SIGNS WITH SMART CONNECTIVITY FOR BETTER ROAD SAFETY

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BACHELOR OF ENGINEERING

In

ELECTRONICS AND COMMUNICATION ENGINEERING

PARISUTHAM INSTITUTE OF TECHNOLOGY AND SCIENCE, THANJAVUR

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CONTENTS

1. Introduction:

1.1 Project Overview

Roads are the foremost source of linking between cities and villages. Due to the ease of traveling by road, vehicles have become the main way people travel. The chances of vehicular accidents (Vas) have increased with the growing number of vehicles on the roads. This causes lack of parking and space for the vehicle. People tend to park at ease in order to obtain their daily needs in a quicker basis, thus parking in an area they aren't supposed to. It was also multiple vehicle collisions (MVCs) can occur owing to delays in receiving information about an incident. According to one study by the Indian police, there were 9582 accidents from 2016 to 2017 all over India caused due to vehicles parked in an no-parking area, involving 11,317 vehicles, leading to 700 fatalities and 1200 persons injured.

Digital technologies like the Internet of Things (IoT) are reshaping road safety measures. Many technology initiatives are undertaken the world over to make smarter and safer roads, the ones that can interact with traffic and pedestrians. Assuming that by giving in vehicle technology information to the driver, accidents can be averted, several technology-based products have been developed. The latest technology researchers are working on is based on the Internet of Things (IoT). IoT is all about data. Data is becoming a valuable resource for our world.

Many sectors and industries have adopted IoT to reduce errors and improve performance in manufacturing, energy, health care, and communication. A cornerstone of these steps is realizing economic systems for "monitoring road safety by strengthening data systems". Meanwhile, a key theme in the package is motivating the adoption of a Safe System approach, which is a holistic approach to road safety that parts from traditional management solutions by emphasizing safety by design.

Mobile-phone-based applications use built-in sensor data to detect the motion based on environmental situations.

The risks for of life, injuries, and other damage may increase if an incident is not reported to an EOC in a timely fashion. Lives can be saved by sending timely information about an accident through an automated mechanism. Moreover, quick automobile accident detection and an alert system are required to protect approaching vehicles against an MVC. Several methods have been implemented in advanced vehicles (Avs) for avoiding an accident. An accident threat is detected through sensors installed in vehicles or by using smartphone sensors. Sensors installed in signs board would also help reduce the risk of accidents and help in obeying the laws stated by the government.

1.2 Purpose

A large amount of research is being carried out in the domain of accident avoidance and accident alarms by a large number of researchers and practitioners. To avoid accidents, many approaches are utilized to enhance safety. For ease of reference, the literature on accident detection and avoidance is separated into three approaches: stand-alone, cooperative, and hybrid. Stand-alone approaches use sensors, such as radar and light detection and ranging (LiDAR), for accident avoidance and detection, whereas cooperative approaches rely on V2X technology and hybrid approaches. The project tris to implement the stand-alone method, which helps us detect a vehicle parked in an illegal space and can be given necessary precautions by the concerned authorities.

2 LITERATURE SURVEY:

2.2 Existing problems

In present Systems the road signs and the speed limits are Static. But the road signs can be changed in some cases. We can consider some cases when there are road diversions due to heavy traffic or due to accidents then we can change the road signs accordingly if they are digitalized. Traffic police face a major issue when people tend to park their car irresponsibly. Thus, accidents and irregularities might occur which would be a bane for the community. This has an impact for the people as well as the authorities as the law is not abided. Even though it seems like a minor problem, it will have a major impact.

a)

Paper Title: NB-IoT based Road Accident Alert System

Authors: Bharath G S , Meghana Bukkapatnam , Hitesh N

Publication: (IJERT) ISSN: 2278-0181 Vol. 11 Issue 03, March-2022

Methodology: Using Long Range Radio (LoRa) and NarrowBand-Iot (NB-IoT),

Abstract : The Safety system Approach within the road transport system is built around the premise that death and injury are unacceptable and avoidable.The paper proposes one such implementation of using a collision detector module to detect an accident. To make sure that the collision is not a false alarm, a Micro-electromechanical systems accelerometer with an ultrasonic sensor is used to get confirmation of an accident at a particular place. Once the confirmation is received, the exact live location of the mishap is attained with the help of the GPRS module's longitude and latitude data coordinates. It consists of Accelerometer, Ultrasonic sensor and Raspberry pi. The module is connected to an ultrasonic sensor which detects obstacles using ultrasonic waves. MEMS accelerometer and impact sensor are interfacedwith Analog to digital converter (ADC) then connected to pi 3 for detecting accidents. GPS is interfaced with raspberry pi for finding the exact live location of the vehicle and the buzzer alerts the surrounding nearby ones.

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Advantages:

- The proposed system is easy to understand and implement.
- The wide use of sensors reduces error which could aid better performance,
- The use of NB-IoT will boost the range, enhance network capacity at a comparatively low cost.

Disadvantages:

- To establish a entire network is quitely costly task
- The ultrasonic Sensor has limited range. Temperature Fluctuation affects the speed of an ultrasonic sensors pulse or sound waves.

b)

Paper Title: Accident prevention and road safety in hilly region Using IOT

Author: Bhumika R, Harshitha S A, Meena D, Asha M

Publication: (IJERT) ISSN: 2278-0181, NCCDS - 2021

Methodology: Using ATMEGA328P Microcontroller

Abstract : The sloping areas are more inclined to mishaps because of the sharp turns, uninten tional bends and the vulnerability or newness of the street. GPS/GSM frameworks additionally don't work as expected in these districts. The destination of the work is to reduce the mishaps in hairpin bends and to facilitate smooth and effective developments of vehicles, to prevent the noise pollution caused due to horn, and to help people in emergency and provide the landslide alert. This paper examines a module which means to screen and improve the security in sloping regions by utilizing Wireless Sensor Network and Internet of Things. Remote sensing (WSN) and utilizes self-controlled detecting gadgets at the areas delicate to previously mentioned reasons and afterward these sensors send data to the worker about the chance of a setback. It consists of ATMEGA328P, IR Sensors, RFID, IOT. One sensor is introduced by the side of the difficult segment of the street, correspondingly another sensor is introduced by the side of the declining part of the street. In view of the yield of sensors, position of vehicles on one or the other side of the twist is distinguished which is given as a contribution to the microcontroller. The microcontroller which chips away at force supply of 9V runs a Priority calculation which triggers the admonition LEDs to gleam and consequently wisely controlling the development of vehicles at the curve. Cautioning LEDs alongside an arched mirror are put at the focal point of the external bend of a barrette twist. Another LED is put in request to tell a framework breakdown. Too as we can carry out a ringer which will alarm the client. For speed trap we can calculate speed by the input from sensor and RFID to distinguish the vehicle. An android application will be created for this reason and approved individual can have continuous updates over his telephone.

Advantages: Accident prevention and road safety in hilly region using IoT is an effective method to reduce the occurrence of accidents

Disadvantages: To establish an entire network is quiet costly task.

c)

Paper Title: IoT Based Mishap Detection for Safety of Road Transport

Authors: G Lavanya,N Deepika,T Sangeetha,E Harni Priyanga,G Saranya P Vinitha

Publication: (EL SEVIER SSRN) ISSN: 1556-5068, ICIOCCT – 2018

Methodology: Using Arduino UNO with Mishop technology

Abstract : Accidents are becoming the major cause for increasing the death rate of human beings in a drastic manner. Even though accident leads to high mortality, the lack of notification within a limited time be a major flaw. This paper mainly focuses on detecting the accident and passes the information to the higher concerns and to the ambulance in order to save the life of the human within the limited time period. As this model concentrate on an optimized solution, it make use of piezoelectric sensor and facial detection module to find heartbeat rate. Web based API is used to notify the higher authorities. It consists of Arduino UNO, Microcontroller, Piezoelectric sensor, TCS3200 color sensor, IOT. When the user is met with an accident, the temperature, pressure, acceleration of the vehicle drastically change from the threshold value. The characteristics that mentioned above are more sensitive and it is difficult to find the particular values of the vehicle in all conditions. As the system concentrate on a optimized solution with interoperability here it make use of the piezoelectric sensor and sends the change to the Arduino. There will be the facial color change of the user if they meet with an accident since they get panic and tensed. The human heartbeat rate also become abnormal. In order to detect those changes the color sensor is employed to sense the facial color change and this information will be sent to the Arduino. During a panic situation there is change in the blood pressure leading to slight change in the facial skin color due to blood circulation. The normal RGB code of driver's skin color can be set as a threshold value to identify the mishap situation.

Advantages:
The proposed system which can detect the accidents as soon as possible and intimates the geographical spot of the accident occurred place to the police and ambulance using IoT was implemented and tested.

Disadvantages: Needs external power supply, The design of the system is difficult

d)

Paper Title: Application of IoT in Road Safety

Author: Srimantini Bhattacharya, Harsh Jha , Radhikesh P. Nanda

Publication: (IRTM) 978-1-6654-7886-1, March 2022

Methodology: Using IoT and Raspberry Pi

Abstract : This paper explores the advancement of the Internet of Things (IoT) and Machine Learning in the field of Road Safety and accident prevention with a state-of-the-art review of various techniques adopted for implementing an intelligent road Safety System. It is seen that, with the help of IoT, the safety system can be updated on a real-time basis which can help to create a smart, intelligent, and highly efficient Road Safety system. Artificial Intelligence (AI) is applied to enhance the technology further for detecting the driver's behavior like drowsiness with the help of real-time camera feed or high-resolution images. IR sensors, camera , GPS , Raspberry Pi and IoT are used in this project. This system detects accidents by vibration sensors, accelerometers. For detection, the GPS and GSM modules locate the accident site and correspondingly inform the person's nearest ones and nearby hospitals through a text message. The system also requires the person that will be riding the bike to have a valid driving license using the already embedded RFID on the driving license. The RFID reader on the bike will have at most ten registered users, hence handling theft-related issues. The prototype is designed using Raspberry Pi, Pi Camera, sensors for monitoring driver's eye movements, detecting yawning, detecting toxic gases, and alcohol consumption to prevent accidents and to provide safety assistance to the drivers. Thereafter the Internet of Things (IoT) and Machine Learning (ML) enabled system is implemented in vehicles for transmitting the behavior of the driver and his driving pattern to the cloud to take quick response under emergencies.

Advantages:

- These technologies can help optimize the maintenance cost and prevent fatal accidents, thus saving the lives of civilians.
- With the help of IoT, the traffic management system gets updated with real-time data, thus increasing the efficiency of the safety system

Disadvantages:

- Raspberry pi may get slow and not suitable for multitasking

2.3 REFERENCE:

1. World Health Organization, "Global status report on road safety 2015, 'https://www.who.int/violence_injury_prevention/road_safety_status/20 15/en/' View at:GoogleScholar
2. World Health Organization, "Decade of Action for Road Safety 2011-2020 seeks to savemillions of lives," http://www.who.int/roadsafety/decade_of_action/en/

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4. W. E. Marshall, "Understanding international road safety disparities: Why is Australia so much safer than the United States?" *Accident Analysis & Prevention*, vol. 111, pp. 251–265,2018.

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View at: Google Scholar

6. United States Census Bureau, "TIGER/Line® Shapefiles: Roads," https://www.census.gov/cgi-bin/geo/shapefiles/index.php?year=2018&layergroup=Roads. View at: GoogleScholar
7. X. Wang, X. Wu, M. Abdel-Aty, and P. J. Tremont, "Investigation of road network featuresand safety performance," *Accident Analysis & Prevention*, vol. 56, pp. 22–31,2013. View at: Publisher Site | Google Scholar
8. E. Ahmed, I. Yaqoob, A. Gani, M. Imran, and M. Guizani, "Internet-of-things- based smart environments: State of the art, taxonomy, and open research challenges," *IEEE Wireless Communications Magazine*, vol. 23, no. 5, pp. 10– 16, 2016. View at: Publisher Site | Google Scholar

2.3 Problem Statement Definition

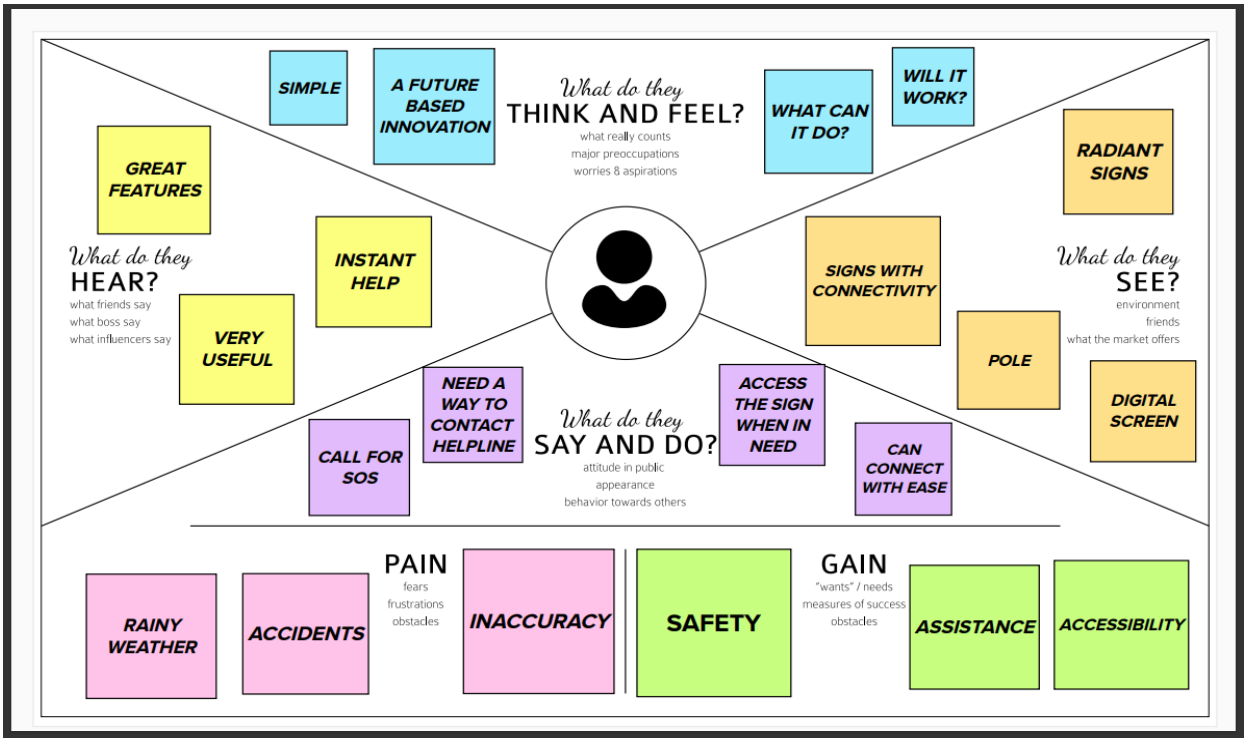
A problem statement is a concise description of an issue to be addressed or a condition to be improved upon. It identifies the gap between the current (problem) state and desired (goal) state of a process or product. Focusing on the facts, the problem statement should be designed to address the Five Ws. The

first condition of solving a problem is understanding the problem, which can be done by way of a problem statement.

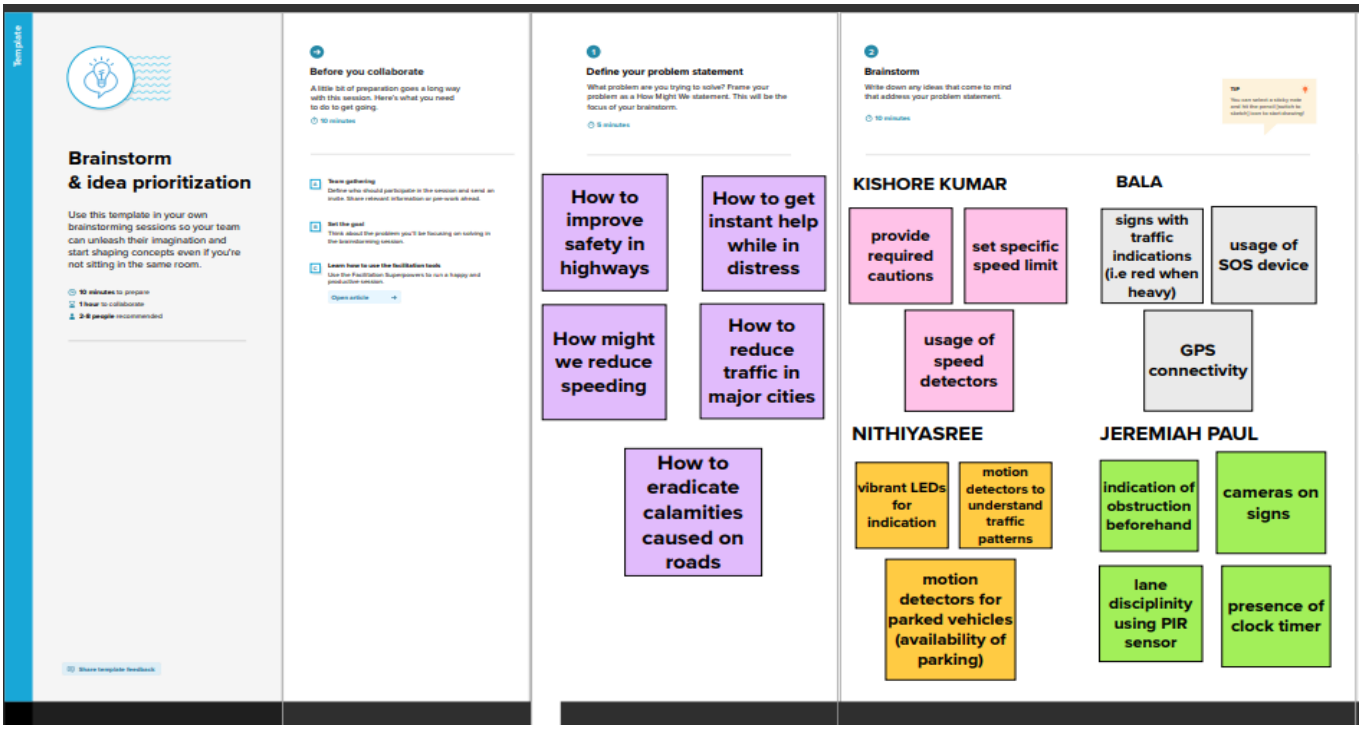
the road signs and the speed limits are Static. But the road signs can be changed in some cases. We can consider some cases when there are road diversions due to heavy traffic or dueto accidents then we can change the road signs accordingly if they are digitalized. Traffic police face a major issue when people tend to park their car irresponsibly.

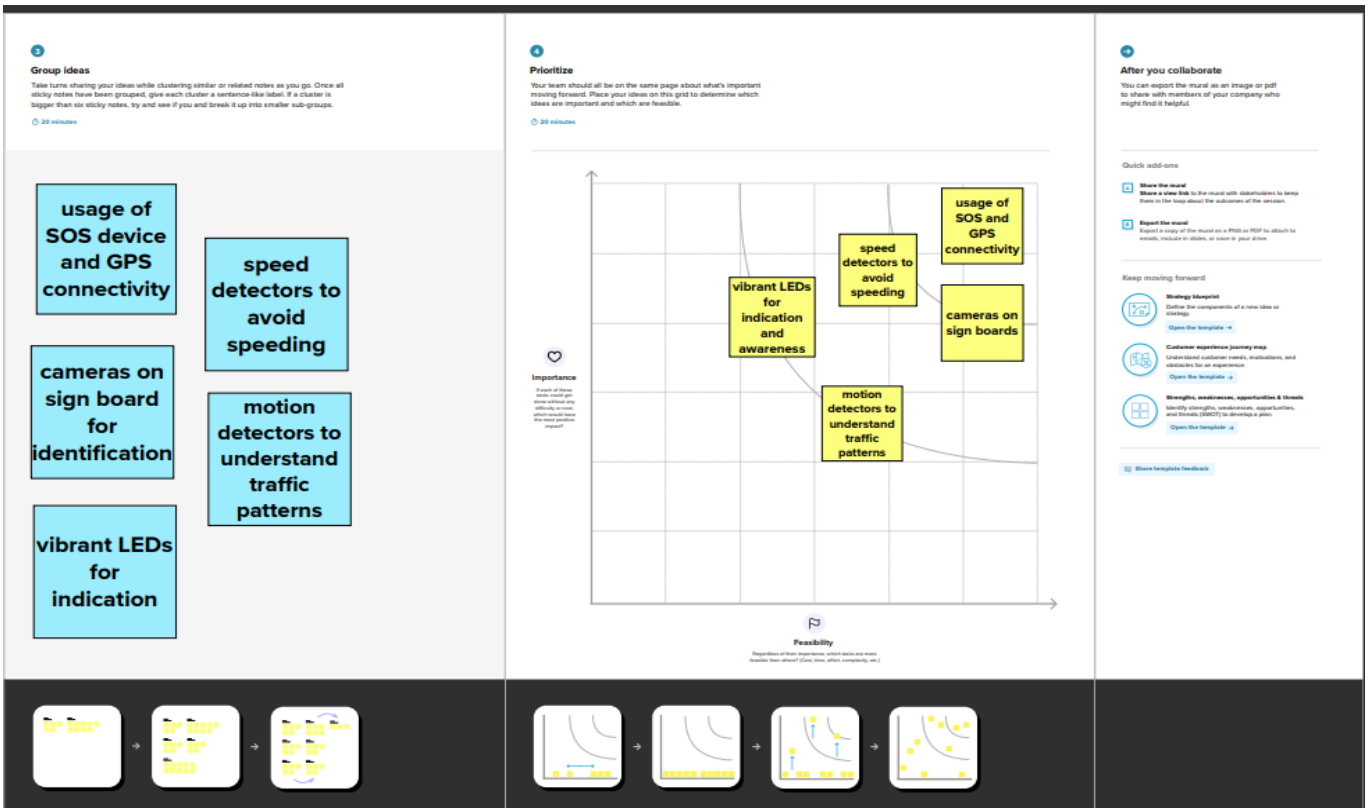
3 IDEATION & PROPOSED SOLUTION

3.2 Empathy map



3.2Canvas ideation & brainstorming



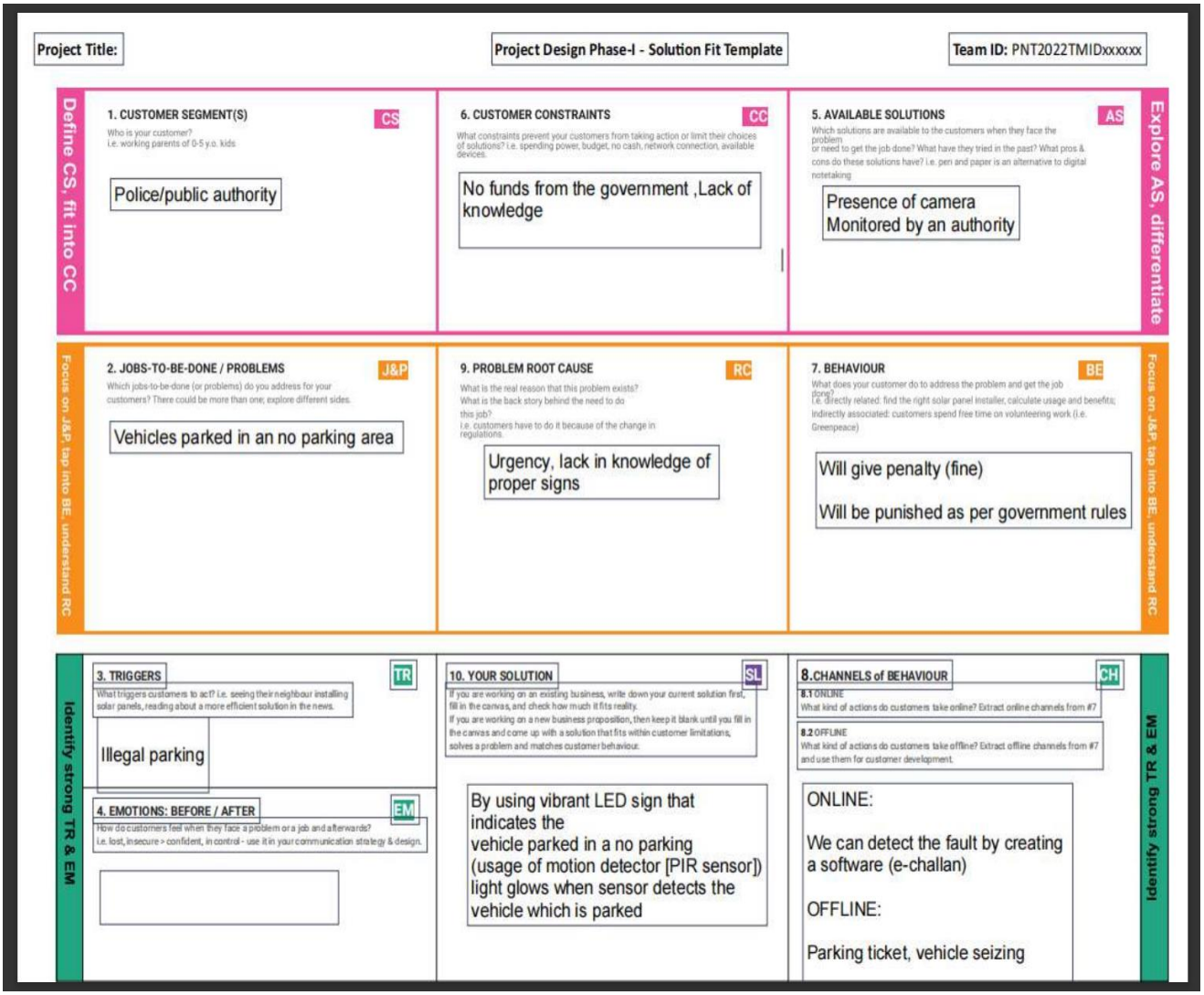


3.3Proposed solutions

S.NO	PARAMETER	DESCRIPTION
1.	Problem Statement (Problem to be solved)	• Over speeding in highways. • Heavy **traffic awareness**. • Parked vehicles at no parking areas.
2.	Idea / Solution description	• Usage of IOT devices in **Sign boards** to indicate heavy traffic beforehand. • Availability of **SOS and GPS** connectivity at selective sign boards. • Indication of parked cars in no parking area using motion detectors in signs.
3.	Novelty / Uniqueness	• Using **IOT**, makes it easier to communicate within devices such that we would have less involvement of humans. • Usage of **Arduino-uno** which is an open-source programmable board.
4.	Social Impact / Customer Satisfaction	• This would help customers to be aware of traffic beforehand so that they could use another route. • Helpful for police to observe over speeding in highways and **to detect** vehicles parked in a No-parking area.
5.	Business Model (Revenue Model)	• Arduino is flexible, easy to program and inexpensive. • **PIR** sensor is used to detect high speed and motion, **RF** transmitter is **SOS** device. • **GPS** module using google maps is easily accessible.

6.	Scalability of the Solution	• Works **90%** of all times. • Helps in **abiding rules** to ensure road safety. • Very effective in case of **emergency**.

3.4Problem Solution Fit



4. REQUIRMENT ANALYSIS

4.1 Functional Requirements:

Following are the functional requirements of the proposed solution.

FR No.	Functional Requirement (Epic)	Sub Requirement (Story / Sub-Task)
FR-1	Arduino board	• Arduino board which helps us connect LED and PIR sensor
FR-2	Database	• IBM cloud foundry to store information obtained from the sensor such that we can manage catalog for repeated usage (SOS)
FR-3	User Interface	• User login (application for authorities)
FR-4	Testing	• With the help of API testing, we can identify if our device can detect an obstacle using IOT
FR-5	Battery life	• It depends on the weather therefore, installation of solar panels behind the sign helps power supply • Power supply from nearby transformer (7-12V)
FR-6	Structure	• Road sign that can withhold Arduino connections inside it (water proof sign board) • Compatible with LEDs

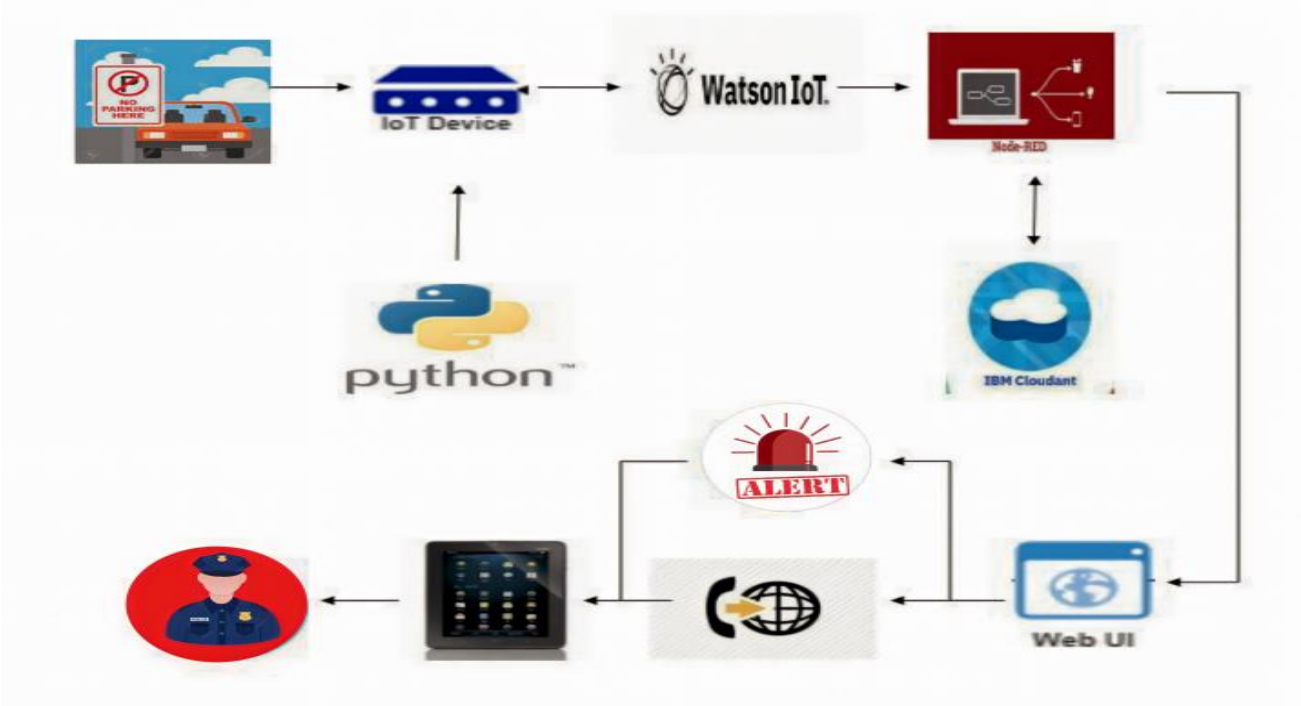
4.1 Non-Functional Requirements

Following are the non-functional requirements of the proposed solution.

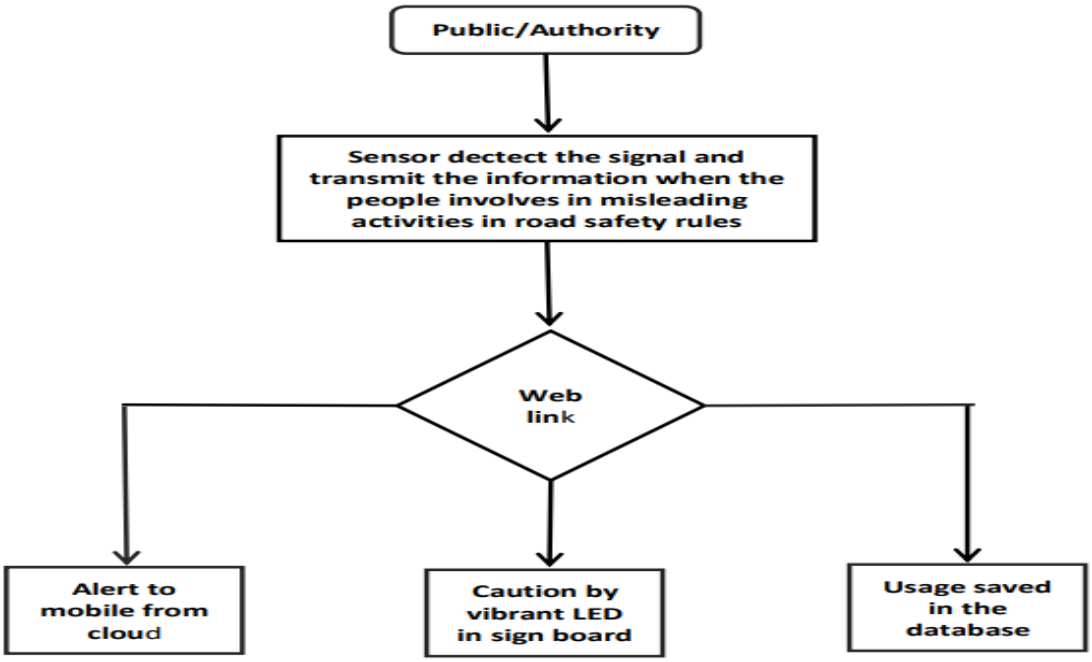
FR No.	Non-Functional Requirement	Description
NFR-1	**Usability**	• This device consists of an Arduino board connected with LEDs {vibrant} which glows when motion is detected by the PIR sensor
NFR-2	**Security**	• Open security for the prototype. Encrypted protocol for the SOS and Emergency database.
NFR-3	**Reliability**	• Very reliable • Easy to implement • Instant identification
NFR-4	**Performance**	• This device immediately senses motion which illuminates the LEDs. • No latency when the SOS message is deployed to the control room.
NFR-5	**Availability**	• Can be available at every illegal parking space, as it is easily implemented. • SOS deployment is available 24/7.
NFR-6	**Scalability**	• Size of the device (circuit connection) is compact and can easily fit into the signboard. • SOS device (RF Transmitter) is very minute and very responsive

5. PROJECT DESIGN

5.1 Data Flow Diagrams:



5.2 Solution & Technology Architecture



5.3 User Stories

User Type	Functional Requirement (Epic)	User Story Number	User Story / Task	Acceptance criteria	Priority	Release
Customer (police)	Accessing the Web using an IOT device	USN-1	As a user, I can use the Application by clicking the screen on the Tab	I can access the Tab	High	Sprint-1
		USN-2	As a user, If I don't know how to use it,I can ask help from the authority from the police booth	By the in-built IOT device	Medium	Sprint-2
Customer (Web user)	User Option	USN-1	Alert Message via SMS	By the Web	Medium	Sprint-3
		USN-2	Alert Message via Call over Internet	By the Web	High	Sprint-4

6. PROJECT PLANNING & SCHEDULING

6.1 Sprint planning and Estimation

Sprint	Functional Requirement (Epic)	User Story Number	User Story / Task	Story Points	Priority	Team Members
Sprint-1	Login	USN-1	As a user, signing in into the app is essential for the authorities. Usage of separate app for individual log in is necessary.	1	Low	Kishore Kumar, Bala, Nithiyasree, Jeremiah Paul
	Dashboard	USN-2	A home page will be available (user login) which helps to enter to next page	1	Medium	Kishore Kumar, Bala, Nithiyasree, Jeremiah Paul
Sprint-2	Help Screen	USN-3	After the Home page,it will direct you the next page which contains 3 options.	2	Medium	Kishore Kumar, Bala, Nithiyasree, Jeremiah Paul
Sprint-3	1 st option	USN-4	User can approach the vehicle parked instantly	2	Medium	Kishore Kumar, Bala, Nithiyasree, Jeremiah Paul
Sprint-4	2nd option & 3 rd option	USN-5	User can send Alert message or deploy sound to move the car. (fine can also be given)	2	High	Kishore Kumar, Bala, Nithiyasree, Jeremiah Paul

6.2 Delivery Schedule Reports from JIRA

TITLE	DESCRIPTION	DATE
Literature Survey& Information Gathering	A literature review is a comprehensive summary of previous researches on the topic. The literature review surveys scholarly articles, books, and other sources relevant to a particular area ofresearch.	17th October 2022
Prepare Empathy Map	An empathy map is a collaborative tool teams can use to gain a deeper insight into their customers. It helps us to understand the customers' pain, gain and difficulties from their point of view.	17th October 2022
Ideation-Brainstorming	Brainstorming is a group problem-solving method that helped us to gather and organize various ideas and thoughts from team members.	17th October 2022
Problem Solution Fit	It helped us understand and analyze all the thoughts of our customer,their choice of options, problems, root cause, behavior and emotions.	17th October 2022
Proposed solution	It helped us analyze and examine our solution morein the grounds of uniqueness, social impact, business model, scalability etc.	17th October 2022

Solution Architecture	Solution architecture is a complex process – with many sub-processes – that bridges the gap between business problems and technology solutions. It helped us understand the features and components used to complete the project.	17th October 2022
Customer journey map	It helped to analyze the various steps, interactions, goals and motivation, positives, negatives and opportunities.	17thOctober 2022
Data flow	A Data Flow Diagram (DFD) is a traditional visual representation of the information flows within a system. A neat and clear DFD can depict the right amount of the system requirement graphically. It shows how data enters and leaves the system, what changes the information, and where data is stored.	17th October 2022

LINK:

https://pitskishore09.atlassian.net/jira/software/projects/SWSCFBRS/boards/1?sprints=2%2C3%2C4%2C5

7. CODING AND SOLUTIONING (explain the feature added in the project)

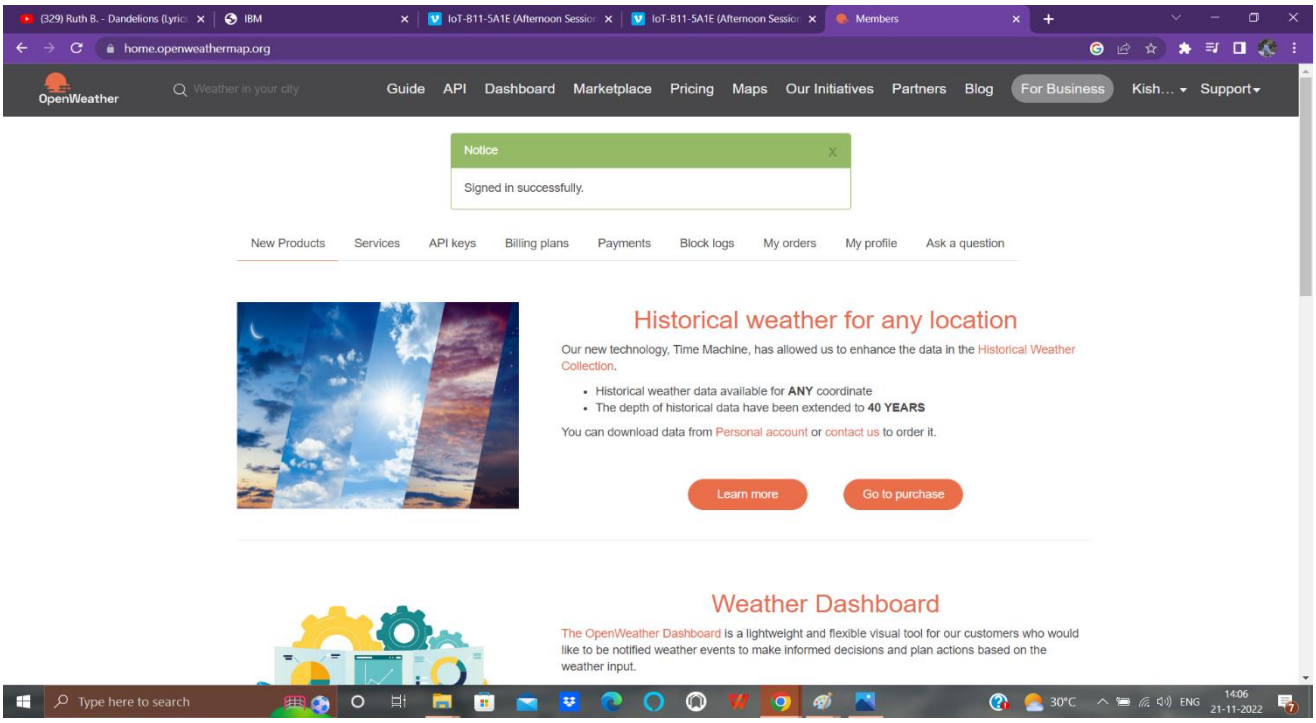
7.1 Feature 1

Integration of weather API to IBM cloud platform

cloudDataPublish.py - C:/Users/swesw/AppData/Local/Programs/Python/Python37/cloudDat...

File Edit Format Run Options Window Help

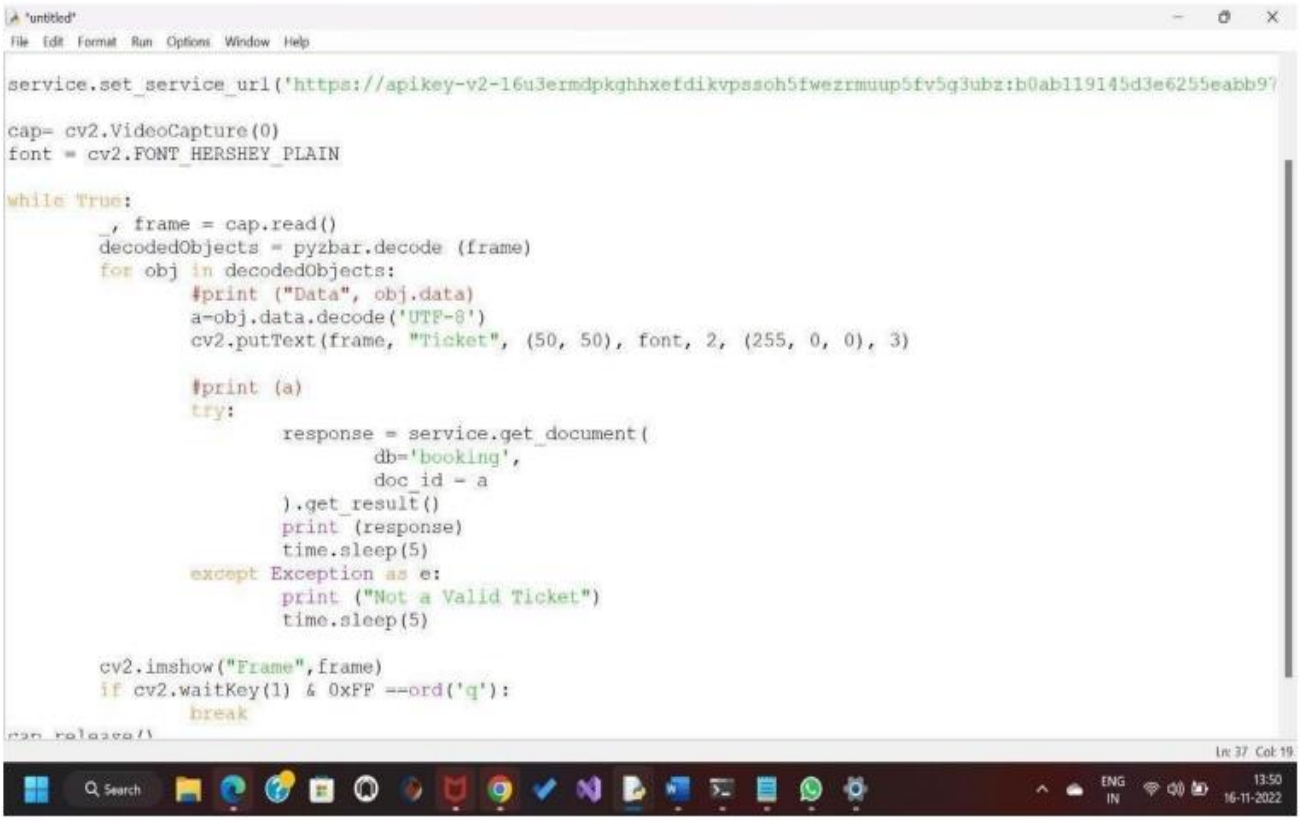
```
import wiotp.sdk.device
import time
import random
myConfig = {
    "identity": {
        "orgId": "b7lu7v",
        "typeId": "Iot_platform_device_1",
        "deviceId":"Iot_platform_ID"
        },
    "auth": {
        "token": "UH+p9wG43O?5W-vN_p"
        }
}
def myCommandCallback(cmd):
    print("Message received from IBM IoT Platform: %s" % cmd.data['command'])
    m=cmd.data['command']
client = wiotp.sdk.device.DeviceClient(config=myConfig, logHandlers=None)
client.connect()
while True:
        temp=random.randint(-20,125)
        hum=random.randint(0,100)
        myData={'temperature':temp, 'humidity':hum}
        client.publishEvent(eventId="status", msgFormat="json",data=myData, qos=
        print("Published data Successfully: %s", myData)
        client.commandCallback = myCommandCallback
        time.sleep(2)
client.disconnect()
```



7.2 Integration of IBM Cloud Platform with Node-Red and displaying in UI

- Node-red connection:

- Code:



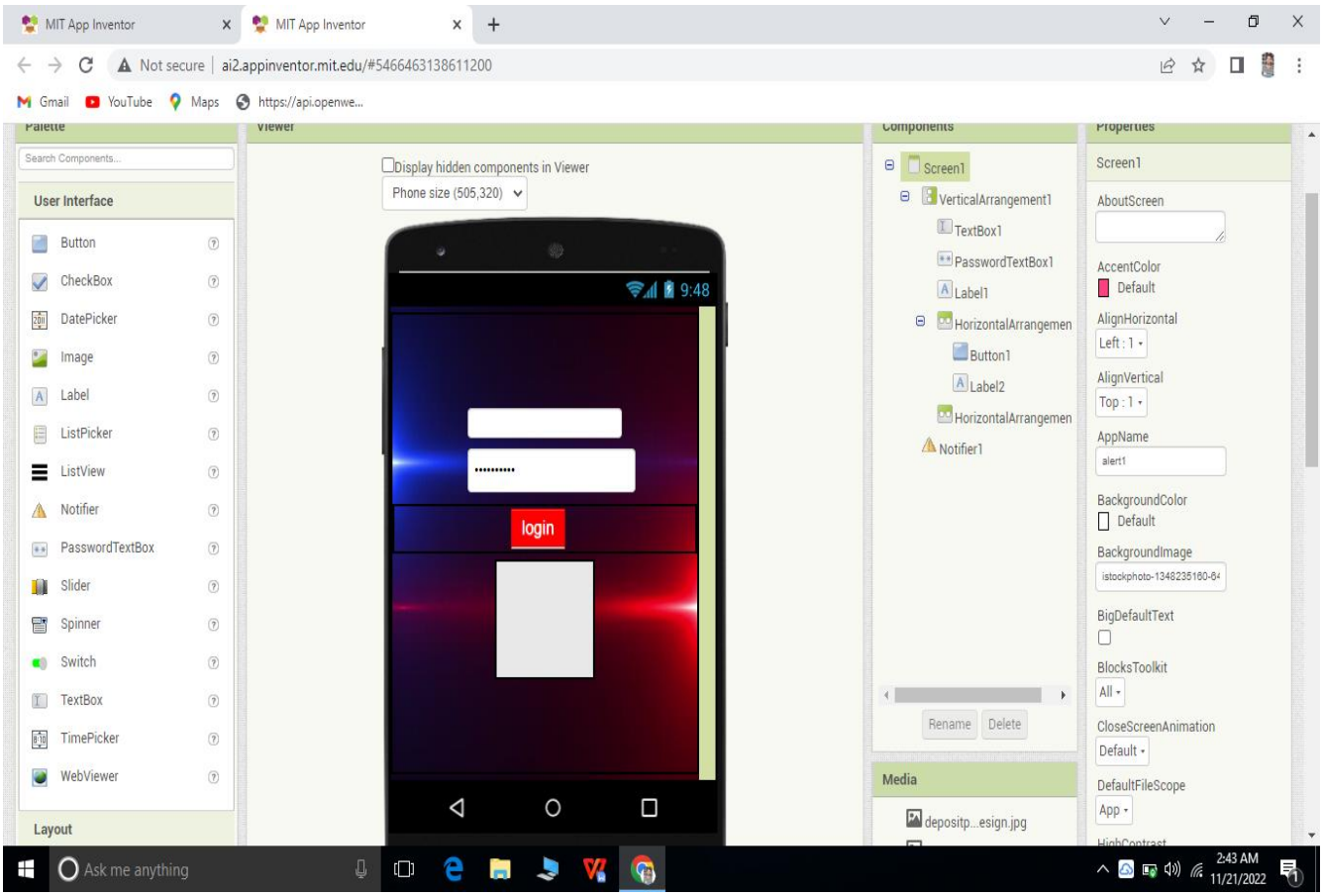
8.TESTING

App Development:

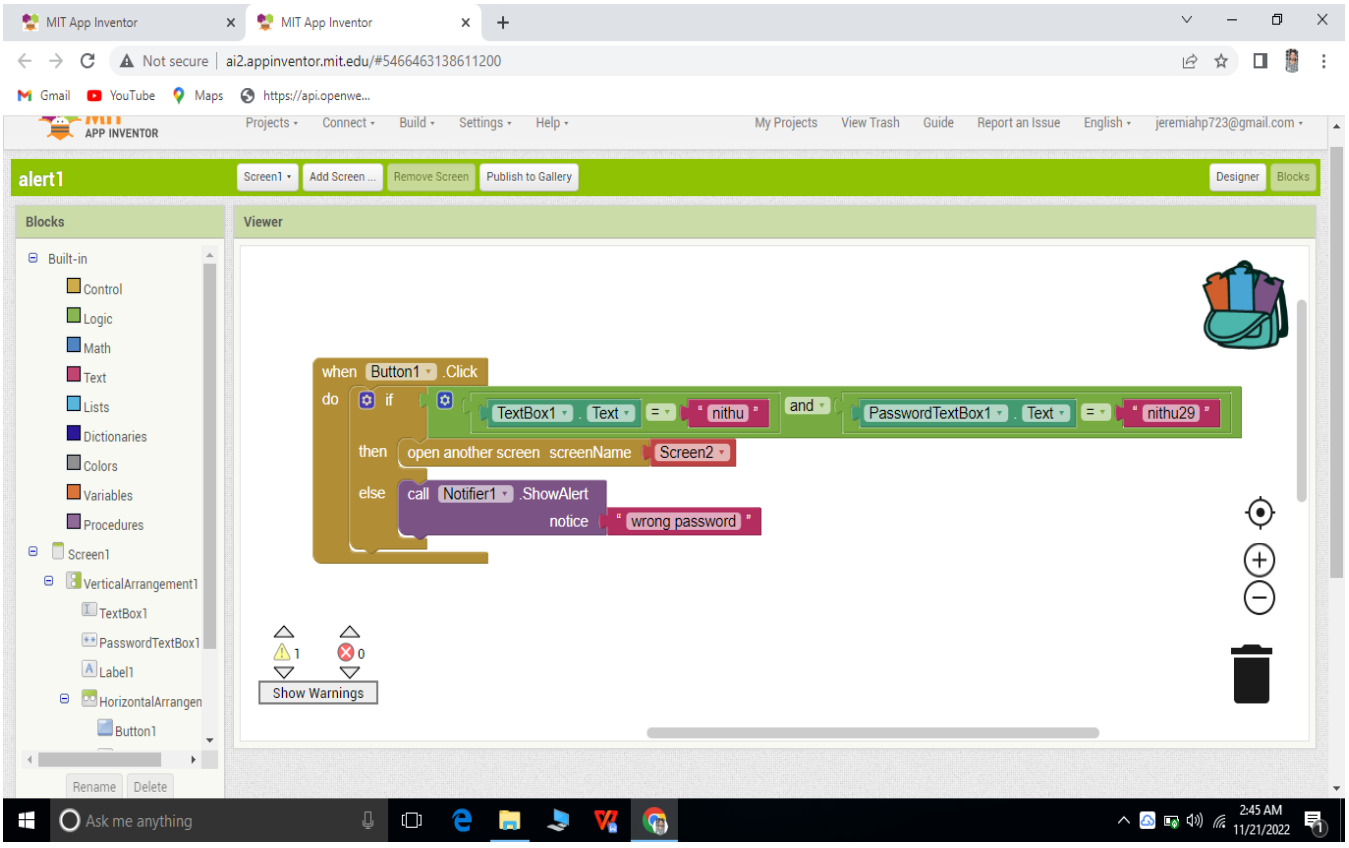
The is created using the MIT app inventor, which provides an interface for the authorities to login and to know about the detection of a vehicle. It was done by creating a login page using the app. Blocks were used to create all the command blocks (username & password). Registered user (authorities) will have their accounts saved in the database hence, the login credentials are encrypted and safe. Input of a incorrect password would indicate an alert of "wrong password!".

After successful login, the user can see the dashboard. This dashboard will indicate the alert message Once the sensor detects the vehicle. This is done by linking the application with the Node-red app. The Sensor is also linked with the cloud using the Node-red App hence, displaying the alert once detected.

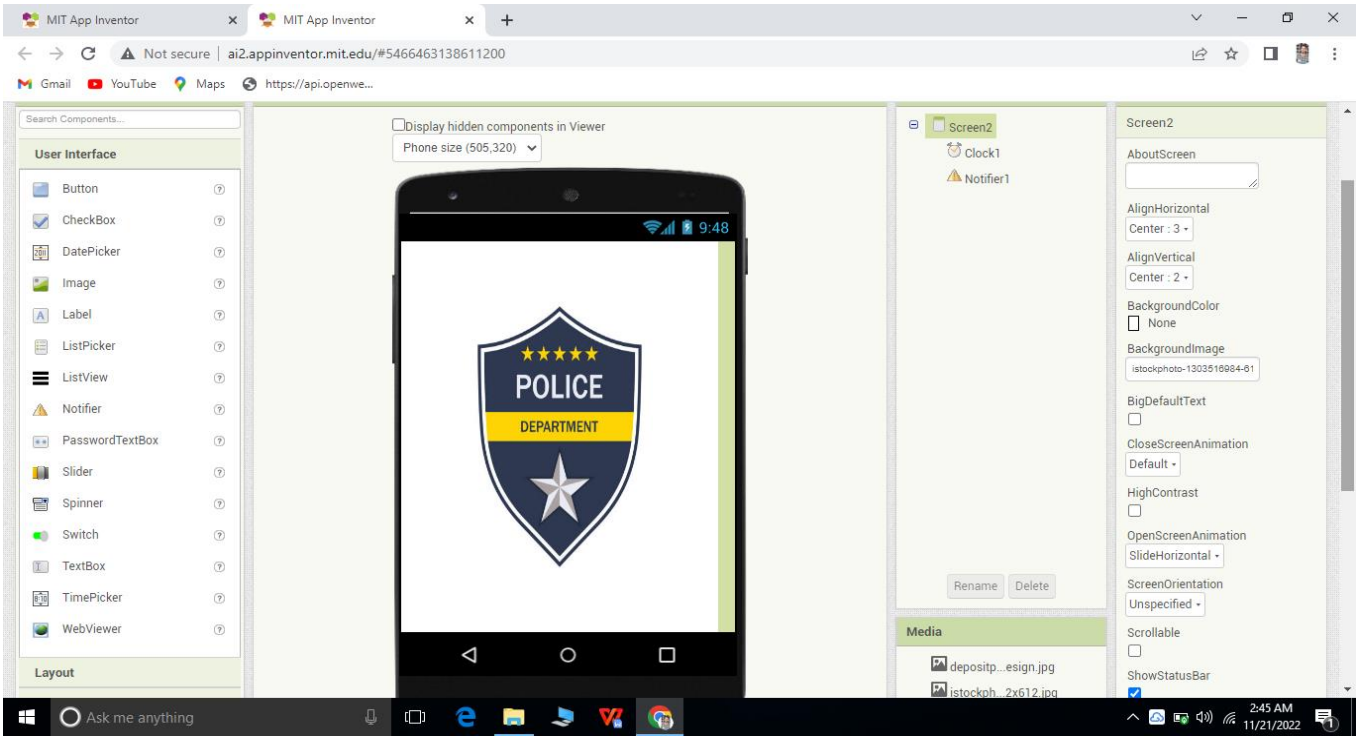
Homepage:



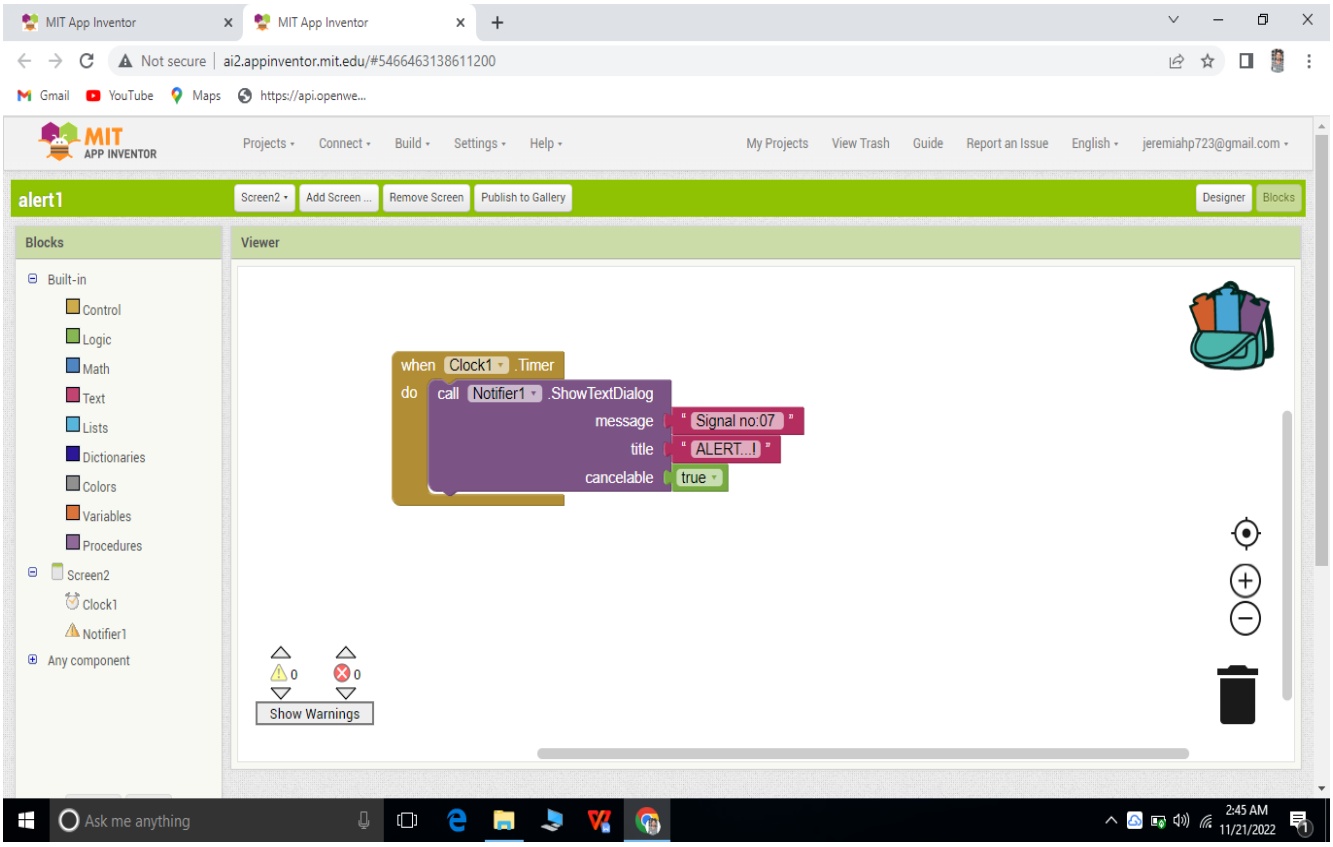
Backend of the homepage:



Dashboard:



Backend of the dashboard:

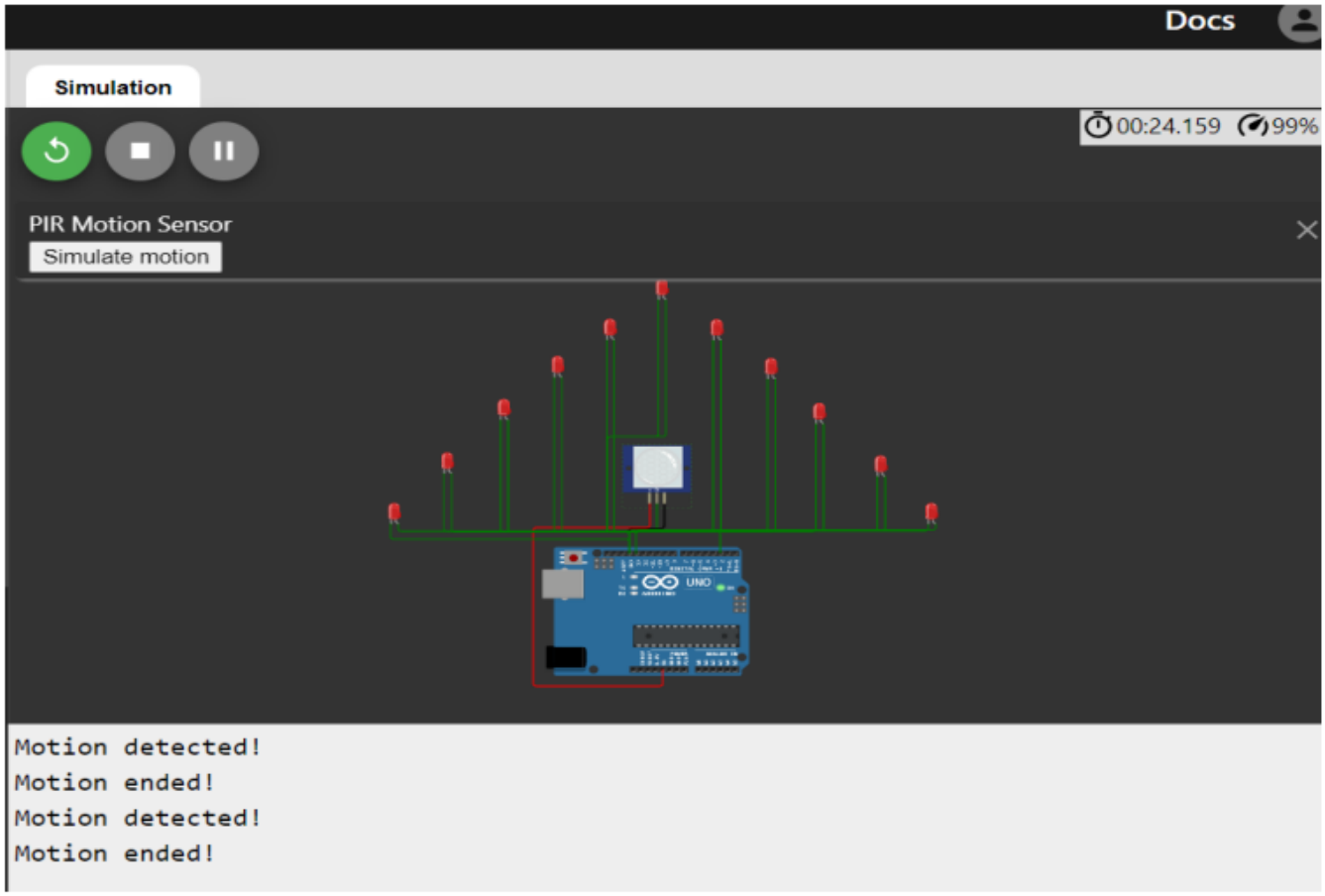


The application is further linked with the node-red app in order to display the alert once the sensor detects an obstacle.

Simulation and coding:

The components used in this simulation comprises of an Arduino Uno3 board, Passive Infrared Sensor (PIR), LED and connecting wires. This simulation is simple to implement and is commonly known as a Motion detector. The Simulation is done using the WOKWI software. Appropriate connections are given To the Arduino board. The basic idea of the project is to turn ON the LEDs when the motion is detected By the sensor. The LEDs are vibrant and are present around the signboard thus, glows when a vehicle is parked in a no-parking area.
Additional code is done to link the simulation output and the cloud using the Node-red app. Necessary Connections are done in the node-red application to send the message to application of the user.

Circuit connection:

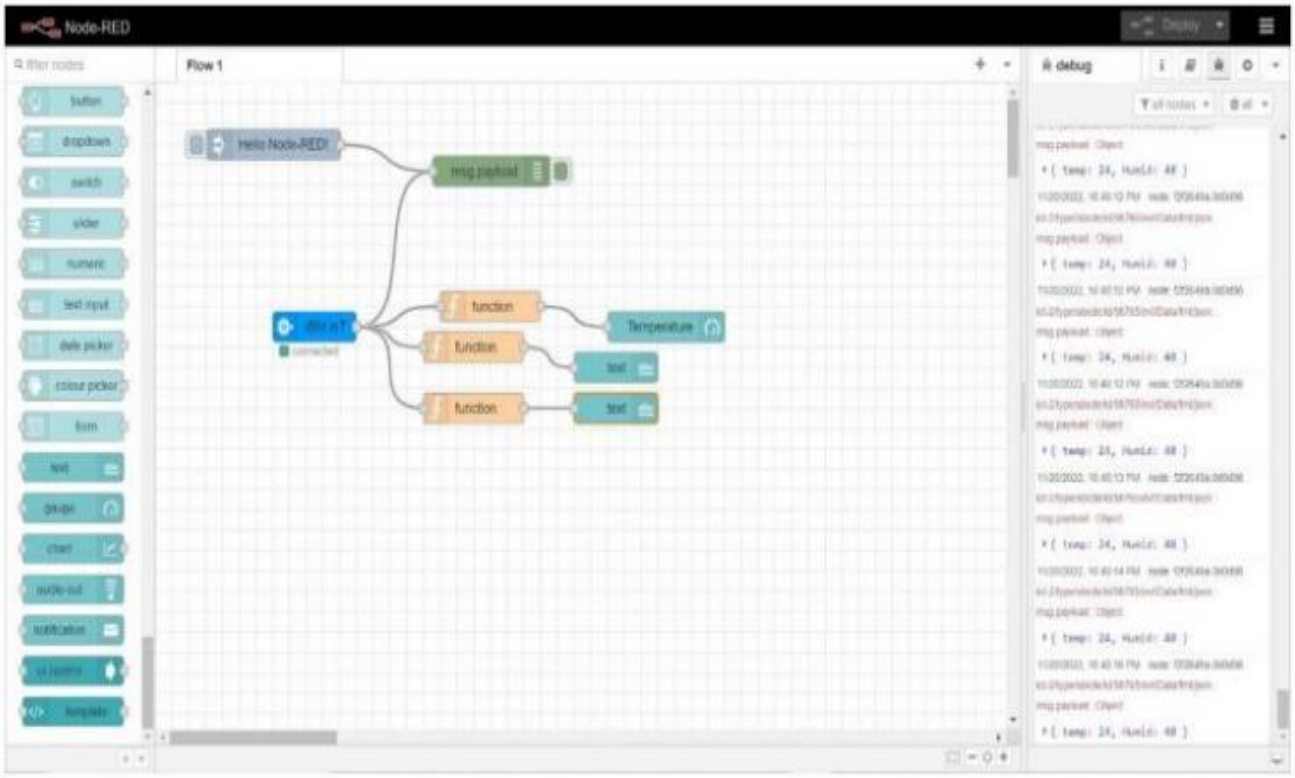


Coding:

```
int ledPin = 13;
int inputPin = 2;
int pirState = LOW;
int val = 0;
void setup() {
 pinMode(ledPin, OUTPUT);
 pinMode(inputPin, INPUT);
 Serial.begin(9600);
}
void loop() {
  val = digitalRead(inputPin);
  if (val == HIGH) {
  digitalWrite(ledPin, HIGH);
   if (pirState == LOW) {
   Serial.println("Motion detected!");
```

```
  pirState = HIGH;
}
} else {
  digitalWrite(ledPin, LOW);
  if (pirState == HIGH) {
  Serial.println("Motion ended!");
  pirState = LOW;
}
}
}
```

Node-red Connection:

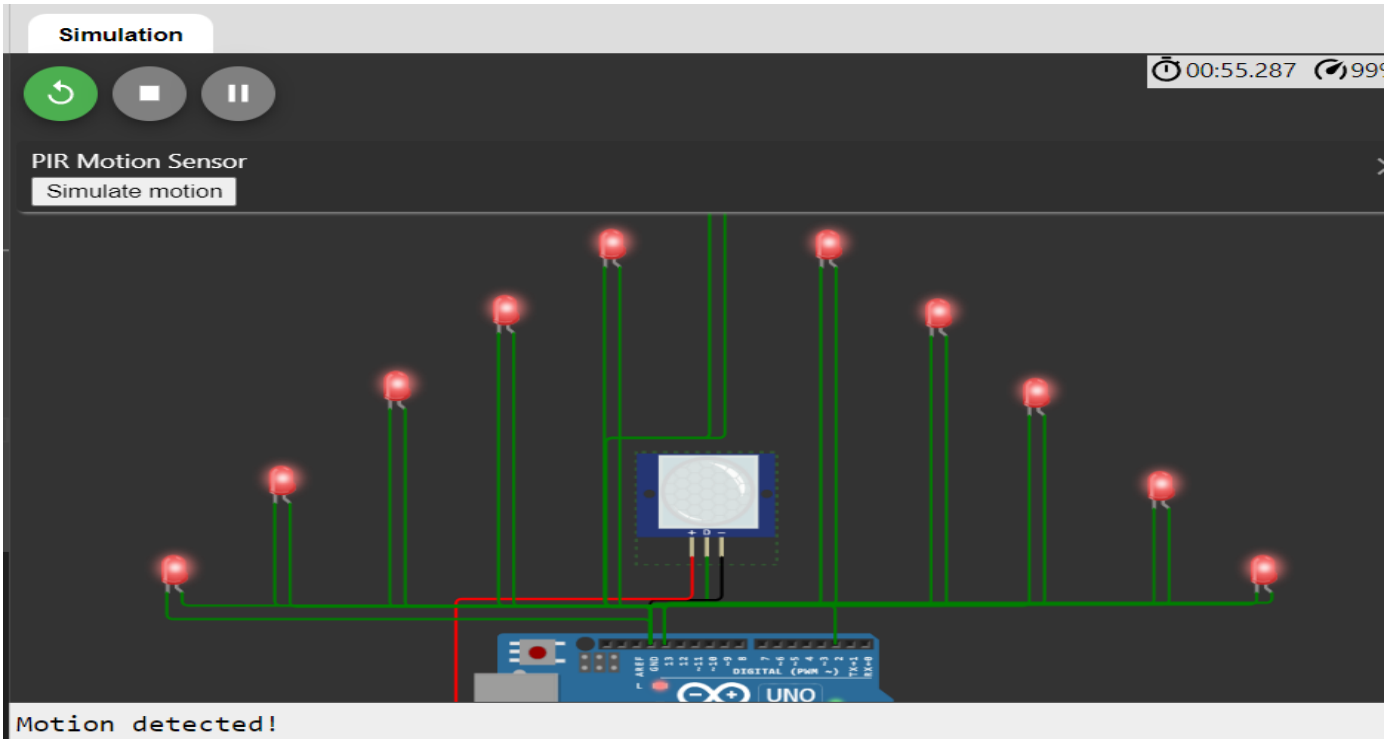


9. RESULTS

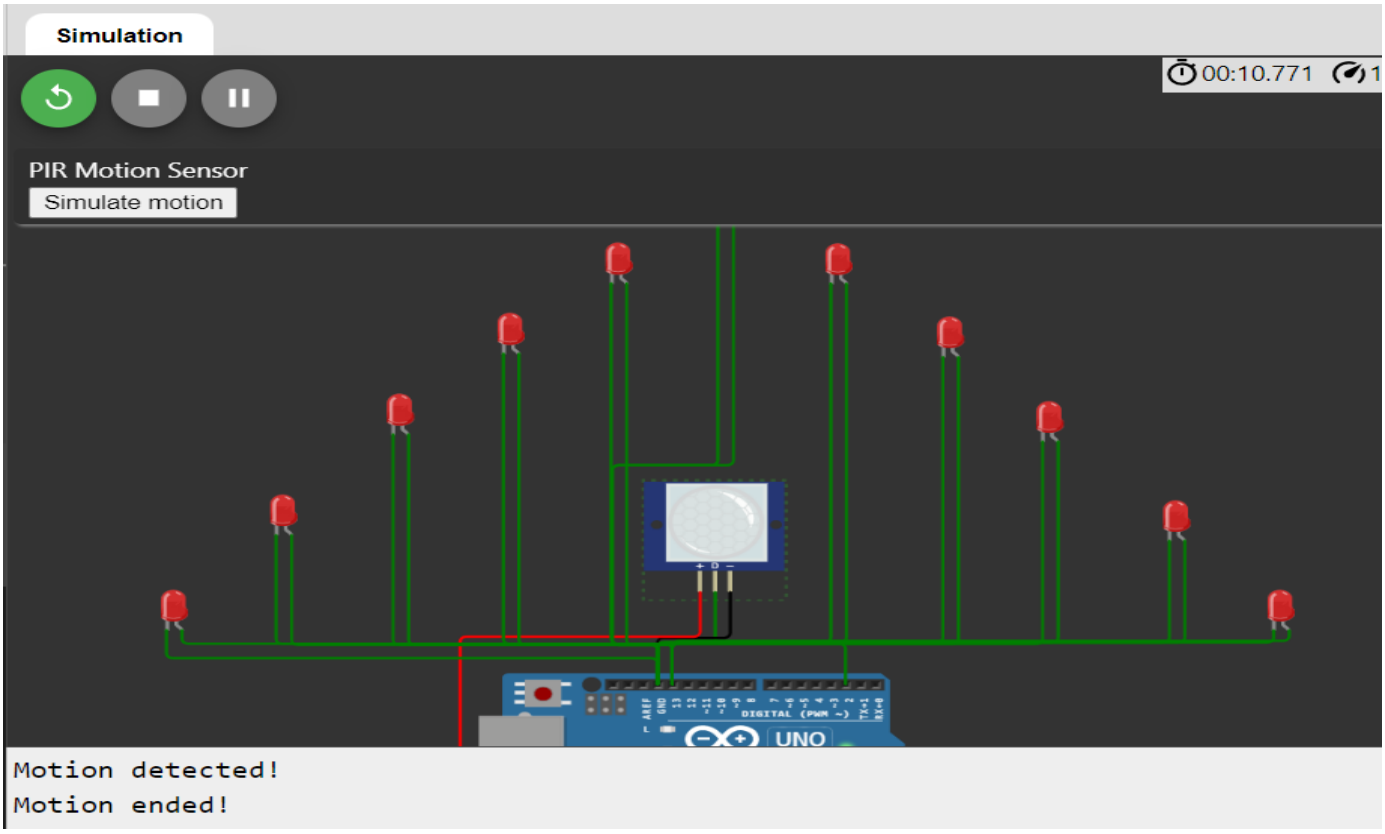
9.1 Performance Metrics

The results obtained are quite amusing and expected. The alert on the application stating “motion Detected” has been obtained. The simulation has also been executed successfully and the message is sent to the cloud. The images are stated below;

when motion is detected:



When motion has ended:



Alert on the user application:

The images above depict the execution of the simulation and sending the message to the cloud, this Helps in sending an alert to the application. The vehicle can be issued with a fine or asked to be moved.

10. ADVANTAGES AND DISAVANTAGES

10.1 Advantages

- Helps in assisting the traffic rules, major relief for the traffic police.
- traffic can be avoided.
- we could prevent accidents caused by stationary vehicles.
- Vehicles in crowded places can be avoided with the help of this sign board.
- Traffic frequency can also be monitored with the help of such sign boards.
- Penalties can be given by the traffic police to people not obeying the sign.

10.2 Disadvantages

- False detection might be an issue.
- Bad weather conditions might disrupt the device.

11. CONCLUSION

Static sign boards are not every effective as the community do not respond to those signs due To lack of knowledge thus, leading to an accident. Our project is an innovative sign board Which deals with detection of a vehicle parked in an illegal spot. This project will be very helpful and it is a very necessary project which will reduce a whole lot of accidents and save lives. This project can be used by the government to improve road safety.

12. FUTURE SCOPE

As we know, the population of the world just become 8 billion so as the population grows the numbers of people in metropolitan cities increase which in turn leads to a lot of people using cars and roads. Hence, roads should be safe for the people to use. The scope for this project will skyrocket in the coming years this project also is very flexible that is a lot of new ideas can be addedto this base idea. We can use advanced concepts of ML to calculate speed and integrate it with GMaps to know traffic details.

13. APPENDIX

13.1 Source Code:

The following code was used to simulate the connections as well as connect the output to the IOT Watson platform and Node-red application.

Code:

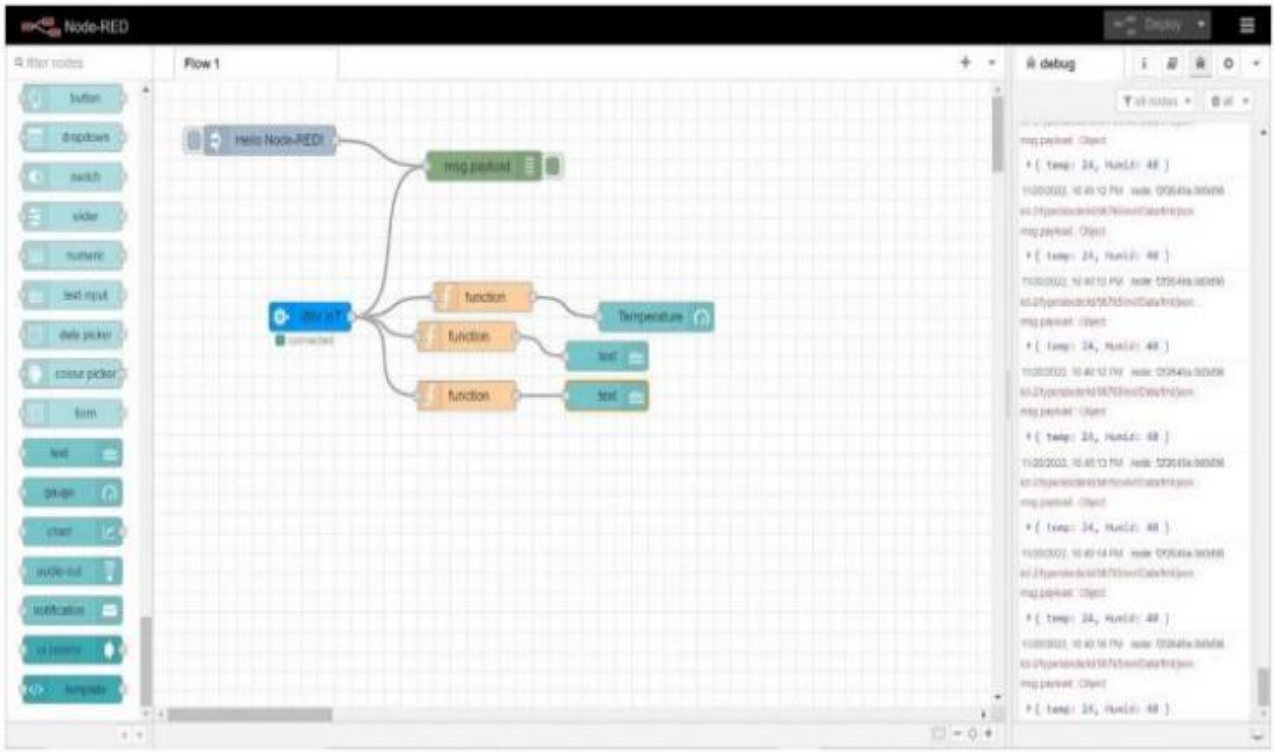
```
#include <WiFi.h>//library for wifi
#include <PubSubClient.h>//library for MQtt
#include "DHT.h"// Library for dht11
#define DHTPIN 15 // what pin we're connected to
#define DHTTYPE DHT22 // define type of sensor DHT 11
#define LED 2
DHT dht (DHTPIN, DHTTYPE);// creating the instance by passing pin and typr of
dht connected
void callback(char* subscribetopic, byte* payload, unsigned int
payloadLength);
//-------credentials of IBM Accounts------
#define ORG "i3869j"//IBM ORGANITION ID
#define DEVICE_TYPE "abcd"//Device type mentioned in ibm watson IOT Platform
#define DEVICE_ID "1234"//Device ID mentioned in ibm watson IOT Platform
#define TOKEN "12345678" //Token
String data3;
float h, t;
//-------- Customise the above values --------
char server[] = ORG ".messaging.internetofthings.ibmcloud.com";// Server Name
char publishTopic[] = "iot-2/evt/Data/fmt/json";// topic name and type of
event perform and format in which data to be send
char subscribetopic[] = "iot-2/cmd/command/fmt/String";// cmd REPRESENT
command type AND COMMAND IS TEST OF FORMAT STRING
char authMethod[] = "use-token-auth";// authentication method
char token[] = TOKEN;
char clientId[] = "d:" ORG ":" DEVICE_TYPE ":" DEVICE_ID;//client id
//-----------------------------------------
WiFiClient wifiClient; // creating the instance for wificlient
PubSubClient client(server, 1883, callback ,wifiClient); //calling the
predefined client id by passing parameter like server id,portand
wificredential
int ledPin = 13;
int inputPin = 2;
```

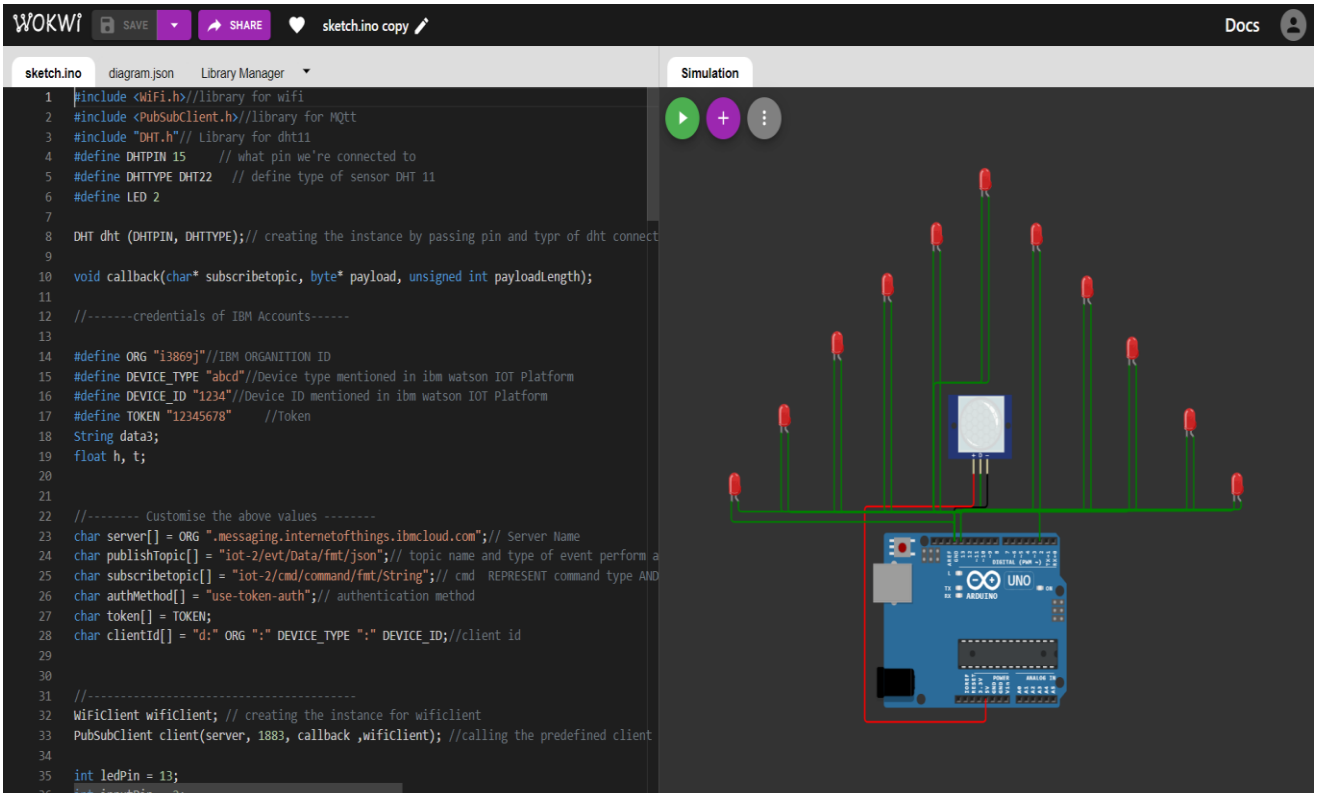
```
int pirState = LOW;
int val = 0;
void setup() {
dht.begin();
pinMode(ledPin, OUTPUT);
pinMode(inputPin, INPUT);
Serial.begin(9600);
wificonnect();
mqttconnect();
}
void loop() {
val = digitalRead(inputPin);
if (val == HIGH) {
digitalWrite(ledPin, HIGH);
if (pirState == LOW) {
Serial.println("Motion detected!");
pirState = HIGH;
}
} else {
digitalWrite(ledPin, LOW);
if (pirState == HIGH) {
Serial.println("Motion ended!");
pirState = LOW;
}
}
}
/*.....retrieving to
Cloud.....*/
void PublishData(char) {
mqttconnect();//function call for connecting to ibm
/*
creating the String in in form JSon to update the data to ibm cloud
*/
String payload = "motion detected";
payload += temp;
payload += "motion ended";
payload += humid;
payload += "}";
Serial.print("Sending payload: ");
Serial.println(payload);
if (client.publish(publishTopic, (char*) payload.c_str())) {
Serial.println("Publish ok");
```

```
// if it sucessfully upload data on the cloud
then it will print publish ok in Serial monitor or else it will print publish
failed
} else {
Serial.println("Publish failed");
}
}
void mqttconnect() {
if (!client.connected()) {
Serial.print("Reconnecting client to ");
Serial.println(server);
while (!!!client.connect(clientId, authMethod, token)) {
Serial.print(".");
delay(500);
}
initManagedDevice();
Serial.println();
}
}
void wificonnect() //function defination for wificonnect
{
Serial.println();
Serial.print("Connecting to ");
WiFi.begin("Wokwi-GUEST", "", 6);//passing the wifi credentials to establish
the connection
while (WiFi.status() != WL_CONNECTED) {
delay(500);
Serial.print(".");
}
Serial.println("");
Serial.println("WiFi connected");
Serial.println("IP address: ");
Serial.println(WiFi.localIP());
}
void initManagedDevice() {
if (client.subscribe(subscribetopic)) {
Serial.println((subscribetopic));
Serial.println("subscribe to cmd OK");
} else {
Serial.println("subscribe to cmd FAILED");
}
}
void callback(char* subscribetopic, byte* payload, unsigned int payloadLength)
{
```

```
Serial.print("callback invoked for topic: ");
Serial.println(subscribetopic);

for (int i = 0; i < payloadLength; i++) {
//Serial.print((char)payload[i]);
data3 += (char)payload[i];
}
Serial.println("data: "+ data3);
if(data3=="lighton")
{
Serial.println(data3);
digitalWrite(LED,HIGH);
}
else
{
Serial.println(data3);
digitalWrite(LED,LOW);
}
data3="";
}
```





13.2 Github & Project Demo Link

https://github.com/IBM-EPBL/IBM-Project-20078-1659712088

https://www.mediafire.com/file/cbxzjektiuaeahl/Project+demo.mp4/file