Project Report

Date	17 Nov2022
Team ID	PNT2022TMID19258
Project	Signs with Smart Connectivity for Better Road Safety

1. INTRODUCTION:
1.1 ProjectOverview:

➢ The Objective of this is to replace the static sign boards. Instead, smart connected sign board are used.
➢ These smart connected sign boards get the speed limitations from a web app using weather API and update automatically.Based on the weather changes.The speed may increase or decrease.

➢ Based on the traffic and fatal situations the diversion signs are displayed. Guide(forS chools), Warning and Service (Hospitals, Restaurants) signs are also displayed accordingly.

1.2 Purpose:

➢ The Purpose of this project is to develop a digital sign board system where the normal signs are displayed with their actual names. And also, to create awareness of the road safety to everyone and obey the traffic rules. To create a better view and warn in the night time.

2. LiteratureSurvey:

2.1 :ExistingProblem:

➢ Damage criteria in static sign boards:
  o Paint deterioration
  o Folded Sheets
  o Pole Bent
  o Concealment by Vegetation
➢ Drivers can face confusing road signs at certain circumstances.

➢ The National Crime Records Bureau (NCRB) 2022 report states that there were155, 622 fatalities, highest since 2014, out of which 69, 240 deaths were due to two-wheelers.

➢ A study by IIT Delhi points out that the national highways constitute only 2% of the length of roads in India, but they account for 30.3% of total road accidents and 36% of deaths. Deaths by accidents on roads increased by almost 17percent in 2021, indicating an increase in the rate of deaths per 1,000 vehicles.

S.No	Title and Author	Year and Publication	Inferences
1.	**Wireless digital traffic signs of the future.** ChaiK.Toh, Juan-CarlosCano, Carlos Fernandez Laguia, Pietro Manzoni, CarlosT. Calafate.	2018, Institution of Engineering and Technology (IET).	The issues and challenges facing current traffic signs, and how it will evolve into a next-generation traffic sign architecture using advanced wireless communications technologies.
2.	**Traffic Sign Board Detection and Recognition using Augmented Reality.**	2020, International Research Journal of	Real-Time approach for fast an
	Akshata Anant Prabhu, Deepika V.D., Murali krishna.N, P.Vaishnavi Acharya, A.R.Manjula.	Engineering and Technology (IRJ ET).	Frame work for traffic sign recognition Which super imposes virtual objects on to a real scene under all types of driving situations, including un favorable weather conditions and gives a voice alert with help of speakers.
3.	**Automatic Sign board Detection System by the Vehicles** Anushree.A.S, HimanshuKumar, IdahIram, KumarDivyam, Rajeshwari.J	2019, IJESC.	Sign board detection system in the vehicle which will detect the sign board and warn the driver about it. It displays the alert message or information on provided LCD and voice alert through speakers.

4.	**Development and Testing of Road Signs Alert System Using a Smart Mobile Phone** EricM.Masatu, RamadhaniSinde, and AnaelSam	2022, Hindawi Journal of Advanced Transportation).	The paper is based on there search about Advanced Driver Assistance system which is one of the salient feature so intellige nt system in transportation.
5.	**AWi-Fi based Electronic Road Sign for Enhancing the Awareness of Vehicle.** ABhawiyuga, RASabriansyah, WYahya,REPutra.	2016, IOP Publishing Ltd.	Employment of vehicular network concept in which a vehicle can communicate with other vehicles or with the infrastructure installed along the road.
6.	**Automatic Detection of Road Signs to Control Vehicle Speed** AnujaNanal, PoojaMotwani, PragatiPawar, RajatNirhale, RahulPatil.	2019, International Journal of Computer Applications.	Electronic Display controller meant for controlling vehicle speed and monitors the zone.

2.2. References

1. Torralba, J. P.García-Martín, J. M. González-Romo, M.García- Castellano,J.Peral-LópezandV. Pérez-Mira, "An Autonomous, Intelligent Sign Control System Using Wireless Communication and LED Signs for Rural and Sub urban Roads," in IEEE Intelligent Transportation Systems Magazine, vol.14,no.2, pp. 115-128,March-April2022, doi:10.1109/MITS.2021.3049375.

2. Toh, C.K., Cano, J.-C.,Fernandez-Laguia, C.,Manzoni, P. andCalafate, C.T.(2019), Wireless digital traffic signs of the future.IETNetw., 8:74-78.https://doi.org/10.1049/iet-net.2018.5127

3. A., Aparna& Shiravale, Sankirti. (2016). Real Time Traffic Sign board Detection and Recognition from Street Level Imagery for Smart Vehicle. International Journal of Computer Applications. 135.1822.10.5120/ijca2016908267.

4. A Bhawiyuga RA Sabriansyah, W Yahya and REPutra*etal* "AWi- Fi based Electronic Road Sign for Enhancing the Awareness of Vehicle Driver", in IOP Publishing Ltd 2017 *J. Phys.: Conf. Ser.*801012085

5. KarthikeyanD, Enitha C, BharathiS, Durkadevi K, 2020, Traffic Sign Detection and Recognition using Image Processing, INTERNATIONAL JOURNAL OF ENGINEERING RESEARCH & TECHNOLOGY (IJERT) NCICCT– 2020 (Volume8– Issue08)

6. Bhawna Saini1, Rachna Devi2, Shilpi Dhankhar 3, Mohammad-ziaul- Haque4, Jagandeep Kaur 5, Smart LED DisplayBoards, International Journal of Electronic and Electrical Engineering. ISSN0974- 2174Volume7,Number 10(2014), pp.1057-1067.

7. Ramalingam, Mritha & chandrasegar & gowrishankar,(2014). A survey of lightemitting diode (LED)Display Board. Indian Journal of Science and Technology. 7. 185-188.10.17485/ijst/2014/v7i2.3.

8. EricM. Masatu, Ramadhani Sinde, Anael Sam, Development and Testing of Road Signs Alert System Using a Smart Mobile Phone, Journal of Advanced Transportation, 10.1155/2022/5829607,**2022**, (1-14), (2022).

9. ZoltánFazekas, GáborBalázs, CsabaGyulai, PéterPotyondi,PéterGáspár,Road- TypeDetection Based on Traffic Sign and Lane Data, Journal of Advanced Transportation, 10.1155/2022/6766455,**2022**, (1-19), (2022).

10. Juanhong Xie, GuojianShi, WeizhiZhu, Intelligent Recognition Technology for the Segmentation of Traffic Indication Images Concerning Different Pavement Materials, Applied Bionics and Biomechanics, 10.1155/2022/6278240,**2022**, (1-7), (2022).

2.3. ProblemStatementDefinition:

To replace the static sign boards, with smart connected digital signboards.These smart connected sign boards get the speed limitations from weather API and update automatically.
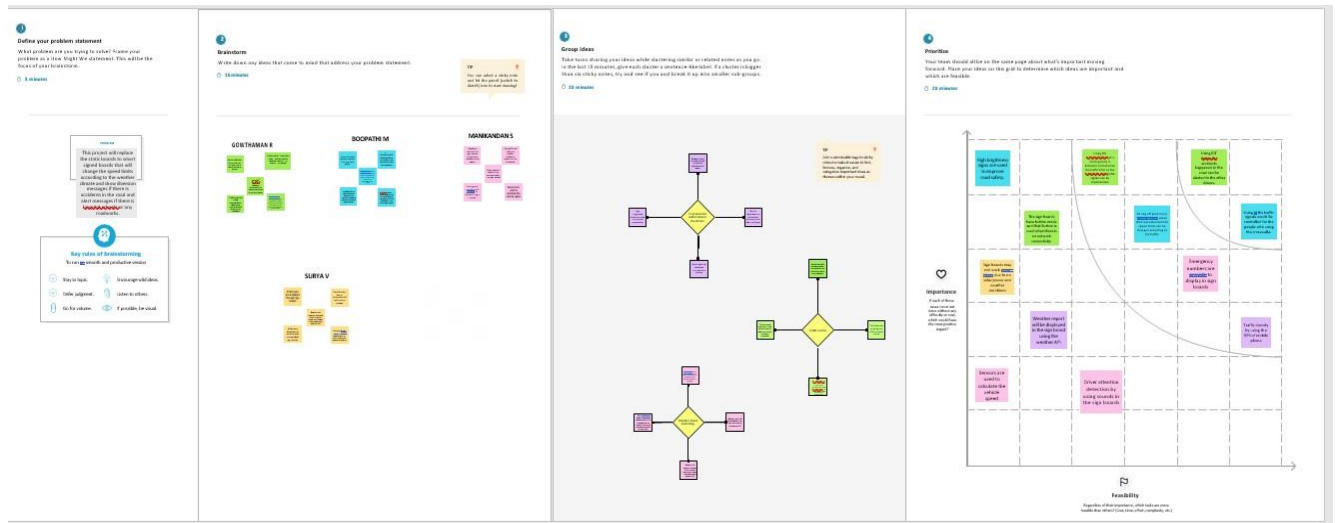
Based on the weather changes the speed may increase or decrease. It will display the normal signs in necessary places with wordings to be aware of the signs. Based on the traffic and fatal situations the diversion signs are displayed. Guide (Schools), Warning and Service (Hospitals, Restaurant) signs are also displayed accordingly. Change of modes will take place automatically.

3. IdeationandProposedSolution:

3.1. EmpathyMapCanvas:

3.1. Ideation&Brainstorming:

3.1. ProposedSolution:

S.No.	Parameter	Description
1.	Problem Statement (Problem to be solved)	In present Systems the road signs and the speed limits are Static. But the road signs can be chang ed in some cases. We can consider some cases when there are some road diversions due to hea vy traffic or dueto accidents then we can chang e the road signs accordingly,if they are digitalized. This project proposes a system which has digital sign boards on which the signs can bec hanged dynamically. If there is rainfall then the roa ds will be slippery and the speed limit would be decreased.There is a web app through which you can enter the data of the road diversions, accident pro neareas and the information sign boar ds can be entered through webapp. This data isretrieved and displayed on the sign boards accordingly.
2.	Idea/ Solution description	The Idea is to replace the static sign boards.In stead, smart connected sign boards are used. These smart connected sign boards get the speed limitations from a web app using weather API and update

		automatically. Based on the weather changes the speed may increase or decrease. Based onthe traffic and fatal situations the diversion signs are displayed. Guide(forSchools), Warning and Service (Hospitals, Restaurant) signs are also displayed accordingly. Additionally, Speed camera integrated with image processing technique is added to detectany traffic speed violations and charge fines.
3.	Novelty/ Uniqueness	Usage of speed camera integrated with ImageProcessing technique for detection of speed violation.
4.	Social Impact/ Customer Satisfaction	Diversion Indication System if traffic or constructions ahead. Speed limit Instructions. Guide (forSchools),Warning and Service(Hospitals ,Restaurant)signs are displayed.
5.	Business Model(RevenueModel)	Since Image Processing and APIs are usedfor monitor, this project employs adecent business strategy and enhance services.
6.	Scalability of the Solution	Low- cost Implementation and Maintenance. Durability is of the productis high.

3.2. ProblemSolutionFit:

4. Requirements:

4.1. Functional Requirement:

FR No.	Functional Requirement (Epic)	Sub Requirement (Story/Sub-Task)
FR-1	User Visibility	Sign Board will have and clear and interactive UI so that it will be clearly visible to al
FR-2	User Understanding	The signs that are to be displayed in the sign board will be with its respective names, so that the users can clearly understand everything
FR-3	User Convenience	Signs will be displayed flawlessly such that it will be of better convenience.

4.1. Non-FunctionalRequirement:

FR No.	Non-FunctionalRequirement	Description
NFR-1	**Usability**	For multiple sign display, time stamps will be allo cated for each sign. It will automatic and dynamically changeable. No need for manual operations.
NFR-2	**Security**	Only required can will be showed. No chance of security vulnerability.
NFR-3	**Reliability**	More reliable than the existing system
NFR-4	**Performance**	Acceptable performance with dynamic updating of data regarding weather, traffic, etc.
NFR-5	**Availability**	It will available for working every 24/7.
NFR-6	**Scalability**	Implementation and Maintenance cost will be less, so that the product is highly scalable.

ProjectDesign:

5.1. DataFlowDiagram:
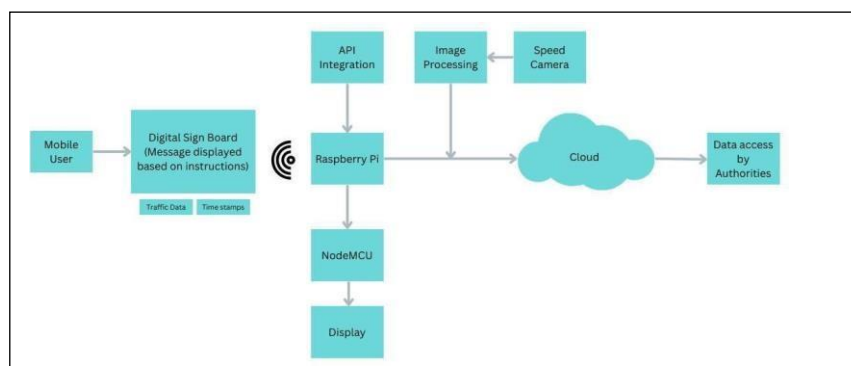
Sprint	Functional lR equirement(Epic)	User Story / Task	Story Points	Team Members
Sprint-1	User Registration	A saucer can register on the web site by entering my email, password, and confirming my password.	3	Surya V
	Admin Registration	As an admin, I can log into the website using my credential sand access the data.	3	Boopathi M
	Login	User and Admin can log into the Website by entering email & password.	1	Gowthaman R
	Dashboard	Develop a dashboard for the website for Knowledge about road rules	3	Manikandan S

Sprint	Functional requirement(Epic)	User Story/Task	Story Points	Team Members
Sprint-2	Node-Red UI	Develop a Node-Red UI Flow.	2	Boopathi M
	Node-Red Dashboard	Develop a Node-Red UI Dashboard.	2	Manikandan S
	Node-Red Webpage	Develop a Node-Red Webpage for displaying the data.	3	Surya V
	Node- Red Data Check	Check the data displayed on the No de-Red Dashboard UI.	3	Gowthaman R

Sprint	Functional Requirement(Epic)	User Story/Task	Story Points	Team Members
Sprint-3	Integration	Integrate the necessary API's.	3	Gowthaman R
	Develop Python Code	Develop Python code to integrate the necessary API.	2	Boopathi M

Sprint	Functional Requirement(Epic)	User Story/Task	Story Points	Team Members
	APIData	Check the data from weather API.	2	Manikandan S
	Hardware Integration	Integrate Arduino with TFTD Is play via simulation.	3	Surya V

Sprint	Functional requirement(Epic)	User Story/Task	Sprint Points	Team Members
Sprint-4	Node- Red Webpage Data	Develop code to display da ta on the web page and check then necesary.	2	Boopathi M
	Node- Red and Watson	Connect Node- Red with IBM Watson platform for data processing(Random Data Generation).	3	Surya V
	Code for Arduino	Develop code to display data in the display screen.	3	Gowthaman R
	Final Check	Checking all the simulation and services working perfectly and display data and final submission of project.	2	Manikandan R

Sprint Delivery Schedule:

Sprint	Total Story Points	Duration	Sprint StartDate	Sprint End Date(Planned)	Story Points Completed (as on Planned End Date)	Sprint Release Date(Actual)
Sprint-1	10	6 Days	24 Oct 2022	29 Oct 2022	10	29 Oct 2022
Sprint-2	10	6 Days	31 Oct 2022	05 Nov 2022	10	05 Nov 2022
Sprint-3	10	6 Days	07 Nov 2022	12 Nov 2022	10	12 Nov 2022
Sprint-4	10	6 Days	14 Nov 2022	19 Nov 2022	10	19 Nov 2022

Sprint–1 Burndown chart:
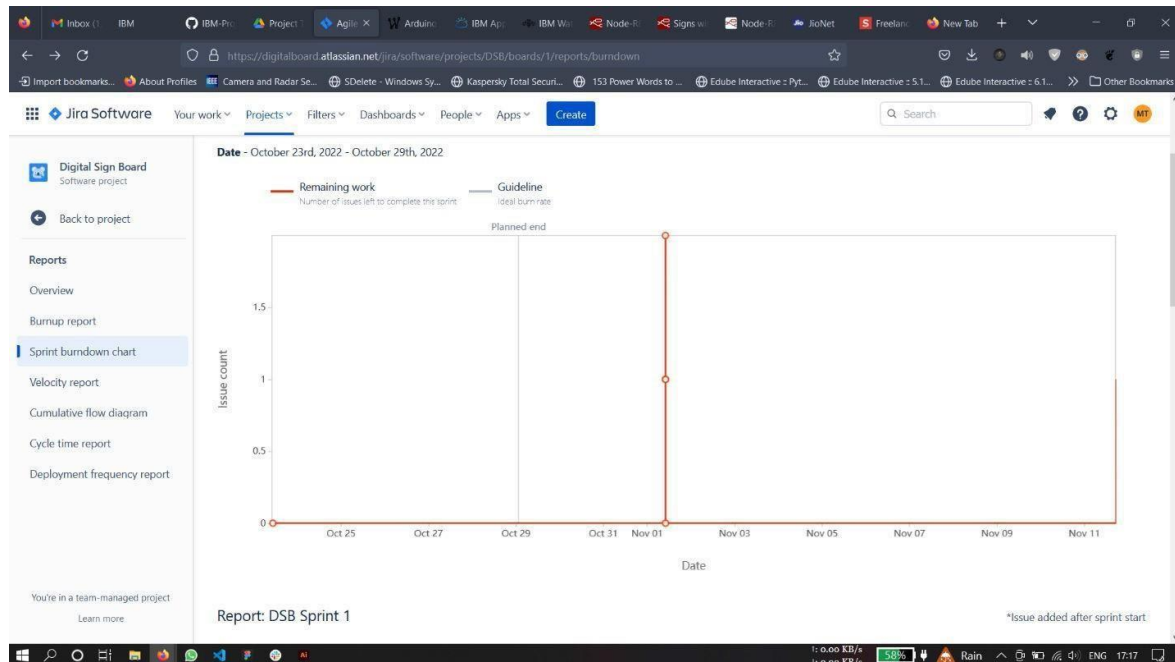
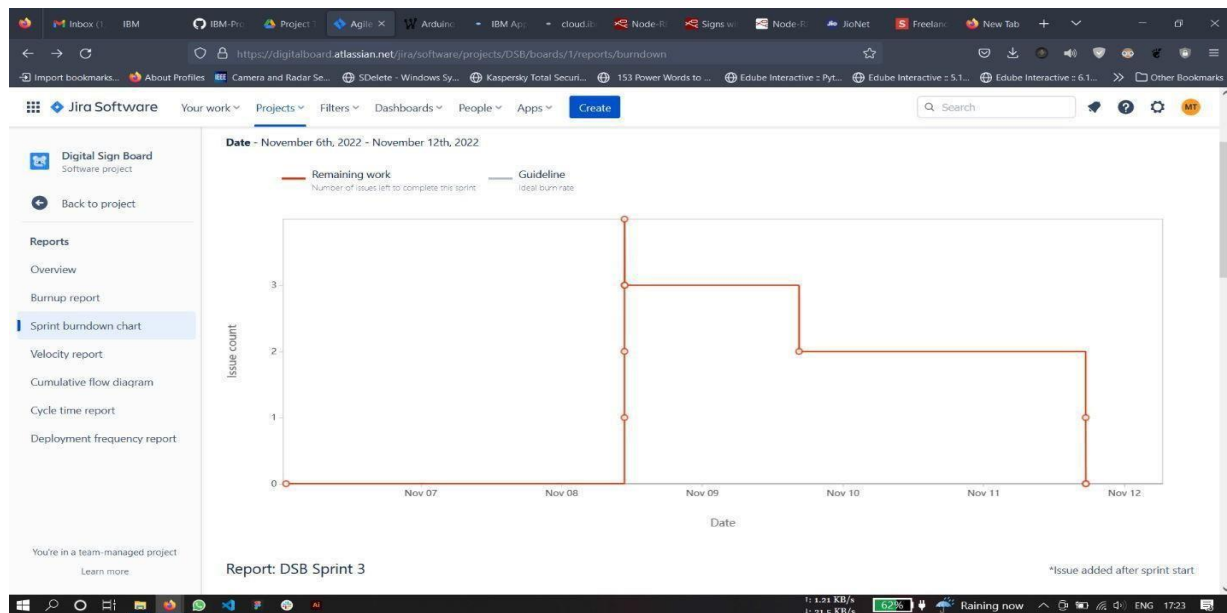Sprint–2 Burndown Chart:
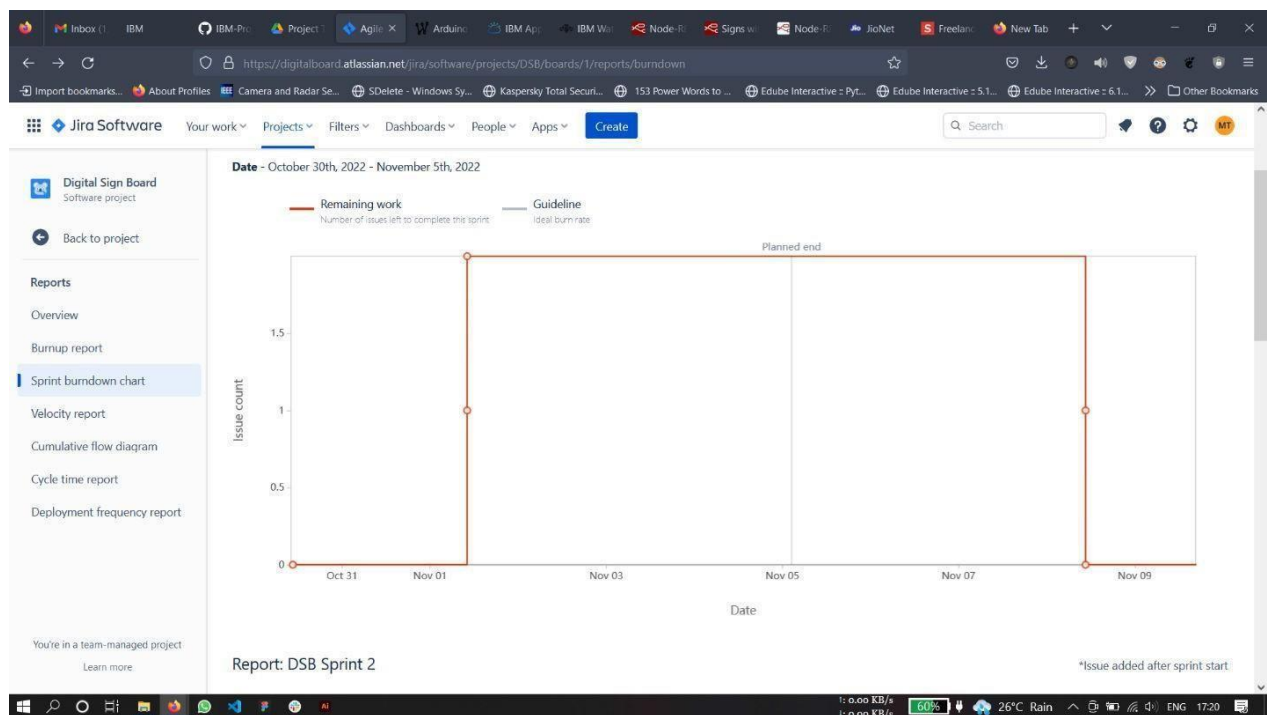
Sprint–3 Burndown Chart:

Sprint–4 Burndown Chart:
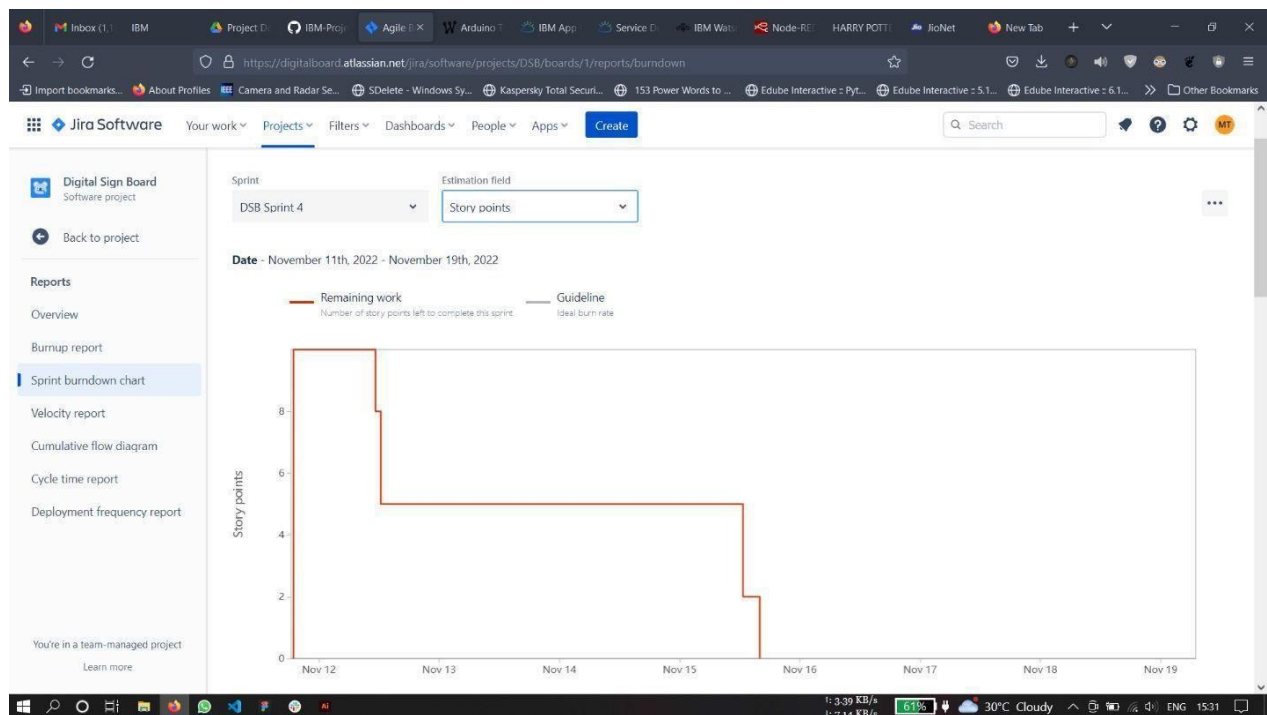
Coding Solutioning:

Feature1:

Climate prediction is done from temperature data from the open weather api. But as for now random values are used. Speed is increased or decreased based on the climate prediction.

```
/*Temperaturefor SpeedControlusingrandom input*/

//Temperature =20;
Temperature=random(-10,35);//(-10)to 10 -- Snow,11 to25 -- Rainyspeed(Tempera-
ture);
Serial.println(Temperature);


/*Speed Controlprocess..
*/voidspeed(int Temp)
{
  tft.fillScreen(Black);
  if(Temp >=-10 &&Temp <=14) //It's Snow
  {
```

```
Weather="Snowy";tft.setCursor (0,0);tft.print("DriveSafe
:)");tft.setTextSize(2);tft.s etCursor(0,40);tft.print("Gos low..!");tft.setCursor(0,100)
;tft.setTextSize(3);tft.print ("SpeedLimit: 30");delay(3000);tft.fillScre en(Black);
}
elseif(Temp >=15&&Temp <=25)//It's Rainy
{
Weather="Rainy";tft.setCursor(0,0
);tft.print("DriveSafe:)");tft.se tTextSize(2);tft.setCursor(0,40); tft.print("SlipperyRoad Ahead");tft.setCursor(0,70);tft.p
rint("GoSlow..!");tft.setCursor(0
,100);tft.setTextSize(3);tft.prin t("SpeedLimit: 40");delay(3000);tft.fillScreen(B lack);
}
else
{
tft.setCursor(0,0);tft.print( "DriveSafe!!");tft.setCursor( 0,30);tft.print("SpeedLimit: 60");delay(3000);tft.fillScre
en(Black);
}
tft.fillScreen(Black);
}


/*Traffic WarningSystem */

voidtraffic_warning(int tdata)
{
```

```
  tft.fillScreen(Black);
  if(tdata ==0)
  {
    tft.setCursor(0,0);tft.prin
    t("DriveSafe :)");
    //tft.setTextSize(2);tft.setC
    ursor(0,40);tft.print("Traffi
    cAhead..");tft.setCursor(0,80
    );
    //tft.setTextSize(3);tft.print
    ("DriveCarefully!");delay(3000
    );tft.fillScreen(Black);
  }
  if(tdata ==1)
  {
    tft.setCursor(0,0);tft.print(
    "DriveSafe
    :)");tft.setTextSize(2);tft.s
    etCursor(0,40);tft.print("Tra
    fficAhead..");tft.setCursor(0
    ,80);
    //tft.setTextSize(3);tft.print("
    TakeDiversion--
    >");delay(3000);tft.fillScreen(B
    lack);
  }
}
```

Traffic data and Construction warning data are given with random inputs. Based on traffc and construction data, warning are displayed.

```
/*TrafficData usingrandom input*/

//Traffic_Data
=0;Traffic_Data=random(0,2);tra ffic_warning(Traffic_Data);Seri al.println(Traffic_Data);


/*Construction Datausing randominput*/

//Construction_Data
=1;Construction_Data=random(0,2);construc tion_warning(Construction_Data);
Serial.pr intln(Construction_Data);
/*Traffic WarningSystem */ voidtraffic_warning(int tdata)
{
tft.fillScreen(Black);i f(tdata ==0)
{
tft.setCursor(0,0);tft.prin t("DriveSafe :)");
//tft.setTextSize(2);tft.setC ursor(0,40);tft.print("Traffi cAhead..");tft.setCursor(0,80
);
//tft.setTextSize(3);tft.print("D riveCarefully!");delay(3000);tft. fillScreen(Black);
}
if(tdata ==1)
{
tft.setCursor(0,0);tft.print( "DriveSafe
:)");tft.setTextSize(2);tft.s etCursor(0,40);tft.print("Tra fficAhead..");tft.setCursor(0
,80);
//tft.setTextSize(3);tft.print("T akeDiversion--
>");delay(3000);tft.fillScreen(Bl ack);
```
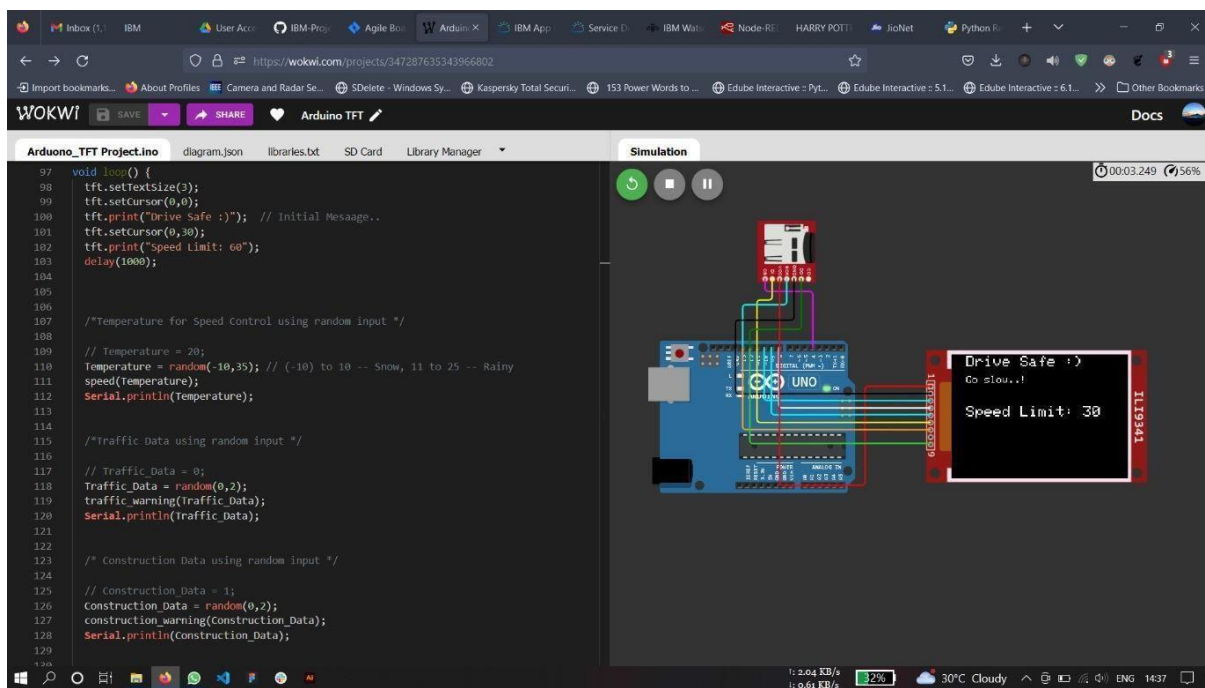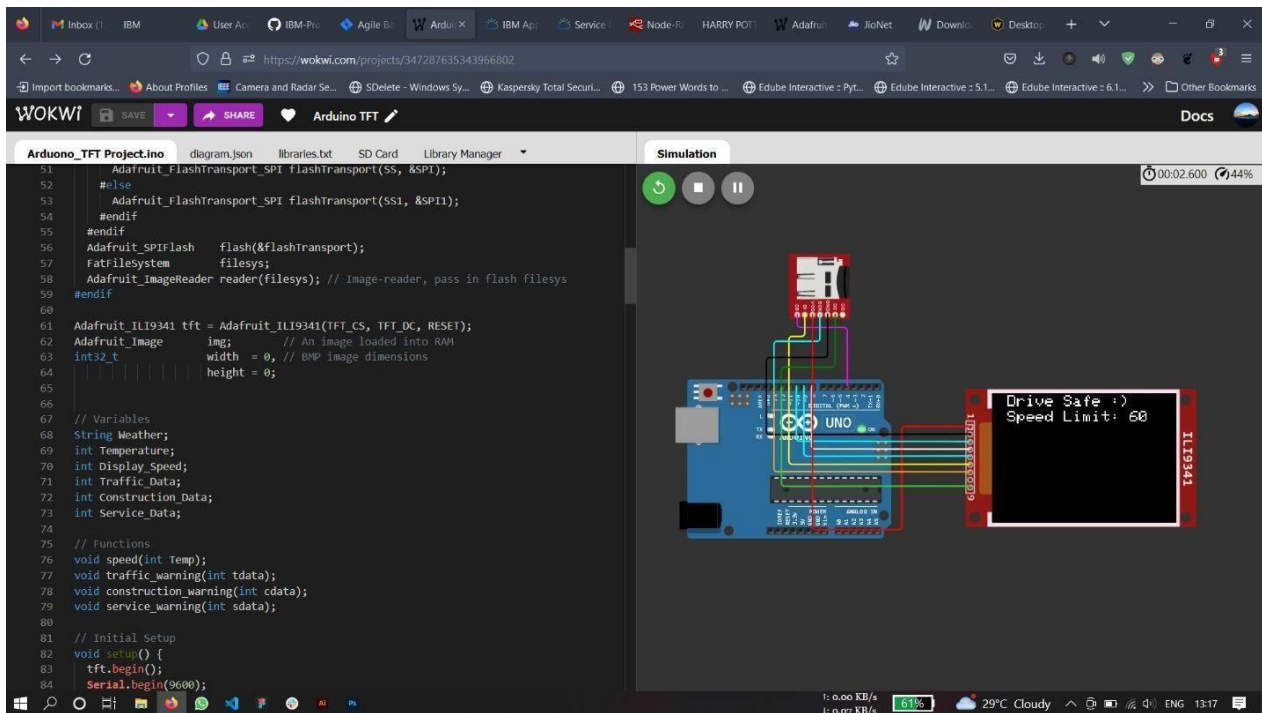
```
  }
}


/*Construction WarningSystem

*/voidconstruction_warning(int

cdata)
{
  tft.fillScreen(Black);
  if(cdata ==0)
  {
    tft.setCursor(0,0);tft.print("Driv
    eSafe
    :)");tft.setTextSize(2);tft.setCur
    sor(0,40);tft.print("ConstructionA
    head..");tft.setCursor(0,80);tft.s
    etTextSize(3);tft.print("DriveCare
    fully..!");delay(2000);tft.fillScr
    een(Black);
  }
  if(cdata ==1)
  {
    tft.setCursor(0,0);tft.print("Driv
    eSafe
    :)");tft.setTextSize(2.5);tft.setC
    ursor(0,40);tft.print("Constructio
    nAhead..");tft.setCursor(0,80);tft
    .setTextSize(2.5);tft.print("TakeD
    iversion <-- ");de-
    lay(2000);tft.fillScreen(Blac k);
  }
}
```
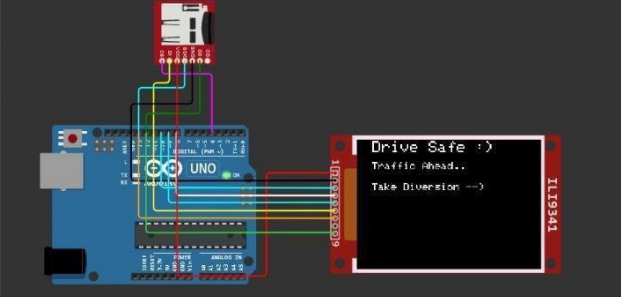
Screenshot 1:

```
101    tft.setCursor(0,30);
102    tft.print("Speed Limit: 60");
103    delay(1000);
104
105
106
107    /*Temperature for Speed Control using random input */
108
109    // Temperature = 20;
110    Temperature = random(-10,35); // (-10) to 10 -- Snow, 11 to 25 -- Rainy
111    speed(Temperature);
112    Serial.println(Temperature);
113
114
115    /*Traffic Data using random input */
116
117    // Traffic_Data = 0;
118    Traffic_Data = random(0,2);
119    traffic_warning(Traffic_Data);
120    Serial.println(Traffic_Data);
121
122
123    /* Construction Data using random input */
124
125    // Construction_Data = 1;
126    Construction_Data = random(0,2);
127    construction_warning(Construction_Data);
128    Serial.println(Construction_Data);
129
130
131    /* Service Warning Data using random input */
132
133    // Service_Data = 1;
134    Service_Data = random(0,2);
```

Simulation display 1: Drive Safe :) / Traffic Ahead.. / Take Diversion -->

Serial output: 12

Screenshot 2:

```
101    tft.setCursor(0,30);
102    tft.print("Speed Limit: 60");
103    delay(1000);
104
105
106
107    /*Temperature for Speed Control using random input */
108
109    // Temperature = 20;
110    Temperature = random(-10,35); // (-10) to 10 -- Snow, 11 to 25 -- Rainy
111    speed(Temperature);
112    Serial.println(Temperature);
113
114
115    /*Traffic Data using random input */
116
117    // Traffic_Data = 0;
118    Traffic_Data = random(0,2);
119    traffic_warning(Traffic_Data);
120    Serial.println(Traffic_Data);
121
122
123    /* Construction Data using random input */
124
125    // Construction_Data = 1;
126    Construction_Data = random(0,2);
127    construction_warning(Construction_Data);
128    Serial.println(Construction_Data);
129
130
131    /* Service Warning Data using random input */
132
133    // Service_Data = 1;
134    Service_Data = random(0,2);
```

Simulation display 2: Drive Safe :) / Construction Ahead.. / Take Diversion <--

Serial output: 12 / 1

Service warnings like schools, hospitals and holy places are displayed.

```
/*ServiceWarningDatausingrandominput*/

//Service_Data
=1;Service_Data=random(0,2);se
rvice_warning(Service_Data);Se
rial.println(Service_Data);

/*School,HospitalWarningSystem*

/voidservice_warning(int

sdata)
{
  tft.fillScreen(Black);if(sdat
  a==0)
  {
    tft.setCursor(0,0);tft.print("DriveSaf
    e
    :)");tft.setTextSize(2);tft.setCursor(0,40);tft.pr
    int("SchoolAhead..");tft.setCursor(0,80);tft.setTe
    xtSize(3);tft.print("DriveCarefully.!\nNoHorn!");d
    elay(2000);
    tft.fillScreen(Black);
  }
  if(sdata==1)
  {
    tft.setCursor(0,0);tft.print("DriveSaf
    e
    :)");tft.setTextSize(2.5);tft.
    setCursor(0,40);tft.print("Hos
    pitalAhead..");tft.setCursor(0
    ,80);tft.setTextSize(2.5);tft.print("DriveCarefull
    y.!\nNoHorn!");delay(2000);
    tft.fillScreen(Black);
  }
}
```

```
105
106
107   /*Temperature for Speed Control using random input */
108
109   // Temperature = 20;
110   Temperature = random(-10,35); // (-10) to 10 -- Snow, 11 to 25 -- Rainy
111   speed(Temperature);
112   Serial.println(Temperature);
113
114
115   /*Traffic Data using random input */
116
117   // Traffic_Data = 0;
118   Traffic_Data = random(0,2);
119   traffic_warning(Traffic_Data);
120   Serial.println(Traffic_Data);
121
```
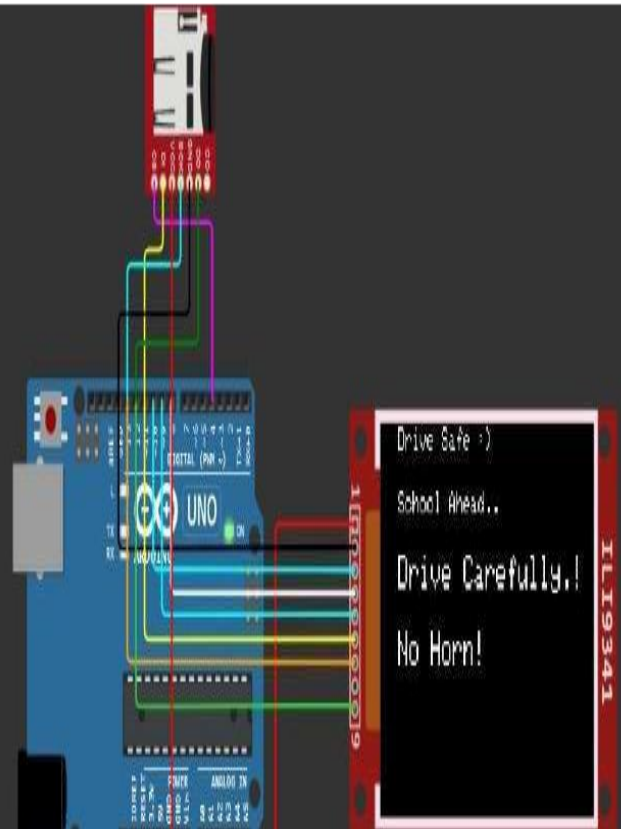
7.1. Feature2:

The temperature and the location data are exactly displayed in the webpage using Node–Red and the forth at is randomized using IBM Watson. A device is created for that purpose and is simulated to send data to node– red.

Edit template node > Text editor
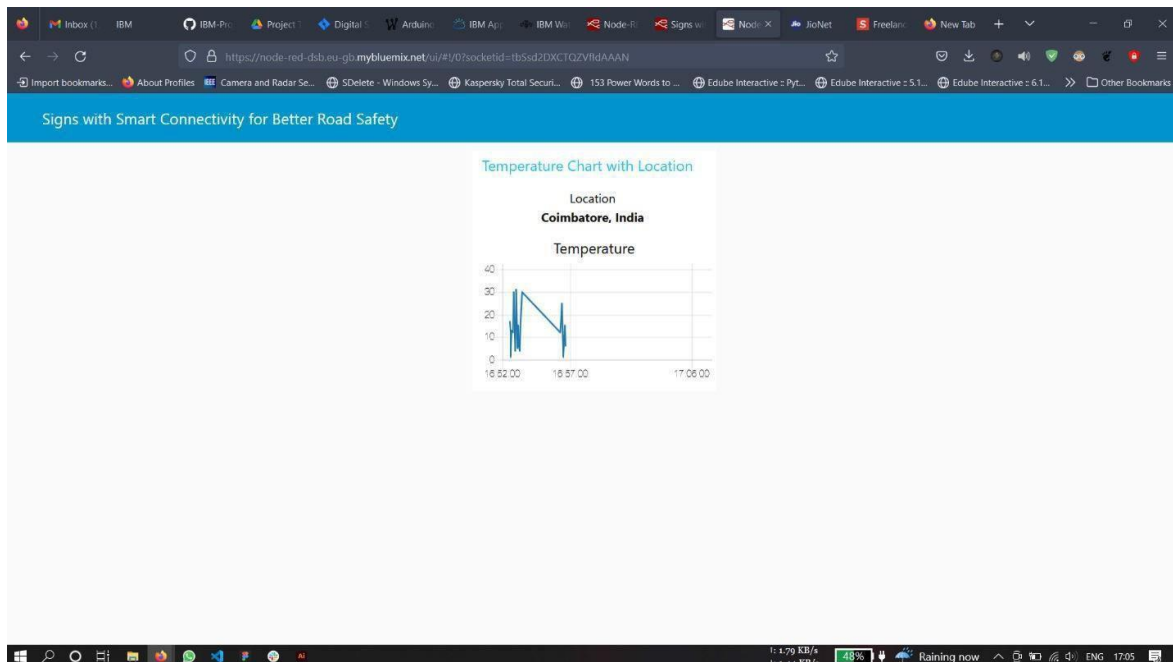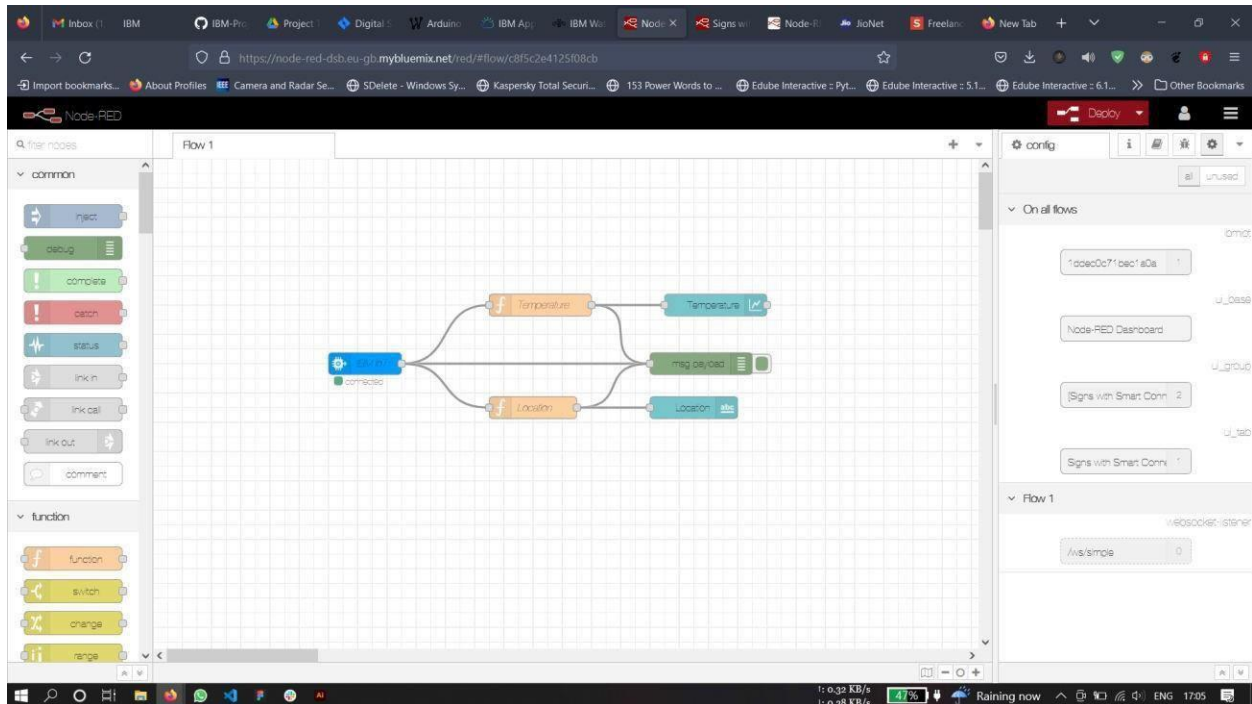
```html
1   <!DOCTYPE HTML>
2   <html>
3     <head>
4       <link rel="stylesheet" href="https://cdnjs.cloudflare.com/ajax/libs/materialize/1.0.0/css/materialize.min.css">
5       <script src="https://cdnjs.cloudflare.com/ajax/libs/materialize/1.0.0/js/materialize.min.js"></script>
6       <link href="https://fonts.googleapis.com/css?family=Montserrat:400,700" rel="stylesheet" type="text/css" />
7       <link href="https://fonts.googleapis.com/css?family=Lato:400,700,400italic,700italic" rel="stylesheet" type="text/css" />
8     <title>Signs with Smart Connectivity</title>
9     <script type="text/javascript">
10        var ws;
11        var wsUri = "ws:";
12        var loc = window.location;
13        console.log(loc);
14        if (loc.protocol === "https:") { wsUri = "wss:"; }
15        // This needs to point to the web socket in the Node-RED flow
16        // ... in this case it's ws/simple
17        wsUri += "//" + loc.host + loc.pathname.replace("simple","ws/simple");
18
19        function wsConnect() {
20            console.log("connect",wsUri);
21            ws = new WebSocket(wsUri);
22            //var line = "";   // either uncomment this for a building list of messages
23            ws.onmessage = function(msg) {
24                var line = "";  // or uncomment this to overwrite the existing message
25                // parse the incoming message as a JSON object
26                var data1 = msg.data;
27                var data = JSON.parse(data1);
28                // console.log(data["temperature"]);
29                // document.getElementById('messages-1').innerHTML = "Temperature: " + data["temperature"];
30                if(data["temperature"] > 0 && data["temperature"] < 15)
31                {
32                    document.getElementById('messages-1').innerHTML = "Temperature: " + data["temperature"] + "<br> Climate: Snowy";
33                }
34
```
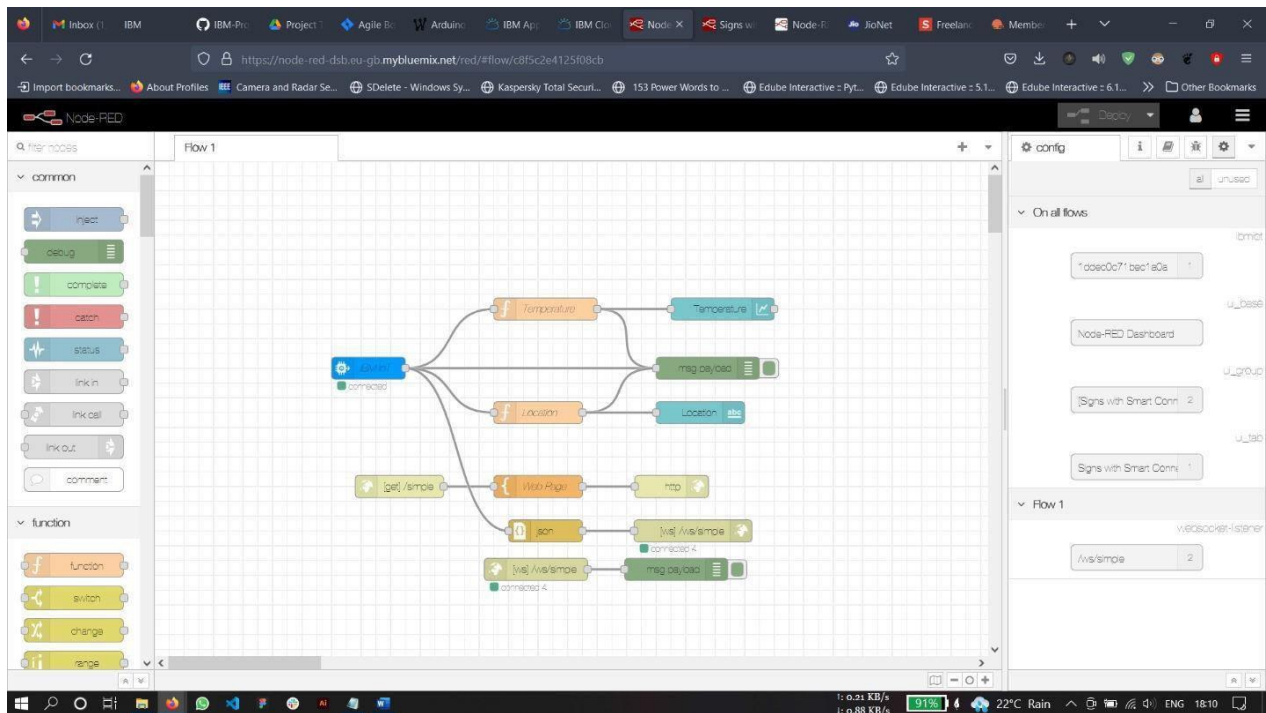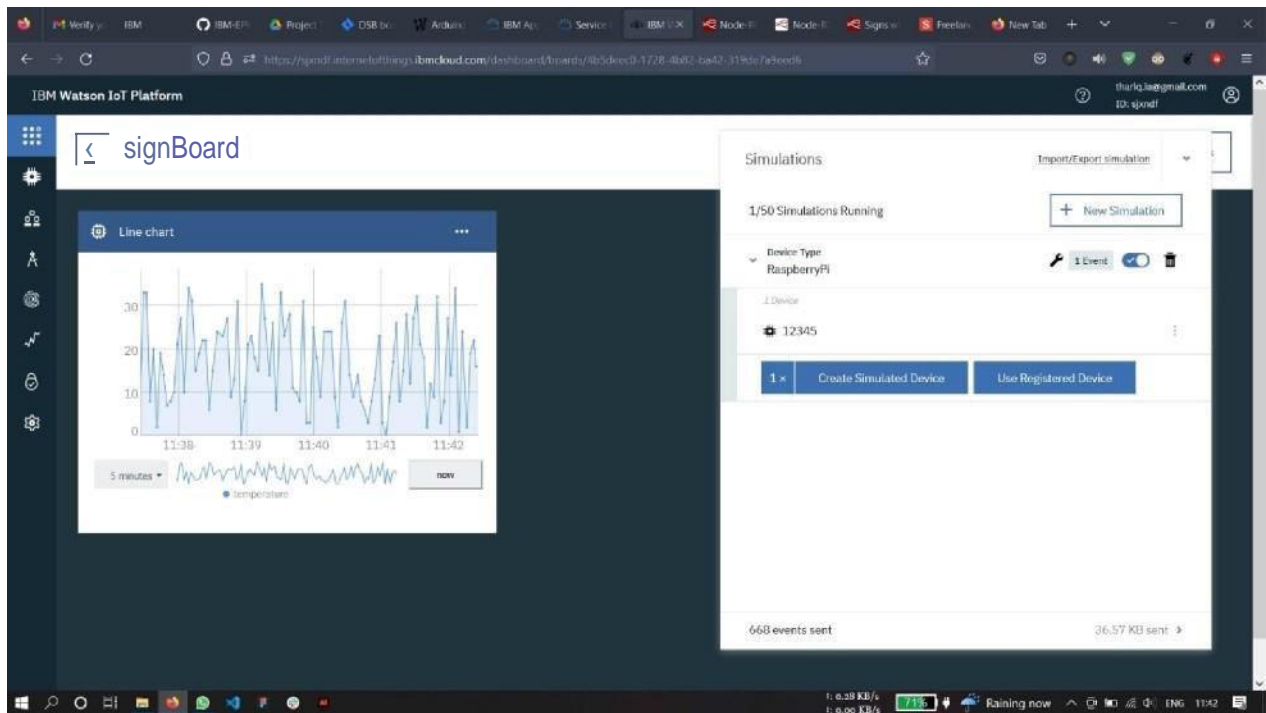
The following features are some ideas we decided to implement but we didn't had much time...

Additionally, a speed cam will be integrated with the digital signboard which use Image processing & AI ,to get the details of the driver who breaks the traffic rules(especially speed) will be updated in the cloud database.

Also, for No parking and One way rule violation scan also be detected and appropriate action an be taken. Violations of stop signs in intersection will also bedetected using AI.

1. Testing:

8.1. TestCases:

1	Date	17-Nov-22
2	Team ID	PNT2022TMID19258
3	Project Name	Project - Signs with Smart Conne
4	Maximum Marks	4 marks

	Pre-Requisite	Steps To Execute	Test Data	Expected Result	Actual Result	Status	Comments	TC for Automation(Y/N)	BUG ID	Executed By
6	IBM Cloud Login ID & Password	1.Go to IBM Cloud signup page 2.Enter e-mail id and other credentials 3.Enter a password	https://cloud.ibm.com/login	User should sign up IBM cloud and details should be verified	Working as expected	Pass	Results verified	No		R.Gowthaman,M.Boopathi,S.Manikandan,V.Surya
7	IBM Cloud Login ID & Password	1.Go to Cloud login 2.Enter user ID & Password 3.Verify login by the popup display	https://cloud.ibm.com/login	User login to IBM Cloud and should be navigated to IBM Cloud dashboard page	Working as expected	Pass	Results verified	No		R.Gowthaman,M.Boopathi,S.Manikandan,V.Surya
8	IBM Watson IoT Platform Login ID & Password	1.Login to IBM Cloud 2.Click Catalog 3.Search IoT and click create 4.Go to resource list and search Internet of Things platform 5.Press Launch and click Sign in IBM Watson Platform	https://sjjndf.internetofthings.ibmcloud.com/dashboard/devices/browse	User should be navigated to IBM IoT Watson Platform	Working as expected	Pass	Results verified	No		R.Gowthaman,M.Boopathi,S.Manikandan,V.Surya
9	IBM Watson IoT Platform Login ID & Password	1.Login to IBM Watson Platform 2. Click Add Device 3.Enter the details and click Finish. Create Device ID & Device type 4.Turn on Device Simulator and click simulation running. Enter the values of temperature & Location. 5.Click Send & Save. Verify the displayed result of the levels	Temperature sensor values and Location are generated randomly in simulation	Temperature sensor values and Location are generated randomly in simulation	Working as expected	Pass	Results verified	No		R.Gowthaman,M.Boopathi,S.Manikandan,V.Surya
	Node Red Installation	1.Install node red and open node red in command prompt 2.Select IBM input in IoT	https://node-red-dsb.eu-gb.mybluemix.net/red/#flow/c8f5c2e4125f08cb	User should be able to see the Node Red page	Working as expected	Pass	Results verified	No		R.Gowthaman,M.Boopathi,S.Manikandan,V.Surya

Date	17-Nov-22	
Team ID	PNT2022TMID19258	
Project Name	Project - Signs with Smart Conne	
Maximum Marks	4 marks	

Pre-Requisite	Steps To Execute	Test Data	Expected Result	Actual Result	Status	Comments	TC for Automation(Y/N)	BUG ID	Executed By
Node Red Installation	1.Select IBM IoT input in Node. In IBM IoT Watson Platform, go to apps and click on generate API keys. 2.Copy & paste generated API key and token in the IBM IoT input. After entering all details, click the done button. 3.Add debug to the IBM IoT and rename as Msg.payload and click on done. Click chart from the dashboard and fill the details & add functions to the chart. Check the generated values from the debug message. 4.Edit function node, connect them, add another chart and functions, name them as "Temperature" & "Location" 5.Finally add light ON/OFF buttons to the IBM IoT and debug. Verify the output from NODE RED using Localhost link	Values of sensors and button for light ON/OFF is displayed	Values of sensors and button for light ON/OFF should be displayed	Working as expected	Pass	Results verified	No		R.Gowthaman,M.Boopathi,S.Manikandan,V.Surya
Python 3.7.0(64 bit) installation	1.Download and install Python 3.7.0 2.Develop python code	https://www.python.org/downloads/release/python-370/	User should be able to develop a python code	Working as expected	Pass	Results verified	No		R.Gowthaman,M.Boopathi,S.Manikandan,V.Surya
Python 3.7.0(64 bit) installation	1.Downlinstall Python 3.7.0 2.After python code	Get the output from the cod	User should be able to get the results from the developed code	Working as expected	Pass	Results verified	No		R.Gowthaman,M.Boopathi,S.Manikandan,V.Surya

8.2. UserAcceptanceTesting:

1. Purpose of Document

The purpose of this document is to briefly explain the test coverage and open issues of the [Product Name] project at the time of the release to User Acceptance Testing (UAT).

2. Defect Analysis

This report shows the number of resolved or closed bugsateachse verity level, and how they were resolved.

Resolution	Severity1	Severity2	Severity3	Severity4	Subtotal
By Design	10	4	2	3	20
Duplicate	0	2	2	0	4
External	2	3	0	1	6
Fixed	11	2	4	17	34
Not Reproduced	0	0	1	0	1
Skipped	0	0	0	1	1
Won't Fix	0	1	0	3	4
Totals	23	12	9	25	70

3. TestCaseAnalysis

This report shows the number of test cases that have passed, failed, and untested

Section	TotalCases	NotTested	Fail	Pass
Print Engine	20	0	0	20
Client Application	38	0	0	38

Security	3	0	0	3
Out source Shipping	3	0	0	3
Exception Reporting	5	0	0	5
Final Report Output	10	0	0	10
Version Control	3	0	0	3

2. Results:

9.1.PerformanceMetrics:

3. Advantages&Disadvantages:

The main advantage of this project is that it is a dynamic system which can change different modes of operations automatically.

It gathers weather data from open weather API and display speed according based on the climate.

Display service warnings like schools, hospitals and holy places and warn to slow down and be silent.

Traffic data and Construction warning data are given with random inputs.Based on traffic and construction data, warnings are displayed.

Additionally, a speed can will be integrated with the digital signboard which use Image processing & AI, to get the details of the driver who breaks the traffic rules (especially speed) will be updated in the cloud database.

Also, for No parking and One way rule violation scan also be detected and appropriate action can be taken. Violations of stop signs in intersection will also be detected using AI.

4. Conclusion:

The project concluded by replacing the static signboards with smart connected digital signboards.Digital road signs are an important part of modern infrastructure an dare becoming increasingly common.

Digital road signs are becoming more common as technology improves and more state sadopt them. The use of digital road signs is expected to continue to grow in the future as it would be observed user-friendly, economic, environment friendly, profitable promoting road safety.

Digital road signs are designed to improve road safety and efficiency by providing real-time information to drivers. These signs can display a variety of information, including speed limits, traffic conditions, and weather warnings.

Digital road sign scan help drivers by providing information that is notal ways available from traditional static signs.

5. FutureScope:

- In the future a speed can will be integrated with the digital signboard.
- Using Image processing & AI, the details of the driver who breaks the traffic rules will be updated in the cloud database.
- No parking and One way rule violation scan also be detected and appropriate action can be taken.
- Violations of stop signs in intersection will also be detected using AI.

Appendix:

Code:

```
/*tft.set Text Color(ILI9341_RED); Future Scope:
Image Processing :Speed Cam No Parking
One-Way
Stop sign in Intersection
*/
//Node Mc UPins Connection
//#defineTFT_MOSID7
//#defineTFT_SCLKD5
//#defineTFT_CSD2
//#defineTFT_DCD4
//#defineTFT_RSTD3
//Library Fuctions #include"SPI.h"
#include"Adafruit_GFX.h"
#include"Adafruit_ILI9341.h"
#include<SdFat.h>
#include<Adafruit_SPIFlash.h>
#include<Adafruit_ImageReader.h>
//Colours #define Black0x000000
 #define White0xffffff
//Arduino Pins Connection
 #defineUSE_SD_CARD
 #defineSD_CS         4 //SD card select pin
 #defineTFT_DC9
#define TFT_CS10
#define RESET 8
//Image Initalization..
#ifdefined(USE_SD_CARD)
Sd Fat  SD;
 //SDcardfilesystem Adafruit_ImageReaderreader(SD);
//Image-readerobject, passinSDfilesys
#else
//SPI or QSPI flash file system(i.e. CIRCUITPYdrive)
#ifdefined(___SAMD51____)
 ||defined(NRF52840_XXAA)Adafruit_FlashTransport_QSPIflash
Transport(PIN_QSPI_SCK, PIN_QSPI_CS,
PIN_QSPI_IO0,PIN_QSPI_IO1, PIN_QSPI_IO2,PIN_QSPI_IO3);
#else
#if (SPI_INTERFACES_COUNT== 1)
Adafruit_FlashTransport_SPIflashTransport(SS,&SPI);
#else
Adafruit_FlashTransport_SPIflashTransport(SS1, &SPI1);
 #endif
#endif Adafruit_SPIFlash
flash(&flashTransport);
FatFileSystem filesys;
Adafruit_ImageReaderreader(filesys);
//Image-reader,passin flash filesys
```

```
#endif
Adafruit_ILI9341tft= Adafruit_ILI9341(TFT_CS, TFT_DC,RESET);
 Adafruit_Image img;
//AnimageloadedintoRAMint32_t width=0,
//BMPimagedimensions height=0;
//VariablesString Weather;
intTem perature;
intDisplay_Speed;
int Traffic_Data;
intConstruction_Data;
int Service_Data;
//Functions
Void normal_signs();
void speed(intTemp);
 voidtraffic_warning(inttdata);
voidconstruction_warning(intcdata);
voidservice_warning(intsdata);
//InitialSetupvoid setup() { ImageReturnCodestat;
tft.begin();
Serial.begin9600);
tft.setRotation(1);
tft.setTextColor(ILI9341_WHITE);
}
//Normalsignswithwordings
//Weather --Speedchange
//Traffic
//Construction
//School, HospitalWarnings
voidloop()
{
tft.setTextSize(3);
tft.setCurs or(0,0);
tft.print("DriveSafe:)");
//InitialMesaage..tft.setCursor(0,30);
tft.print("SpeedLimit:60");
delay(1000);
/*NormalSignsDisplay*/normal_sign s();
/*TemperatureforSpeedControlusingrandominput*/
//Temperature = 20;
Temperature = random(-10,35);
//(-10)to10-- Snow, 11to25-- Rainyspeed(Temperature);
Serial.println(Temperature);
/*TrafficDatausing randominput*/
//Traffic_Data =0;
Traffic_Data=random(0,2);
traffic_warning(Tr affic_Data);
Serial.println(Traffi c_Data);
/*ConstructionDatausingrandominput*/
//Construction_Data=1;
Construction_Data= random(0,2);
construction_warning(Constru ction_Data);
```

```
Serial.println(Construction_Dat a);
/*ServiceWarningDatausingrandominput*/
//Service_Data=1;
Service_Data =random(0,2);
service_warning(Service_Data);
Serial.printl n(Service_Data);
}
/*NormalSignsImageDisplaywithwordingsfor awareness*/
voidnormal_signs()
{
stat= reader.drawBMP("/wokwi.bmp",tft, 0, 0);
reader.printStatus(stat);
}
/*SpeedControl process..
*/voidspeed(intTemp)
{
tft.fillScreen(Black);
if( Temp>=-10&&Temp<=14)
//It's Snow
{
Weather="Snowy";tft.setCursor(0,0);
tf t.print("DriveSafe:)");
tft.setTextSize(2);
tft.setCursor(0,40);
tft.print("Go slow..!");
tft.setCursor(0,100);
tft.setTextSize(3);
tft.print("SpeedLimit:30");
delay(3000);
tft. fillScreen(Black);
}
elseif(Temp>=15&&Temp<=25)//It'sRainy
{
Weather = "Rainy";
tft.setCursor(0,0);
tft.print("DriveSafe:)");
tft.setTextSize(2);
tft.setCursor(0,40);
tft.print("Sli pperyRoadAhead");
tft.setCursor( 0,70);
tft.print("GoSlow..!")
;tft.setCu rsor(0,100);
tft.setTextSize(3);
tft.print("SpeedLimit:40");
delay(3000);
tft.fillScreen(Black);
}
else
{
tft.setCursor(0,0);
tft.print("Dr iveSafe!!");
```

```
tft.setCursor(0,30);
tft.print("SpeedLimit:60");
del ay(3000);
tft.fillScreen(Black);
}
tft.fillScreen(Black);
}
/*TrafficWarningSystem*/
voidtraffic_warning(inttdata)
{
tft.fillScreen(Black);
if (tdata ==0)
{
tft.setCursor(0,0);
tft.print("Dri veSafe:)");
//tft.setTextSize(2);
tft.setCurs or(0,40);
tft.print("TrafficAhea d..");
tft.setCursor(0,80);
//tft.setTextSize(3);
tft.print("D riveCarefully!");
delay(3000);
tf t.fillScreen(Black);
}
if (tdata ==1)
{
tft.setCursor(0,0);
tft.print("Dri veSafe:)");
tft.setTextSize(2);
tf t.setCursor(0,40);
tft.print("Tra fficAhead..");
tft.setCursor(0,8 0);
//tft.setTextSize(3);
tft.print("Tak eDiversion-->");
delay(3000);
tft.fillScreen(Bl ack);
}
}
/*ConstructionWarningSystem*/
voidconstruction_warning(intcdata)
{
tft.fillScreen(Black);
if (cdata ==0)
{
tft.setCursor(0,0);
tft.print("Drive Safe:)");
tft.setTextSize(2);
tft.set Cursor(0,40);
tft.print("Constructi onAhead..");
tft.setCursor(0,80);
tft.setTextSize(3);
```

```cpp
tft.print("Dr iveCarefully..!");
delay(2000);
tft.fillScreen(Black);
}
if (cdata ==1)
{
tft.setCursor(0,0);
tft.print("Drive Safe:)");
tft.setTextSize(2.5);
tft.se tCursor(0,40);
tft.print("Construct ionAhead..");
tft.setCursor(0,80);
tft.setTextSize(2.5);
tft.print("Tak eDiversion<-- ");
delay(2000);
tft.fillScreen(Blac k);
}
}
/*School, HospitalWarningSystem*/
voidservice_warning(intsdata)
{
tft.fillScreen(Black);
if (sdata == 0)
{
tft.setCursor(0,0);
tft.print("Dr iveSafe:)");
tft.setTextSize(2);
tft.setCursor(0,40);
tft.print("Sc hoolAhead..");
tft.setCursor(0, 80);
tft.setTextSize(3);
tft.print("DriveCarefully.!\nNoHorn!");
dela y(2000);
tft.fillScreen(Black);
}
if (sdata == 1)
{
tft.setCursor(0,0);
tft.print("DriveSafe:)");
tft.setTextSi ze(2.5);
tft.setCursor(0,40);
tft.print(" HospitalAhead..");
tft.setCursor(0,80);
tft.setTextSize(2.5);
 tft.print("DriveCarefully.!\nNoHorn!");
dela y(2000);
tft.fillScreen(Black);
}
}
```

IBM-CLOUD LINK-

https://cloud.ibm.com/catalog/services/internet-of-things-platform

NODE-RED DASH BOARD (WEBPAGE) LINK

https://node-red-dsb.eu-gb.mybluemix.net/simple

GITHUB PROJECT LINK

https://github.com/IBM-EPBL/IBM- Project-33055-1660214186

OPEN WEATHERMAP LINK

https://home.openweathermap.org/users/signup_up

DEMO VIDEO DRIVE LINK

https://docs.google.com/document/d/1CUfbRhnBzndQa-QUDJjIrSwK9SBlKIqUGdYwY2e3RFI/edit?usp=drivesdk