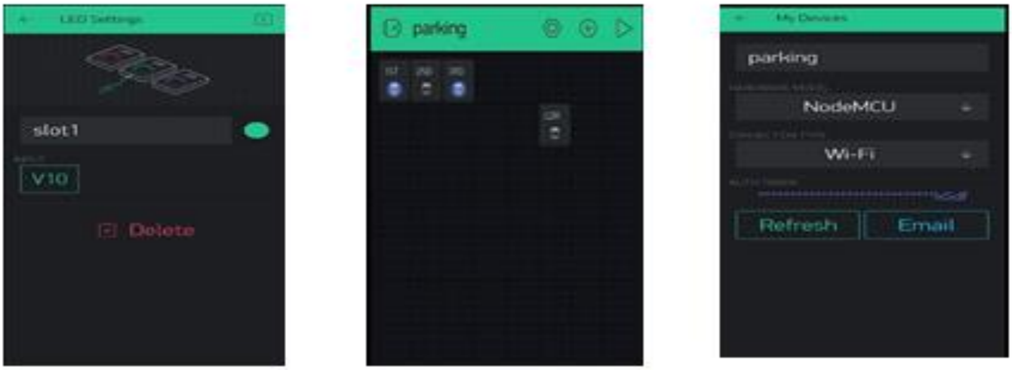


Location1 Lamp Indicator

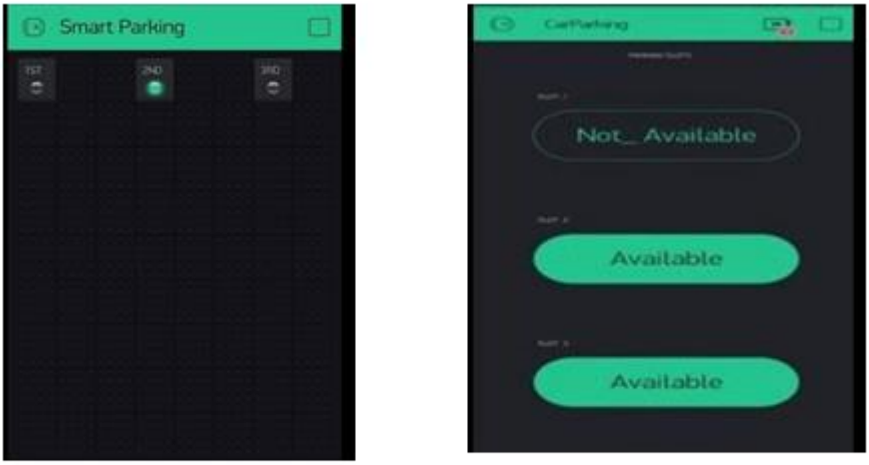
5 days ago



APP OUTPUT



Externaly we are using nodeMCU to make a iot based.



APP OUTPUT

CONCLUSIONS

In our paper there is a developed version of the smart parking system. The system has implemented a smart parking system with online booking through an Android application. This system helps to save our time in this busy world. This optimal parking system has a computerized approach to parking issues, which effectively controls traffic congestion during peak hours during business hours. This system helps to avoid excessive traffic, which leads to lower fuel consumption and the content of CO2 in the atmosphere. Our parking system allows us to book empty parking spaces for easy parking without creating traffic. This system reduces the rate of accidents per year due to traffic.

6.1 FUTURE ENHANCEMENT

For future works, we can upgrade our project through online payment. This method of net payment is enough to rent the parking space for the time they need and use it properly.

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