PROJECT REPORT

IBM NALAIYA THIRAN

PROJECT TITLE :

SIGNS WITH SMART CONNECTIVITY FOR BETTER ROAD SAFETY

TEAM ID : PNT2022TMID12332

TEAM MEMBERS :1.V.NEVITHA

2.R.KEERTHIKA

3.M.SELVAPRIYA

4.RAMPRIYA S

1. INTRODUCTION:

1.1 PROJECT OVERVIEW:

Technology has brought fine changes into every portion of our life by making it smartand reliable. There are many situations in which technologies can be used to avoid accidents in roads which opens a wide window for the requirement of Smart Road System. With the dynamic changes in the models of the vehicles the roads need to have same ability to face them. Evolving towards the future, the roads needs to build with advanced sensors and antenna systems to have a pace with the new era. The design involves the road side units and vehicle side units as part of intelligent transport system involving Internet of things(IOT).This project has designed a system to alert the driver about the speed limits in specific areas by reducing the speed of the vehicle in sensitive public zones without any interference of the drivers where controls are taken automatically by the use of a wireless local area network. The main objective of the proposed system is to operate the vehicles in a safe speed at critical zones minimizing the possible risk of unwitting accidents and casualties. Besides, the system is capable of detecting the accidents and give notification to the control room. The system operates in such way that the accident information is passed to the vehicles entering the same zone to take diversion to avoid traffic congestion.

The basic steps of this system are:

- Block and circuit preparation
- Hardware Implementation
- Setting up IOT

1.2 PURPOSE:

The main purpose of our project is to alter the driver about the speed limits in particular areas especially in schools, colleges, hospital and reduce the speed of the vehicles.

2.LITERATURESURVEY:

2.1Existing problem:

The early effects to prevent road accidents and to ensure road safety includes the use of speed detection devices, CCTVs, speed limiters and emergency accident units as the first phase.Despite achieving the state-of-the-art performance, the existing systems suffer fromtwo main problems,

- Over Speed: These systems cannot control speed at some specific zones.
- Exact location of accident occurred: These systems cannot give the precise location of accident.

2.2REFERENCES:

S.No	Author	Paper Title	Journal & Year	Remarks / Critics
1.	Ashish Dhar	Traffic and road condition monitoring system	Indian Institute of Technology, Mumbai. - 2008.	Reports severity, intensity and dimension of a damaged road segment. Proposed a different solution using AMR Magnetic Sensor.
2.	Pooja Pawar, Suvarna Langade, Mohini Bandgar	IOT Based digital Notice Board using Arduino ATMega 328.	International Research Journal of Engineering and Technology(IRJET). - 2019.	Circulates notice regularly &reduce physical efforts. Send message at any distant location within a second.
3.	Sandeep Chaware, Trushitha Chaware.	Proposed Algorihm for Smart Traffic Control using Ultrasonic Sensor.	International Journal of Engineering and Advanced Technology(IJEAT). - 2019.	The outcome of the projectis to learn insights of the traffic controlling and management at the signal with the dynamically changing in timing of timer as per need.
4.	Kamna Singh, Deepa Bura	IOT:distinct algorithms for the Sensor Connectivity with Comparative Studybetween node MCU andArduino MCU.	NVEO Journal–2021	Presents different algorithms for the connection between different types of sensors. Brief description of node MCU & Arduino MCU. Stepby step solutionto provide connectivity with IOT technology

5.	Jack Greenhaigh	Recognizing Text BasedTraffic Signs.	IEEE – 2015	Detect all possible Road signcandidates. Reduce total regions based on contextual constraints. A Novel System for the automatic detection and recognition of text in traffic sign based on MSER & MSV.

2.3 PROBLEM STATEMENTS:

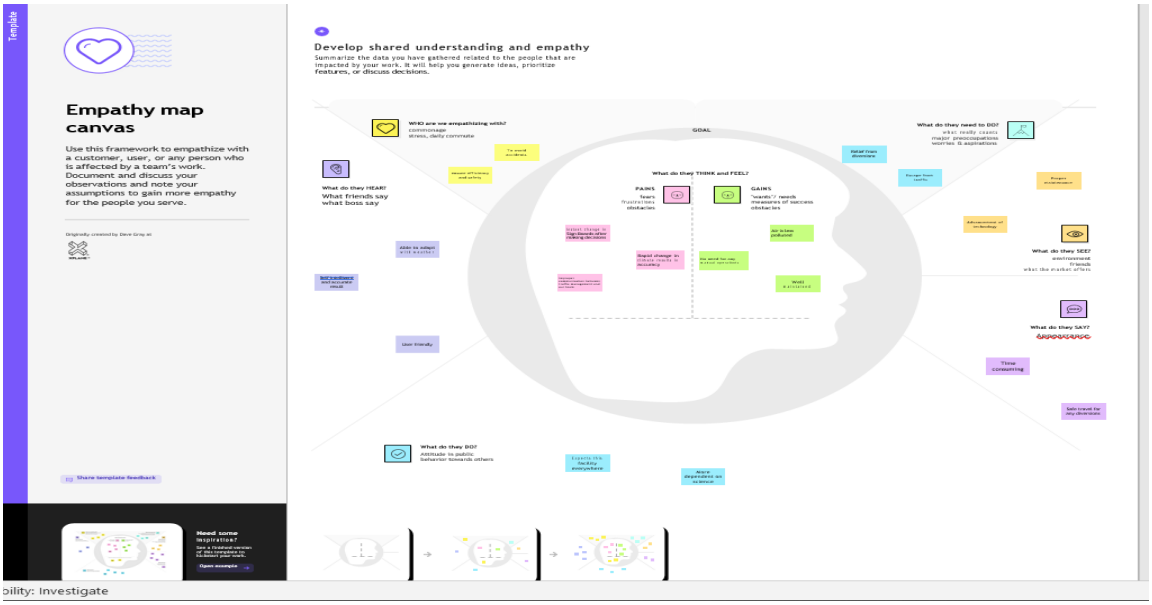
The early effects to prevent road accidents and to ensure road safety includes the use of speed detection devices ,CCTVs, speed limiters and emergency accident units.Old approaches emphasize the concept of problem-solving in Road safety, but it is more correct to recognize that Road safety activities doesn't solve problems. For instance, when a safer road design is implemented, hopefully the number of crashes, or their seriousness, will go down, but they will not disappear. It is more correct to say the implementation of correct policies, programs and measures will reduce numbers or consequences of crashes, but they will not be solved.This realization is important, becauseit changes the focus from a problem that will go away if we devote enough resources toit, to a situation requiring on-going management. This management in turn requires the development of scientifically based techniques, witch will enable us to predict withconfidence that safety resources are well-spent and likely to be effective.

Problem Statement (PS)	I am (Customer)	I'm trying to	But	Because	Which makes me feel
PS-1	As a student, I struggle with road safety caused by the heavy traffic	I'm attempting to give a helping hand in traffic management and thus prevent so many traffic violations	However, I'm unable to prevent such accidents from occurring due to driver Inexperience, Impaired driving	To bring about a better road safety initiated by one person is an impossible task, it is a social responsibility	It is one of the greatest concerns of a society to have a better road safety and itmakes me distressed.
PS-2	As a senior citizen, I findit strenuous to drive in heavy traffic	I'm trying to acclimatize to this situation outside of the car	People don't have the patience to drive beside us, they end up overtaking us which causes us to panic	As a senior citizen this change is new to us, and we are often expected to react quickly, to avoid unexpected turn of events	Driving has become a complex everyday task for me, which makesfeel anxious while I'm driving.

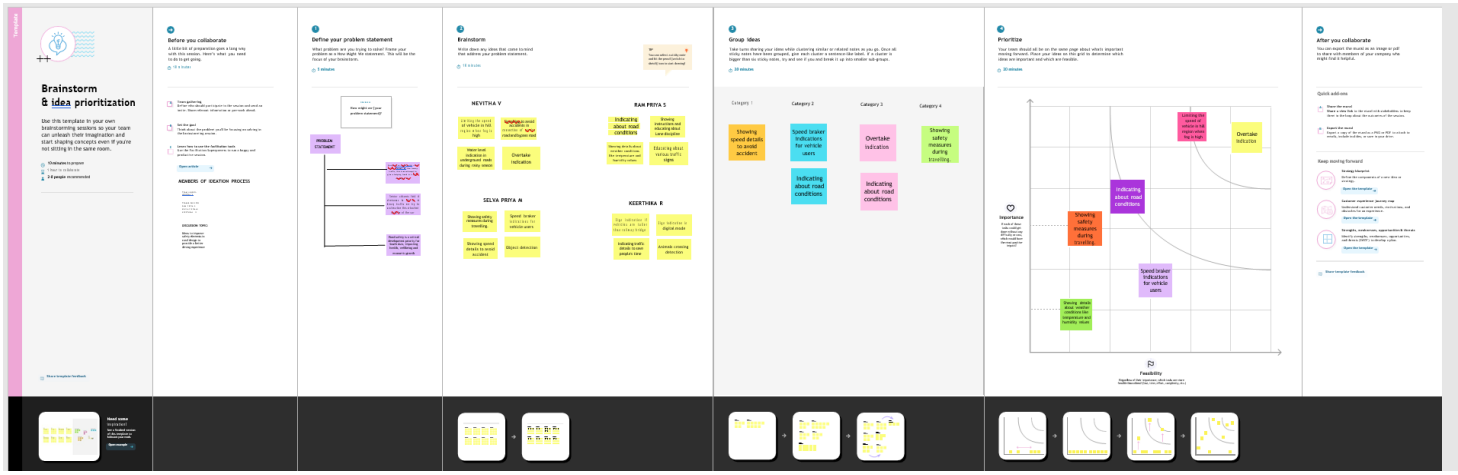
3.IDEATION AND PROPOSED SOLUTION

3.1EMPATHY MAP

An empathy map is a simple and easy to understand the problems about user's behavior's and feelings. It is a very useful tools to help to understanding theirs users. Creating an effective requirement are know the true problem from the person what its experience and pain.The exercise of creating the map from user's perspective goals and challenges.



3.2BRAINSTORMING AND IDEATION:



3.3PROPOSED SOLUTION:

1.Problem Statement (Problem to be solved) :

Smart connected sign boards are used to replace static signboards. These intelligent connected sign. Boards update automatically and obtain the speed restrictions from a web application using weather API. The speed may increase or decrease in response to changes in the weather. The display of the diversion signs depends on the flow of traffic and possible

fatalities. The necessary guide, warning, and. service signs are also posted at hospitals and restaurants.

2.Idea / Solution description:

Smart traffic signals can also be programmed to react properly to conditions like gridlock or blockage or to the movement of heavier vehicles. Smart programming and digitization. can be used to control traffic signal operations in both bigger and smaller metropolitan areas. Simple traffic programming can be utilised to avoid congestion and improve traffic. Why Road capacity may be quickly. increased when traffic lights coordinate perfectly and respond to demand in real-time. With technical experience, all of this. programming can be completed.

3.Novelty / Uniqueness:

Pedestrians have ability to request sign changes for the crosswalk signal for anyapplication that updates using both buttons and a web API.

4.Social Impact / Customer Satisfaction:

The purpose of the diversion will be shown. Pedestrians do not need to wait to. cross thestreet if there is no traffic. Customer can reach at the target. destinations earlier than expected time.

5.Business Model (Revenue Model):

This project uses a business approach where income is earned based on how long users actively interact with the product, since APIs are used to actively monitor the customer's environment. This product is intended to be. provided without charge to the general public, but cash will be created by selling it to the government for a reasonable price, reducing accidents and increasing public awareness of errors or accidents on a certain road.

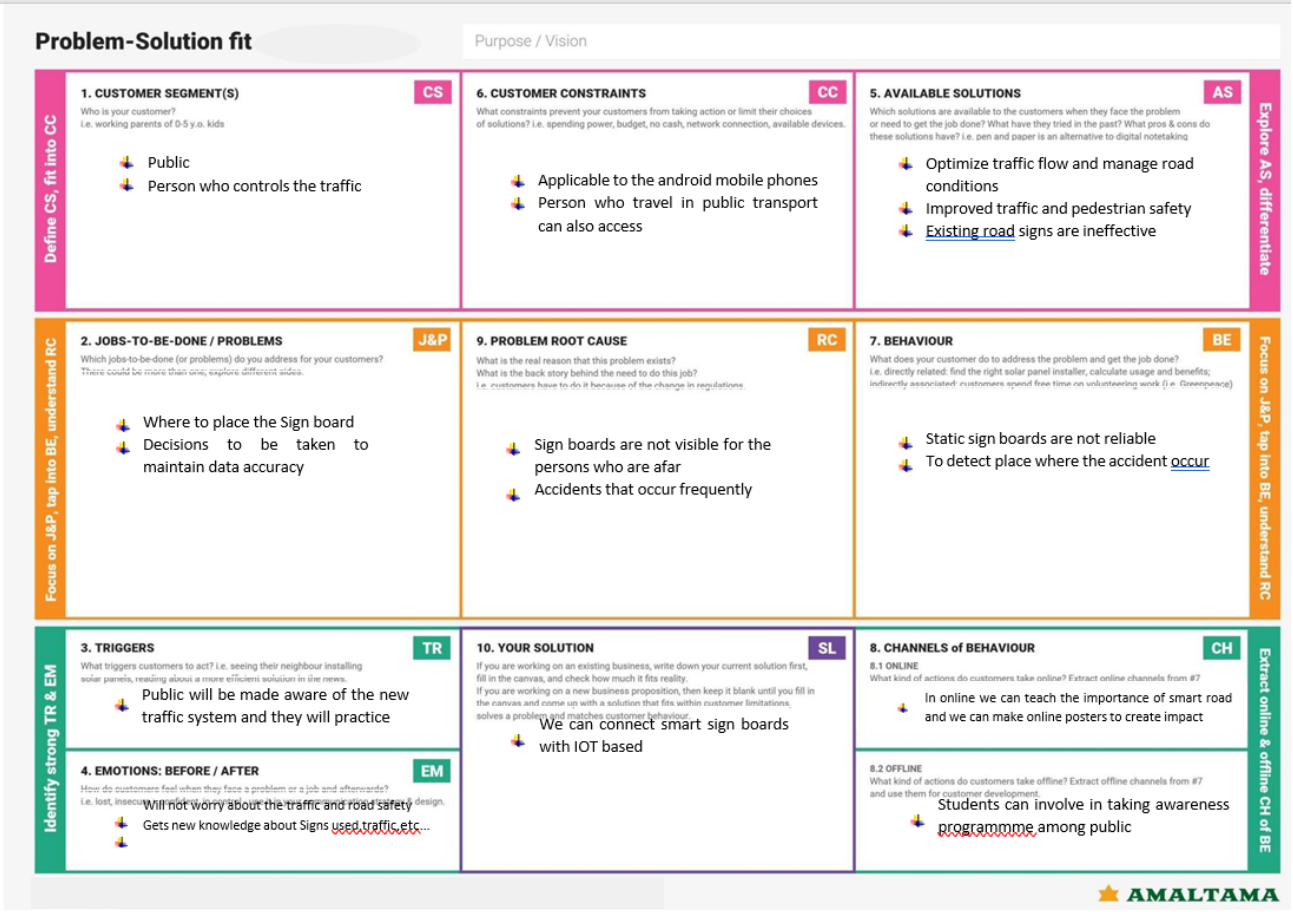
6.Scalability of the Solution:

Future updates that are needed can be quickly applied, whether they are on the

hardwareor software side. The programming of the present product can be slightly modified and the hardware components can be directly interfaced with the microcontroller. The website application must be updated with the new capabilities in the case of software by adding a new section for the updated hardware. As a result, the product's current functionality won't be impacted, and new functionality can be added with ease. Along with the hardware, a separate circuit will be preserved to detect any issues and alert the web application. A notification will also be forwarded to the product service division.

3.4 Problem –Solution Fit Template:

The problem-solution fit simply means that you have found a problem with your customer and that the solution you have realized for it actually solves the customer's problem. It helps entrepreneurs marketing and corporate innovators identify behavioral patterns and recognize what would work and why


Problem-Solution fit
Purpose / Vision
Define CS, fit into CC
1. CUSTOMER SEGMENT(S)
CS
Who is your customer?
i.e. working parents of 0-5 y.o. kids
Public
Person who controls the traffic
6. CUSTOMER CONSTRAINTS
CC
What constraints prevent your customers from taking action or limit their choices of solutions? i.e. spending power, budget, no cash, network connection, available devices.
Applicable to the android mobile phones
Person who travel in public transport can also access
5. AVAILABLE SOLUTIONS
AS
Which solutions are available to the customers when they face the problem or need to get the job done? What have they tried in the past? What pros & cons do these solutions have? i.e. pen and paper is an alternative to digital notetaking
Optimize traffic flow and manage road conditions
Improved traffic and pedestrian safety
Existing road signs are ineffective
Explore AS, differentiate
Focus on J&P, tap into BE, understand RC
2. JOBS-TO-BE-DONE / PROBLEMS
J&P
Which jobs-to-be-done (or problems) do you address for your customers? There could be more than one, explore different sides.
Where to place the Sign board
Decisions to be taken to maintain data accuracy
9. PROBLEM ROOT CAUSE
RC
What is the real reason that this problem exists?
What is the back story behind the need to do this job?
i.e. customers have to do it because of the change in regulations
Sign boards are not visible for the persons who are afar
Accidents that occur frequently
7. BEHAVIOUR
BE
What does your customer do to address the problem and get the job done?
i.e. directly related: find the right solar panel installer, calculate usage and benefits; indirectly associated: customers spend free time on volunteering work (i.e. Greenpeace)
Static sign boards are not reliable
To detect place where the accident occur
Focus on J&P, tap into BE, understand RC
Identify strong TR & EM
3. TRIGGERS
TR
What triggers customers to act? i.e. seeing their neighbour installing solar panels, reading about a more efficient solution in the news.
Public will be made aware of the new traffic system and they will practice
4. EMOTIONS: BEFORE / AFTER
EM
How do customers feel when they face a problem or a job and afterwards?
i.e. lost, insecure > confident, in control - use it in your communication strategy & design.
Will not worry about the traffic and road safety
Gets new knowledge about Signs used traffic etc...
10. YOUR SOLUTION
SL
If you are working on an existing business, write down your current solution first, fill in the canvas, and check how much it fits reality.
If you are working on a new business proposition, then keep it blank until you fill in the canvas and come up with a solution that fits within customer limitations, solves a problem and matches customer behaviour.
We can connect smart sign boards with IOT based
8. CHANNELS of BEHAVIOUR
CH
8.1 ONLINE
What kind of actions do customers take online? Extract online channels from #7
In online we can teach the importance of smart road and we can make online posters to create impact
8.2 OFFLINE
What kind of actions do customers take offline? Extract offline channels from #7 and use them for customer development.
Students can involve in taking awareness programmme among public
Extract online & offline CH of BE
AMALTAMA

4.REQUIREMENT ANALYSIS:

4.1Functional Requirements:

1.User Visibility: Sign Boards should be made with LED's which are Bright colored and are capable of attracting the drivers attention but it should also not be too distracting or blinding cause it may lead to accidents.

2.User Need: The smart sign boards should be placed frequently in places it is needed and less in places where it is not needed much to avoid confusion for the user during travel.

3.User Understanding: For better understanding of the driver, the signs should be big

clear and legible and it can also include illustrations which will make it easilyunderstandable to the driver.

4.User Convenience: The display should be big enough that it should evenbe visible from far distance clearly.

4.2Non-functional Requirements:

1.Usability: It should be able to Upgrade and Update when there is a need for it.

2.**Security:** IOT It should have good security system so that no other person isable tohack and display their own directions.

3.Reliability: It should be able to display to information correctly and error-free.

4.Performance: It should be able to automatically update itself when certain weather ortraffic problem occurs.

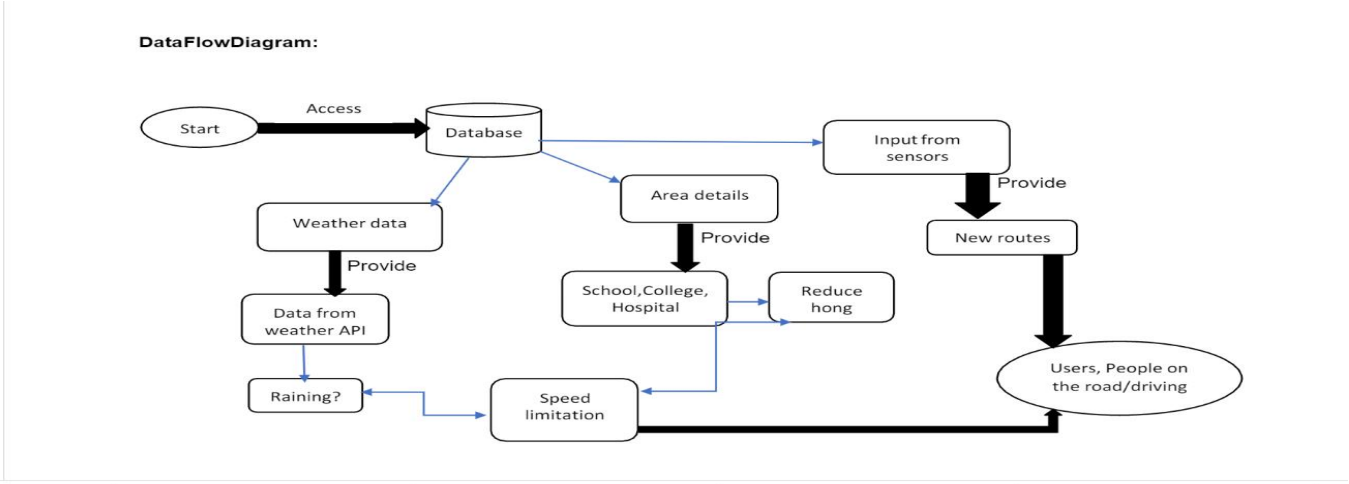
5.Availability: It should be available 24/7 so that it can be beneficial to the customer i.ethe driver.

6.Scalability: It should able to easily change and upgrade according to change and needin requirement.

5.PROJECT DESIGN:

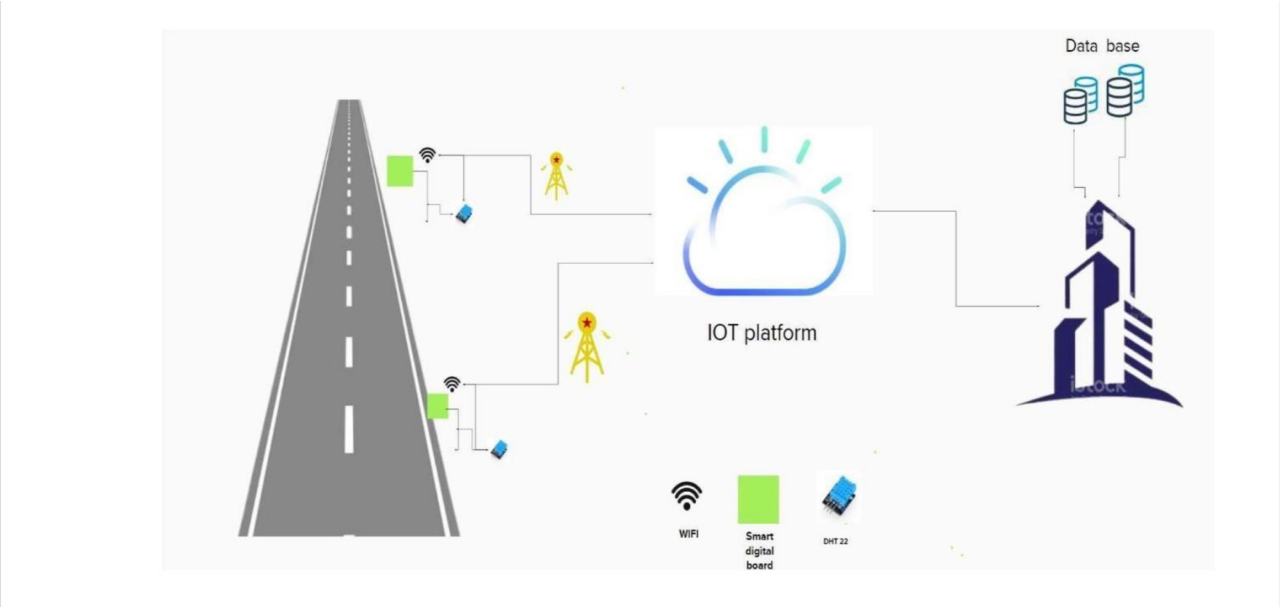
5.1Data Flow Diagram:

Data flow representation are easily understanding tools. This templates are explained our projects step by step.



5.2Solution and Technical Architecture:

The solution architecture are perform. This task has to understand how all parts are worktogether including processes, operating systems, and application architectures



6.PROJECT PLANNING AND SCHEDULING:

6.1 SPRINT PLANNING & ESTIMATION:

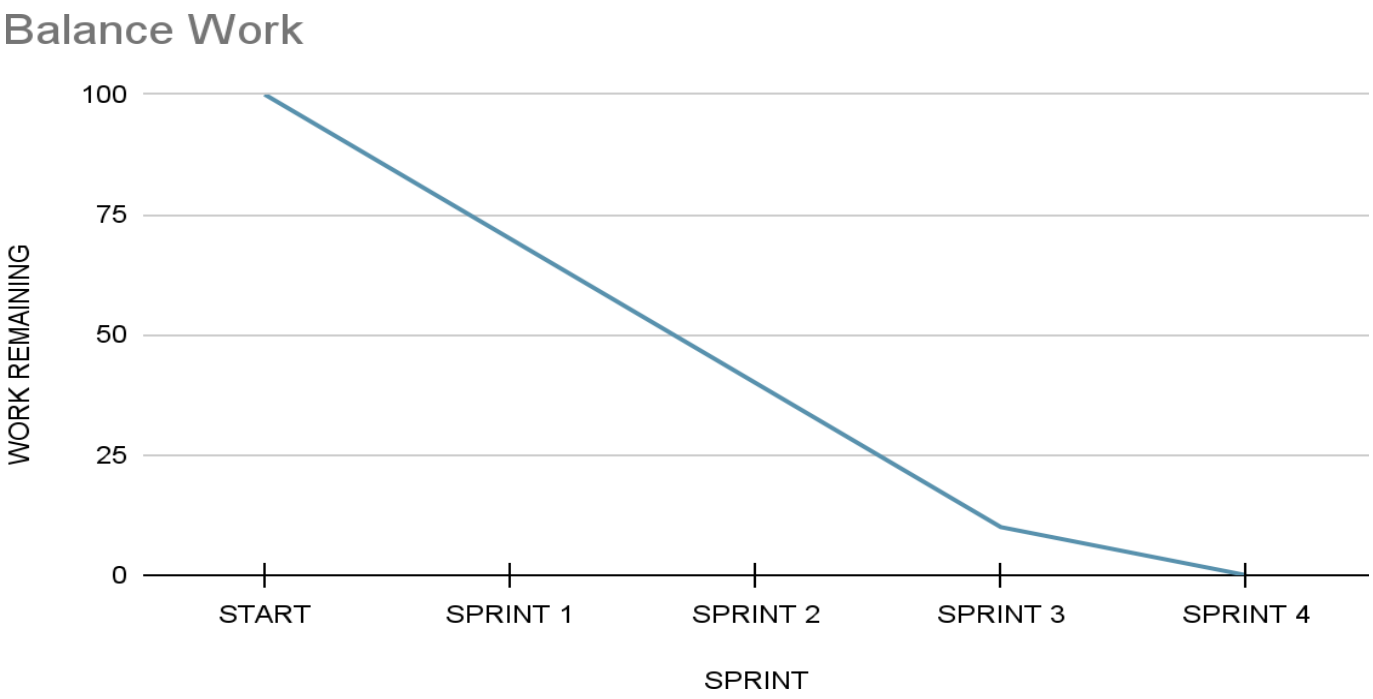
Sprint	Functional Requirement (Epic)	User Story / Task	Story Points	Priority	Team Members
Sprint-1	Resources Initialization	Create and initialize accounts in various publicAPIs like Open Weather API.	1	LOW	V.Nevitha, R.Keerthika, M.SelvaPriya, S.RamPriya
Sprint-1	Local Server/Software Run	Write a Python program that outputs resultsgiven the inputs like weather and location.	1	MEDIUM	V.Nevitha, R.Keerthika, M.SelvaPriya, S.RamPriya

Sprint-2	Push the server/software tocloud	Push the code from Sprint 1 to cloud so it can beaccessed from anywhere	2	MEDIUM	V.Nevitha, R.Keerthika, M.SelvaPriya, S.RamPriya
Sprint-3	Hardware initialization	Integrate the hardware to be able to access thecloud functions and provide inputs to the same.	2	HIGH	V.Nevitha, R.Keerthika, M.SelvaPriya, S.RamPriya
Sprint-4	UI/UX Optimization & Debugging	Optimize all the shortcomings and provide better user experience.	2	LOW	V.Nevitha, R.Keerthika, M.SelvaPriya, S.RamPriya

6.2SPRINT DELIVERY SCHEDULE:

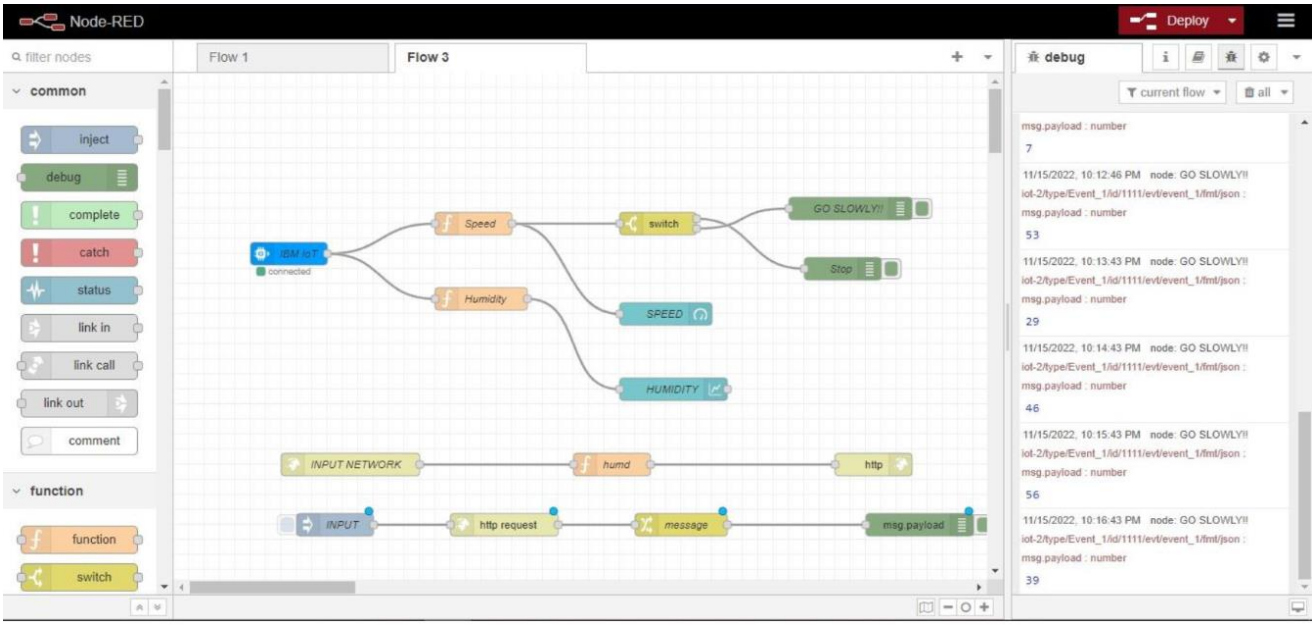
Sprint	Total Story Points	Duration	Sprint Start Date	Sprint End Date (Planned)	Story Points Completed (as on Planned End Date)	Sprint Release Date (Actual)
Sprint-1	20	4 Days	29 Oct 2022	01 Nov 2022	20	01 Nov 2022
Sprint-2	20	3 Days	01 Nov 2022	03 Nov 2022	20	03 Nov 2022
Sprint-3	20	7 Days	04 Nov 2022	10 Nov 2022	20	10 Nov 2022
Sprint-4	20	7 Days	11 Nov 2022	17 Nov 2022	20	17 Nov 2022

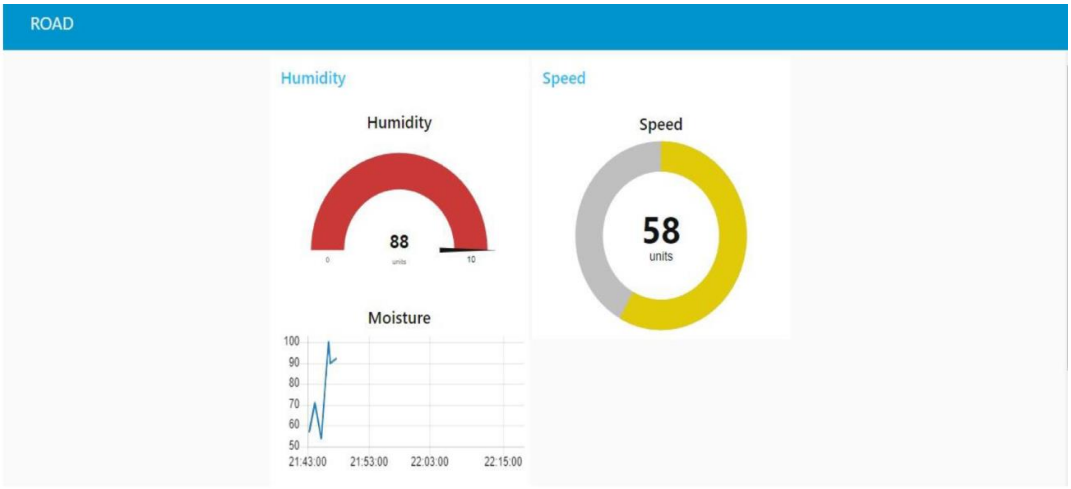
Burndown Chart:



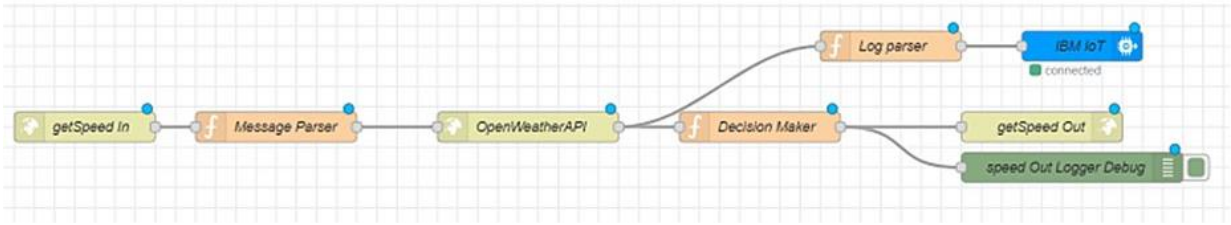
7.CODING AND SOLUTIONS:

7.1 FEATURE 1

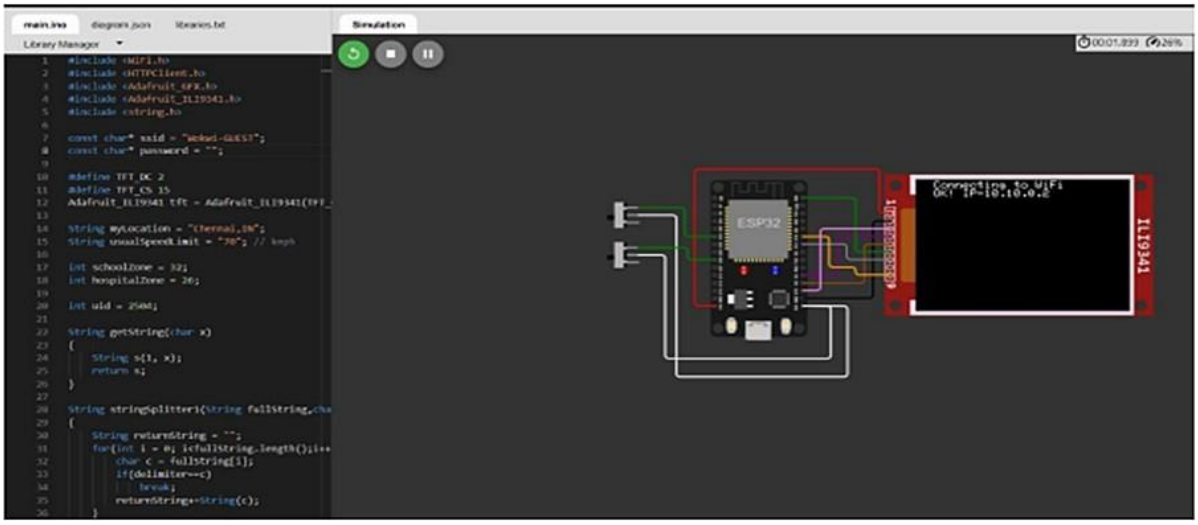


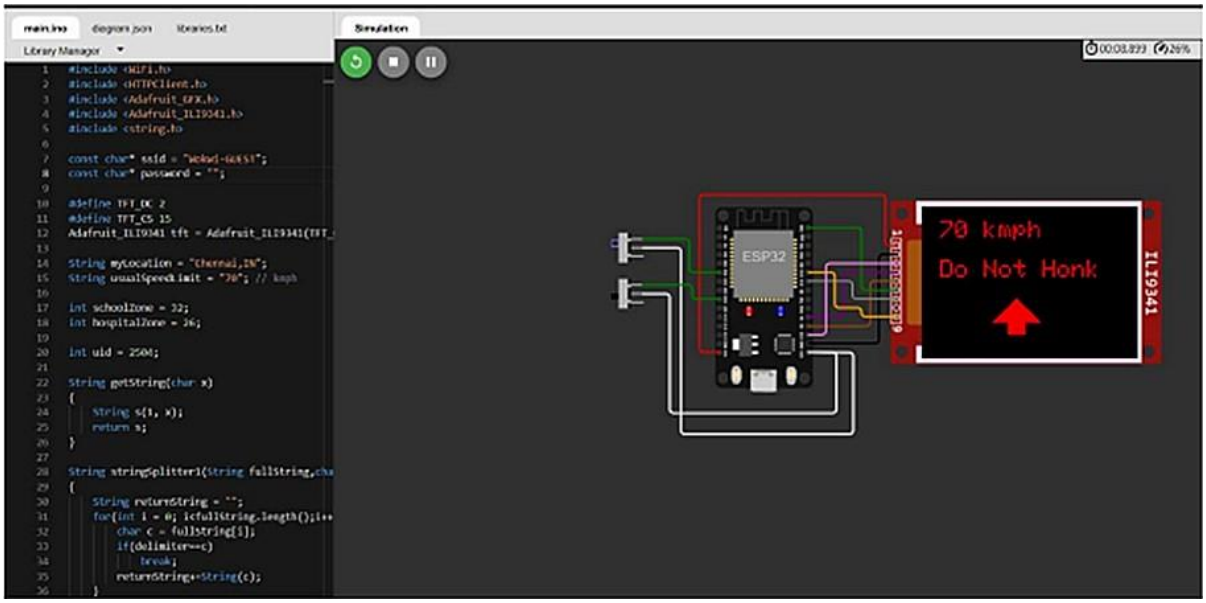


get speed API flow:



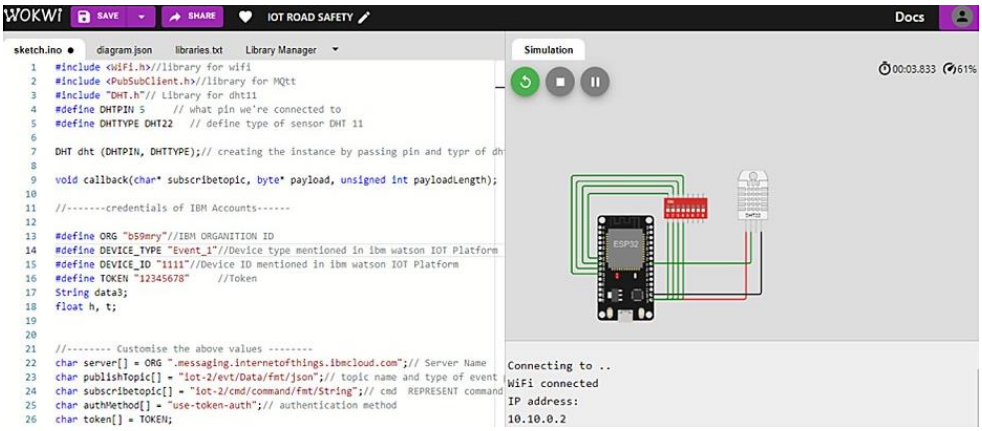
7.2 FEATURE 2:

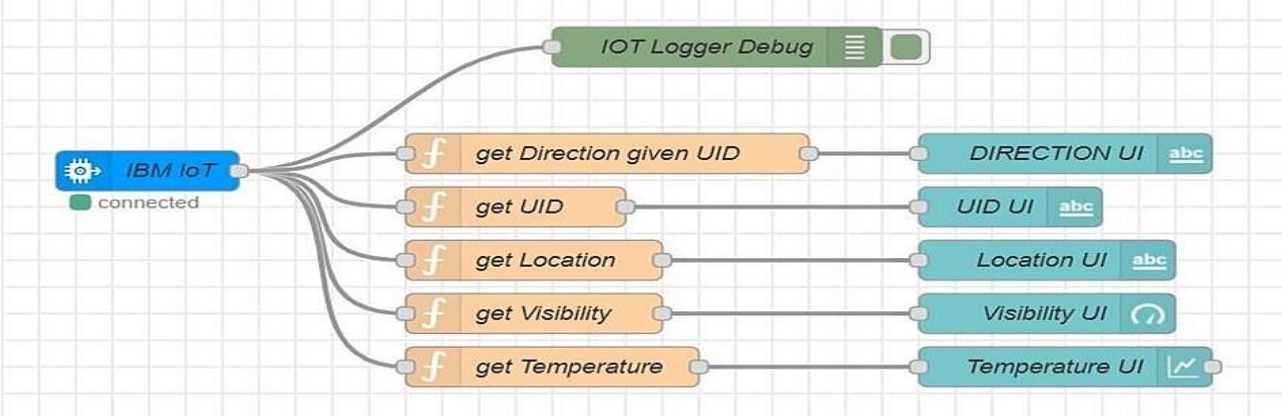




8.TESTING:

8.1TestCases:





9.RESULTS:

We have presented a system, to alert the driver about the speed limits in specific areas and reduce the speed of the vehicles in sensitive public zones without any interference of the drivers where controls are taken automatically by the use of a wireless local area network. In the initial phase, we designed the basic block and circuit diagram for the system. In the implementation phase, we executed the hardware with the help of IoT connecting technologies such as Blynk app. Extensive experiments conducted on IoT and other connecting technologies.

10.ADVANTAGES:

- Smart road technology can assist in optimizing traffic flow and managing road condition
- Reducing the congestion and emissions
- It helps traffic light to operate in real-time condition.

11.CONCLUSION:

The road rules, avoiding excessive speeds and improved general awareness can

significantly reduce the risk of a traffic accident. Regularly checking vehicle health and maintenance of parts also eliminates any potential risks.

12.FUTURE SCOPE:

The Safe System goals and strategies focus on providing a road traffic system free from death and serious injury. The Safe System guides the planning, design, management, operationand use of the road traffic system so as to provide safety in spite of human fallibility.

13.APPENDIX:

a. Circuit Diagram:

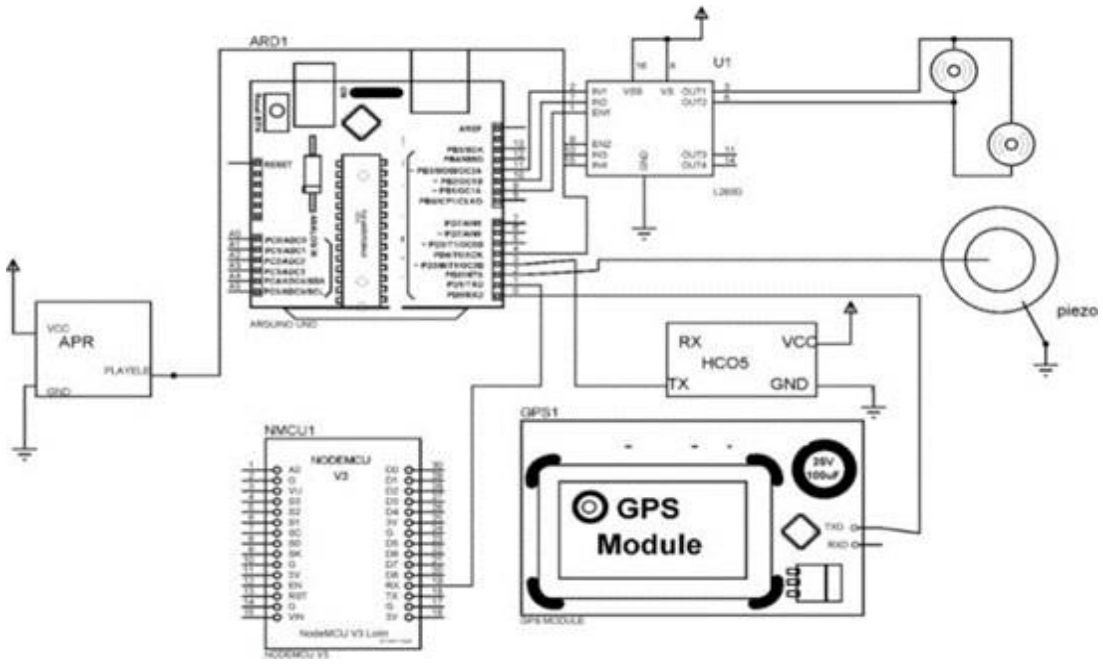


Figure 1:Control Side

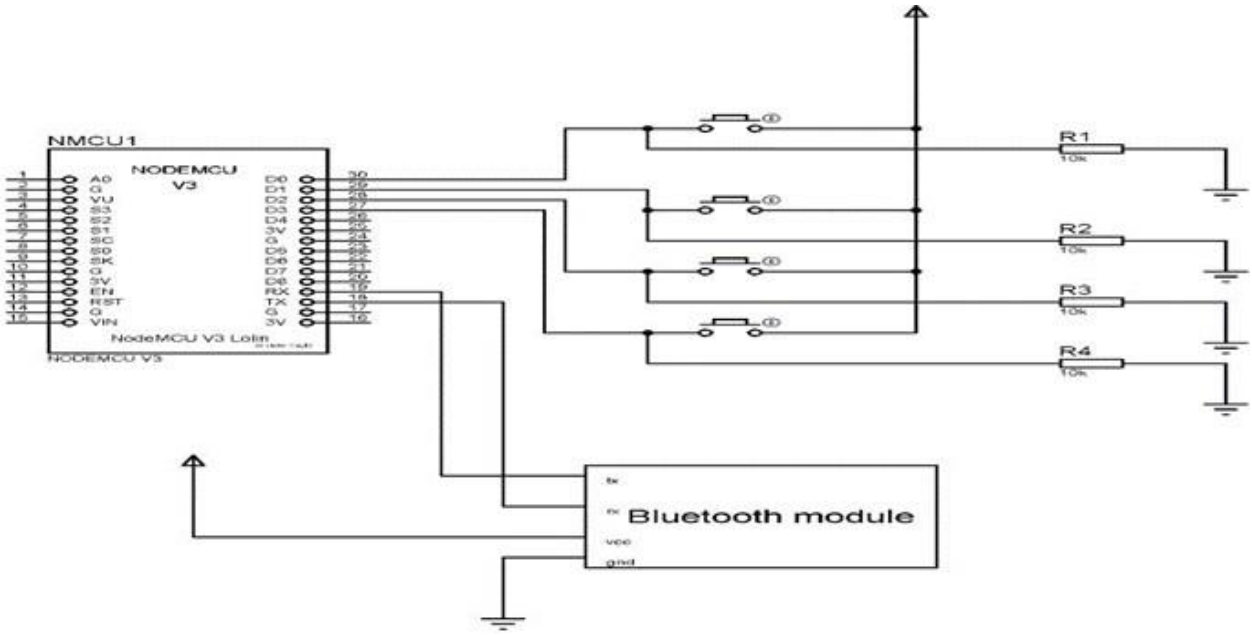


Figure 2:Another Vehicle

12.1.1 Code:

```
                # IMPORT SECTION STARTS
    import weather
    from datetime importdatetime as dt
    # IMPORT SECTIONENDS
    # UTILITY LOGICSECTION STARTS
def processConditions(myLocation,APIKEY,localityInfo):
weatherData = weather.get(myLocation,APIKEY)
        finalSpeed = localityInfo["usualSpeedLimit"] if "rain" notin weatherData else
    localityInfo["usualSpeedLimit"]/2
    finalSpeed = finalSpeed if weatherData["visibility"]>35 elsefinalSpeed/2
    if(localityInfo["hospitalsNearby"]):
    # hzone of the hospital
    doNotHonk = True
    else:
      if(localityInfo["schools"]["schoolZone"]==False):
      # neither hospital zone nor school
     doNotHonk = False
     else:
    # schoolzone
       now = [dt.now().hour,dt.now().minute]
       activeTime = [list(map(int,_.split(":"))) for _ in
    localityInfo["schools"]["activeTime"]]
        doNotHonk = activeTime[0][0]<=now[0]<=activeTime[1][0] and
    activeTime[0][1]<=now[1]<=activeTime[1][1]
    return({
    "speed" : finalSpeed, "doNotHonk" :
    doNotHonk
    })
    import brain
    # IMPORT SECTION ENDS
```

```
# USER INPUT SECTION STARTS
myLocation = "Chennai,IN"
APIKEY ="c7388b7d0d823ee0ee0be65c6fd40411"localityInfo = {
"schools" : { "schoolZone" : True,
"activeTime" : ["7:00","17:30"] # schools active from 7 AM till 5:30 PM
},
"hospitalsNearby" : False, "usualSpeedLimit" : 40
# in km/hr
}
          import requests as reqs
          def get(myLocation,APIKEY):
               apiURL =
          "https://api.openweathermap.org/data/2.5/weather?q={myLocation}&appid={APIKE
          Y}"
               responseJSON = (reqs.get(apiURL)).json()
               returnObject = {
                  "temperature" : responseJSON['main']['temp'] - 273.15,
                  "weather" : [responseJSON['weather'][_]['main'].lower() for _ in
          range(len(responseJSON['weather']))],
                  "visibility": responseJSON['visibility']/100,
               }
               if("rain" in responseJSON):
                  returnObject["rain"] = [responseJSON["rain"][key] for keyin
                  responseJSON["rain"]]
               return(returnObject)

              #include <WiFi.h> #include
              <HTTPClient.h> #include
        <Adafruit_GFX.h>
              #include
        <Adafruit_ILI9341.h>
        #include <string.h>
        const char* ssid = "Wokwi-


        GUEST";const char* password =
        "";
        #define TFT_DC2
        #define TFT_CS 15
        Adafruit_ILI9341 tft = Adafruit_ILI9341(TFT_CS, TFT_DC);
```

```
   String myLocation = "Chennai,IN";
   StringusualSpeedLimit = "70"; // kmph
int schoolZone = 32;
inthospitalZone = 26;
   intuid = 2504; // ID
   Unique to this Micro
   ContollerString
   getString(char x)
{
        String s(1,
        x);returns;
}


String stringSplitter1(String fullString,char delimiter='$')
{
        String returnString = "";
        for(int i = 0; i<fullString.length();i++) {char
            c =fullString[i]; if(delimiter==c)
                break;
            returnString+=String(c);
        }
        return(returnString);
}
String stringSplitter2(String fullString,char delimiter='$')
{
        String returnString =
        "";boolflag = false;
        for(int i = 0; i<fullString.length();i++) {char
            c =fullString[i];
            if(flag)
                returnString+=String(c);if(delimiter=
                =c)flag = true;
        }
        return(returnString);
}
void rightArrow()
{
     int refX = 50;
     int refY = tft.getCursorY() + 40;
     tft.fillRect(refX,refY,100,20,ILI9341_RE
     D);tft.fillTriangle(refX+100,refY-
30,refX+100,refY+50,refX+40+100,refY+10,ILI9341_RED);
}

void leftArrow()
```

```
{
    int refX = 50;
    int refY = tft.getCursorY() + 40;


    tft.fillRect(refX+40,refY,100,20,ILI9341_RED); tft.fillTriangle(refX+40,refY-
    30,refX+40,refY+50,refX,refY+10,ILI9341_RED);
}
void upArrow()
{
    int refX = 125;
    int refY = tft.getCursorY() + 30;


    tft.fillTriangle(refX-
    40,refY+40,refX+40,refY+40,refX,refY,ILI9341_RED); tft.fillRect(refX-
    15,refY+40,30,20,ILI9341_RED);
}
  String APICall()
    { HTTPClient
    http;


  String url = "https://node-red-grseb-2022-11-05-
test.eu-gb.mybluemix.net/getSpeed?";
    url += "location="+myLocation+"&";
    url += "schoolZone="+(String)digitalRead(schoolZone)+(String)"&";
    url += "hospitalZone="+(String)digitalRead(hospitalZone)+(String)"&";url +=
    "usualSpeedLimit="+(String)usualSpeedLimit+(String)"&";
    url +=
    "uid="+(String)uid;
    http.begin(url.c_str());
    int httpResponseCode = http.GET();


    if (httpResponseCode>0) {
      String payload = http.getString();
      http.end();
      return(paylo
      ad);
    }
    else {
      Serial.print("Error code: ");
      Serial.println(httpResponseCo
      de);
    }
    http.end();
}
```

```
  void myPrint(String contents) {
    tft.fillScreen(ILI9341_BLAC
    K);tft.setCursor(0, 20);
    tft.setTextSize(4);
    tft.setTextColor(ILI9341_RE
    D);
    //tft.println(contents);
    tft.println(stringSplitter1(contents));String
    c2 =stringSplitter2(contents); if(c2=="s") //
    represents Straight
    {
      upArrow();
    }
    if(c2=="l") // represents left
    {
      leftArrow();
    }
    if(c2=="r") // represents right
    {
      rightArrow();
    }
}
void setup() {
    WiFi.begin(ssid, password, 6);

    tft.begin();
    tft.setRotation(1);

    tft.setTextColor(ILI9341_WHIT
    E);tft.setTextSize(2);
    tft.print("Connecting to WiFi");

    while (WiFi.status() != WL_CONNECTED)
      {delay(1
      00);
      tft.print("
      .");
    }

    tft.print("\nOK! IP=");
    tft.println(WiFi.localIP());
}
```

```
  void loop(){
    myPrint(APICall
    ());delay(100);
}
```

GITHUB LINK:

https://github.com/IBM-EPBL/IBM-Project-14037-1659539207

THANK YOU