

# PROJECT DOCUMENTATION

Date	19 November 2022
Team ID	PNT2022TMID25663
Project Name	Signs with Smart Connectivity for Better Road Safety

## 1. INTRODUCTION

### 1.1 Project Overview

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 some road diversions due to heavy traffic or due to accidents then we can change the road signs accordingly if they are digitalized. This project proposes a system which has digital sign boards on which the signs can be changed dynamically. If there is rainfall then the roads will be slippery and the speed limit would be decreased. These smart connected sign boards get the speed limitations from a web app using weather API and update automatically. There is a web app through which you can enter the data of the road diversions, accident prone areas and the information sign boards can be entered through web app. This data is retrieved and displayed on the sign boards accordingly.

### 1.2 Purpose

- To improve vehicle safety by providing real-time traffic information to the driver. Road signs play an important role in road safety.
- To be effective, road signs must be visible at a distance that enables drivers to take the necessary actions.
- To avoid the accidents, due to the increasing vehicle speed.□
- To provides a voice alert to a needed action that enhances driver's attention.□

## 2. LITERATURE SURVEY

### 2.1 Existing Problem

- Increased traffic can increase carbon emissions and other pollution.

- Land use for roads can damage built and natural environment, impose mortality on wildlife if habitats are severed.
- construction has associated environmental costs.□

## 2.2 Reference

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

Digital signage is evolving to smart signage which provides personalized service by adaptively changing contents according to the user context. However, previous smart signage services have difficulty to expand their service because it is not easy to connect additional sensing devices. Furthermore, previous smart signage systems only consider single signage for a service. In this paper, we propose IOT based smart signage platform. The proposed platform provides IOT based connectivity between sensors and signage platform for flexible service extension. Also, we suggest IOT based signage connection, status sensing, and controlling. Therefore, our platform can make a service group of signages dynamically and enables signages to collaborate for a service in wide area. To show the performance of proposed platform, we implemented smart nursing home service. The service shows that IOT devices and signages can be connected to the platform dynamically and collaborate together for a service in wide area.

This paper presents an approach to detect traffic signs using You Only Look Once version 4 (YOLOv4) model. The traffic sign detection and recognition system (TSDR) play an essential role in the intelligent transportation system (ITS). TSDR can be utilized for driver assistance and, eventually, driver less cars to reduce accidents. When driving an automobile, the driver's attention is usually drawn to the road. On the other hand, most traffic signs are situated on the side of the road, which may have contributed to the collision. TSDR allows drivers to view traffic sign information without having to divert their attention. Due to the existence of a large background, clutter, fluctuating degrees of illumination, varying sizes of traffic signs, and changing weather conditions, TSDR is an important but difficult process in intelligent transport systems. Many efforts have been made to find answers to the major issues that they face. The objective of this study addresses road traffic sign detection and recognition using a technique that initially detects

the bounding box of a traffic sign. Then the detected traffic sign will be recognized for usage in a speed-up process. Since safe driving necessitates real-time traffic sign detection, the YOLOv4 network was employed in this research. YOLOv4 was evaluated on our data set, which consisted of manual annotations to identify 43 distinctive traffic signs classes. It was able to achieve an average recognition accuracy of 84.7%. Overall, the work adds by presenting a basic yet effective model for real-time detection and recognition of traffic signs.

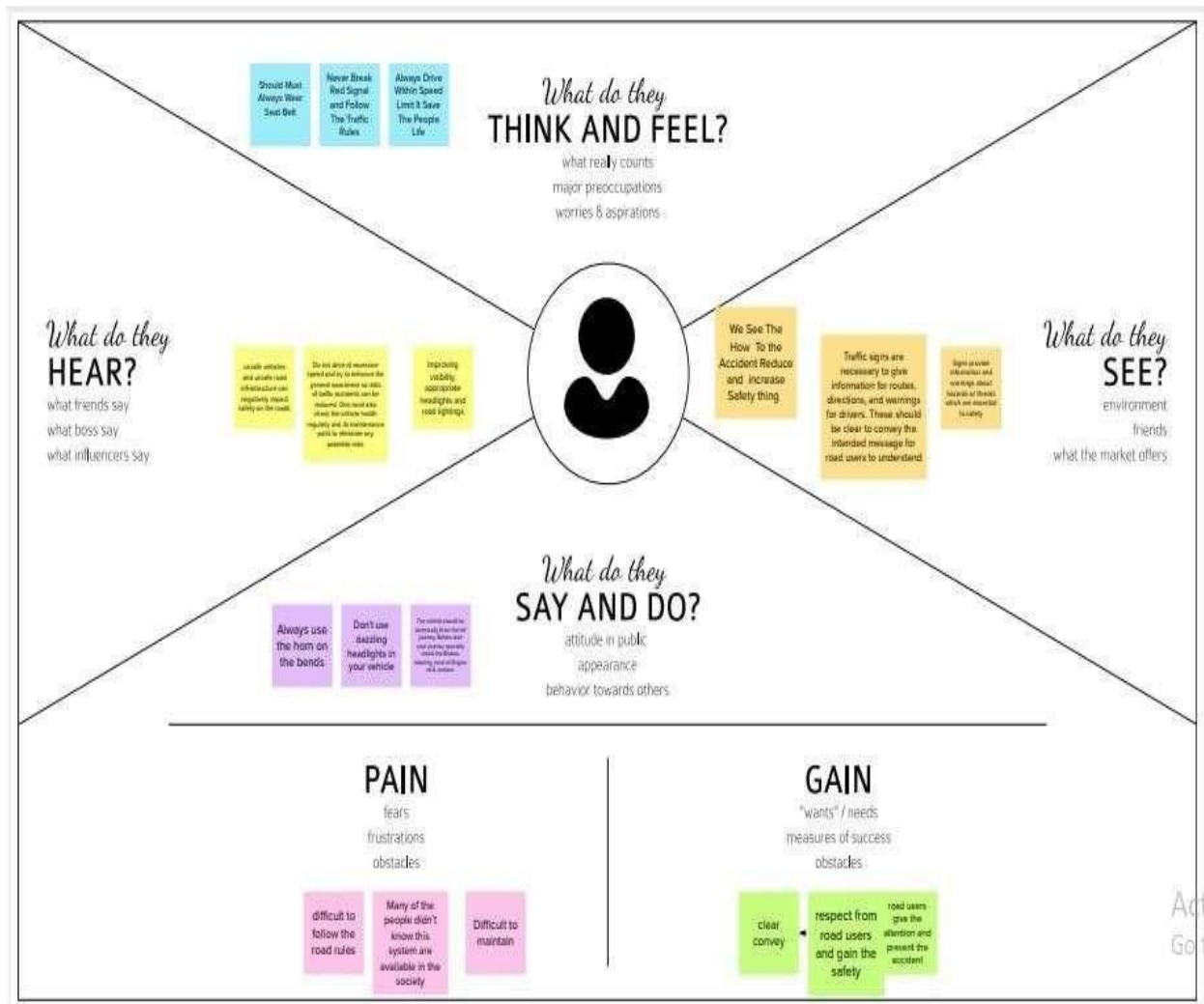
Ubiquitous nature of smart cities requires multiple technologies to be implemented in this area. To develop the smart cities in practice, there is huge need of “Smart Traffic Management”. Smart Traffic Management is a system to monitor and control the traffic signals using sensors to regulate the flow of traffic and to avoid the congestion for smooth flow of traffic. Prioritizing the traffic like ambulance, police etc. is also one application comes under smart traffic management. Traffic sign board plays important role to make the traffic in shape and to control and manage the traffic on roads. Many at times the driver misses the sign boards while driving due to various reasons like insufficient light, fog, rain, traffic etc. In this paper, a framework of the Smart Traffic Sign Boards (STSB) is proposed, which can communicate with the system deployed in all the vehicles to make the drivers of those vehicles aware of speed breakers, speed limits, schools, or ‘U’ turn ahead, etc. beforehand, to avoid the mishap due to sudden appearing of such unusual features of the road during the road journey.

### 2.3 Problem Statement Definition:

- A driver who wants to drive safely on road but there are many obstacles because of heavy traffic, weather condition, etc.,
- A driver who wants to avoid the heavy traffic roads but they are unpredictable because they change from time to time.
- A passenger who wants to travel safely but there are many road accidents because of some drivers who drive very fast and carelessly.
- A driver who wants to reach the destination but unable to choose the route and turn in wrong direction because there are no navigation instructions.

### 3. IDEATION AND PROPOSED SOLUTION:

#### 3.1 Empathy Map Canvas:



## 3.2 Ideation & Brainstorming:

Step-1: Team Gathering, Collaboration and Select the Problem Statement.

Template

# Brainstorm & idea prioritization

Use this template in your own brainstorming sessions so your team can unleash their imagination and start shaping concepts even if you're not sitting in the same room.

10 minutes to prepare  
1 hour to collaborate  
2-8 people recommended

Before you collaborate

A little bit of preparation goes a long way with this session. Here's what you need to do to get going.

10 minutes

A Team gathering

Define who should participate in the session and send an invite. Share relevant information or pre-work ahead.

B Set the goal

Think about the problem you'll be focusing on solving in the brainstorming session.

C Learn how to use the facilitation tools

Use the Facilitation Superpowers to run a happy and productive session.

Open article

Define your problem statement

What problem are you trying to solve? Frame your problem as a How Might We statement. This will be the focus of your brainstorm.

5 minutes

How might we reduce accident in accident prone zones with the help of LED smart signs, which includes a weather monitoring systems and gives instant information regarding upcoming road such as road damage, speed limit suggestion and some advanced ideas for safe travel?

Key rules of brainstorming

To run a smooth and productive session

Stay on topic.

Defer judgment.

Go for volume.

Encourage wild ideas.

Listen to others.

If possible, be visual.

1-2

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## Step-2: Brainstorm, Idea Listing and Grouping

### Brainstorm

Write down any ideas that come to mind that address your problem statement.

10 minutes

**Tip**

Don't worry about a "badly" idea and let the rest of the team decide if it's really a "bad" idea or not.

#### TeamLead

- It helps in reducing risks for accident
- Weather monitoring
- Smart LED signs are visible from afar
- Suggests speed limit while driving
- In case of emergency, alerted via LED about the emergency and road signs for emergency vehicles
- It helps in detecting temperature both internal as well as external

#### Member 1

- Cost efficient
- Advanced driver assistance systems (ADAS) is expected to grow to about 34 billion units
- If vehicle speed is more than road speed limits then it generates user alert by buzzer
- It alerts the officials to nearest emergency services can reach there within short time
- It alerts about the upcoming accident prone zones
- Vehicle system always collect vehicle status by built in sensors and process it

#### Member 2

- Scalable technology system for monitoring, maintenance and repair of roads
- It can provide real-time information to the user about the status of the traffic light
- Electronics were always the prime sponsors for an efficient no traffic jamway and secured roads
- This aims to reduce accidents around traffic lights and reduce their duration via through better real-time monitoring
- These systems can help reduce the number of accidents that can occur around traffic lights and reduce their duration via through better real-time monitoring
- All this helps to avoid breakdowns and, therefore, the prevention of accidents

#### Member 3

- The fundamental idea is to guarantee road safety of the connected cars in the proximity
- It gives instant information on LED
- In future, the system can also collect vehicle status via built in sensors and process it
- By taking action of other vehicles, the system can help in reducing the risk and hence, the prevention of accidents
- It can reduce the number of accidents and improve circulation
- It works perfectly in climatic conditions

## Step-3: Idea Prioritization

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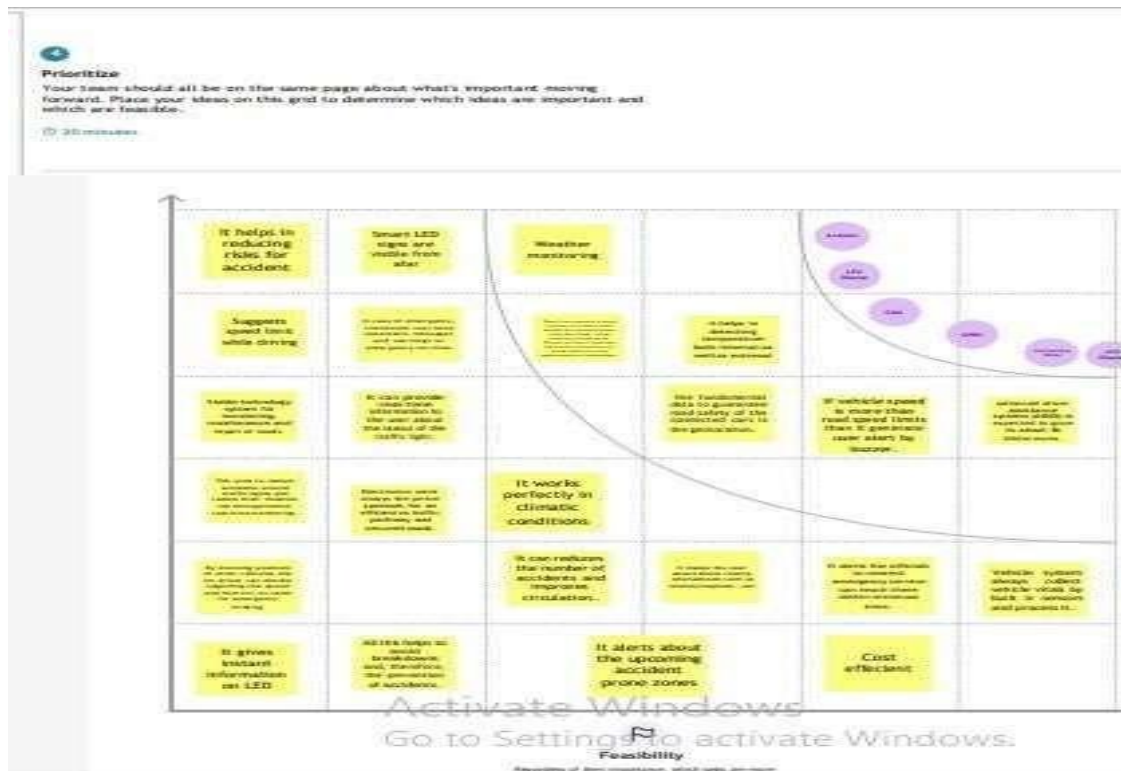
### Group ideas

Take turns sharing your ideas while clustering similar or related notes as you go. Once all sticky notes have been grouped, give each cluster a sentence-like label. If a cluster is bigger than six sticky notes, try and see if you can break it up into smaller sub-groups.

🕒 20 minutes



## Prioritize:





### 3.3 Proposed Solution:

S.No.	Parameter	Description
1.	Problem Statement (Problem to be solved)	Road traffic accidents (RTA) are defined as accidents that occurred or originated on a way or street open to public traffic. This problem is due to some inconvenience in signs placed in Highways and Roads. This issue regularly causes death to human's .
2.	Idea / Solution description	There are some road diversions due to heavy traffic or due to accidents then we can change the road signs accordingly if they are digitalized. This project proposes a system which has digital sign boards on which the signs can be changed dynamically. If there is rainfall then the roads will be slippery and the speed limit would be decreased. Using this we can enter the data of the road diversions, accident prone areas and the information sign boards can be entered through web app. This data is retrieved and displayed on the sign boards accordingly.
3.	Novelty / Uniqueness	This project is varies from others because here we are using our domain as Internet of Things (IOT). Then we use RAM- Minimum 4GB Processor- Min. Configuration OS Windows/Linux/MAC and etc.. The methods used now are high in cost and not an easy task to implement over the world .But our idea has an easy impact to spread all over the world. This

		project comes under budget friendly for implementation.
4.	Social Impact / Customer Satisfaction	Safety for all must be insured in today's world and it is necessary for efficient and proactive safety Systems should be implemented in public places. If we used this, there might be a less in accident detection and traffic problems. So, there will be a reduce in death rate and loss in morality problem. Surely, It will help the people which helps in the problems comes under Social Impact .
5.	Business Model (Revenue Model)	Route planning has become widely used in both personal and commercial use, resulting in an increasing dependence on its reliability. Various applications employ efficient algorithms for route planning . Trip time and cost, e.g., for tolls, have been the typical metrics for route planning applications, but other metrics, however, have been utilized, e.g., for fuel emission/consumption or energy requirements of electric vehicles. In this manner, drivers can be directed through routes that minimizes their overall risk in traversing the road network. It is furthermore possible to target auxiliary mechanisms for safety-control across the network by controlling and redirecting traffic based on user driving behaviour or irrespective to incidental changes in the road network.

6.	Scalability of the Solution	The present framework is some what different from the others. <i>Road accidents</i> cannot be eliminated but can be reduced by enhancing the safety of the drivers.
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### 3.4 Problem Solution Fit:

Define CS, fit into CL	<b>1. CUSTOMER SEGMENT(S)</b> <span>CS</span> It provides us with certain rules and regulations that describe how one should use roads diligently and in a proper way	<b>6. CUSTOMER LIMITATIONS</b> <span>CL</span> <small>EG. BUDGET, DEVICES</small> Budget and Available device	<b>5. AVAILABLE SOLUTIONS</b> <span>AS</span> <small>PROS &amp; CONS</small> When two cars pass from the opposite side of a mountaincurve the IR sensor senses the car and LEDcolour changes to red and raises the buzzer giving signal of danger	Explore AS, differentiate
	<b>2. PROBLEMS / PAINS</b> <span>PR</span> <small>+ ITS FREQUENCY</small> Many roads have insufficient capacity, poor sidewalks, unlimited crossings and a lack of road equipment and safety measures.  The emotional impact of the accident itself as well as related injuries can lead to depression, withdrawal, isolation, feelings of hopelessness and suicidal thoughts.	<b>9. PROBLEM ROOT / CAUSE</b> <span>RC</span> Lack of proper information or training, unsafe systems of work, poorly maintained or unsuitable equipment, poor planning, unclear responsibilities, poor supervision	<b>7. BEHAVIOR</b> <span>BE</span> <small>+ ITS INTENSITY</small> The behavior such as age, experience, gender, attitude, emotions, fatigue, drowsiness, driving conditions	
Focus on PR, tap into BE, understand RC	<b>3. TRIGGERS TO ACT</b> <span>TR</span> Create awareness among the road users on road safety aspects, with particular focus on drunken driving and over speeding.	<b>10. YOUR SOLUTION</b> <span>SL</span> IR sensor senses the car and LED colour changes to red and raises the buzzergiving signal of danger and then it changes oneLED colour into green to allow the one car to pass and then the other LED colour turns green. In this way we can prevent the accidents of curved road.	<b>8. CHANNELS of BEHAVIOR</b> <span>CH</span> ONLINE Install and operate the IR Sensor detectionsystem software.	Extract online & offline CH of BE
	<b>4. EMOTIONS</b> <span>EM</span> <small>BEFORE / AFTER</small> The people <u>feels</u> panic, afraid when they face a problem, after that they feel confident and safety.		OFFLINE Sensor Setup	
Identify strong TR & EM				

## 4.REQUIREMENT ANALYSIS:

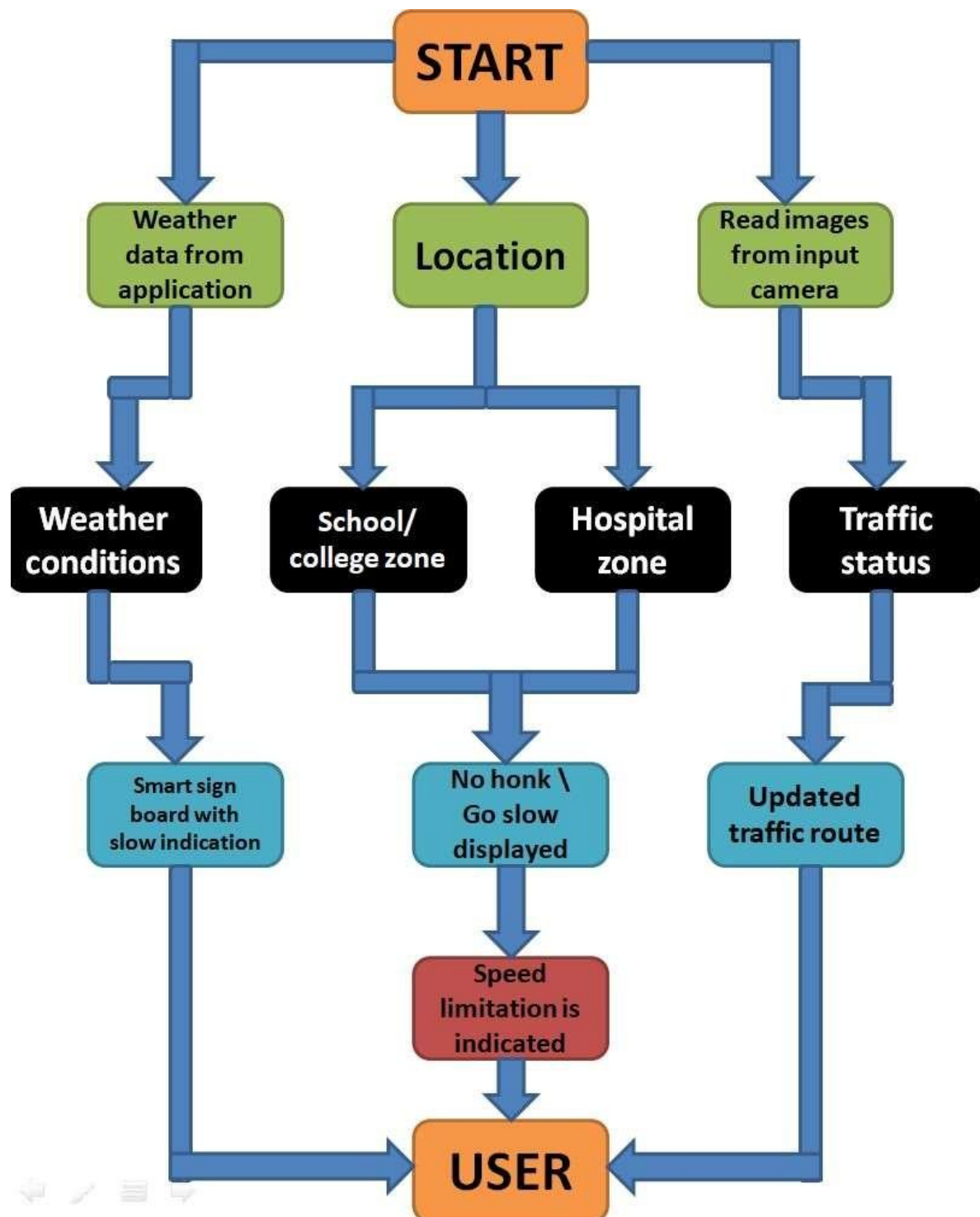
### 4.1 Functional Requirements:

FR No.	Functional Requirement (Epic)	Sub Requirement (Story / Sub-Task)
FR-1	User Visibility	Sign Boards should be made of bright coloured LEDs capable of attracting driver's attention Not too distracting to cause accidents
FR-2	User Understanding	Should display information through means like images/illustrations with text so that the user can understand the signs correctly
FR-3	User Convenience	Display should be big enough to display all the signs correctly so that it is visible even to far away drivers

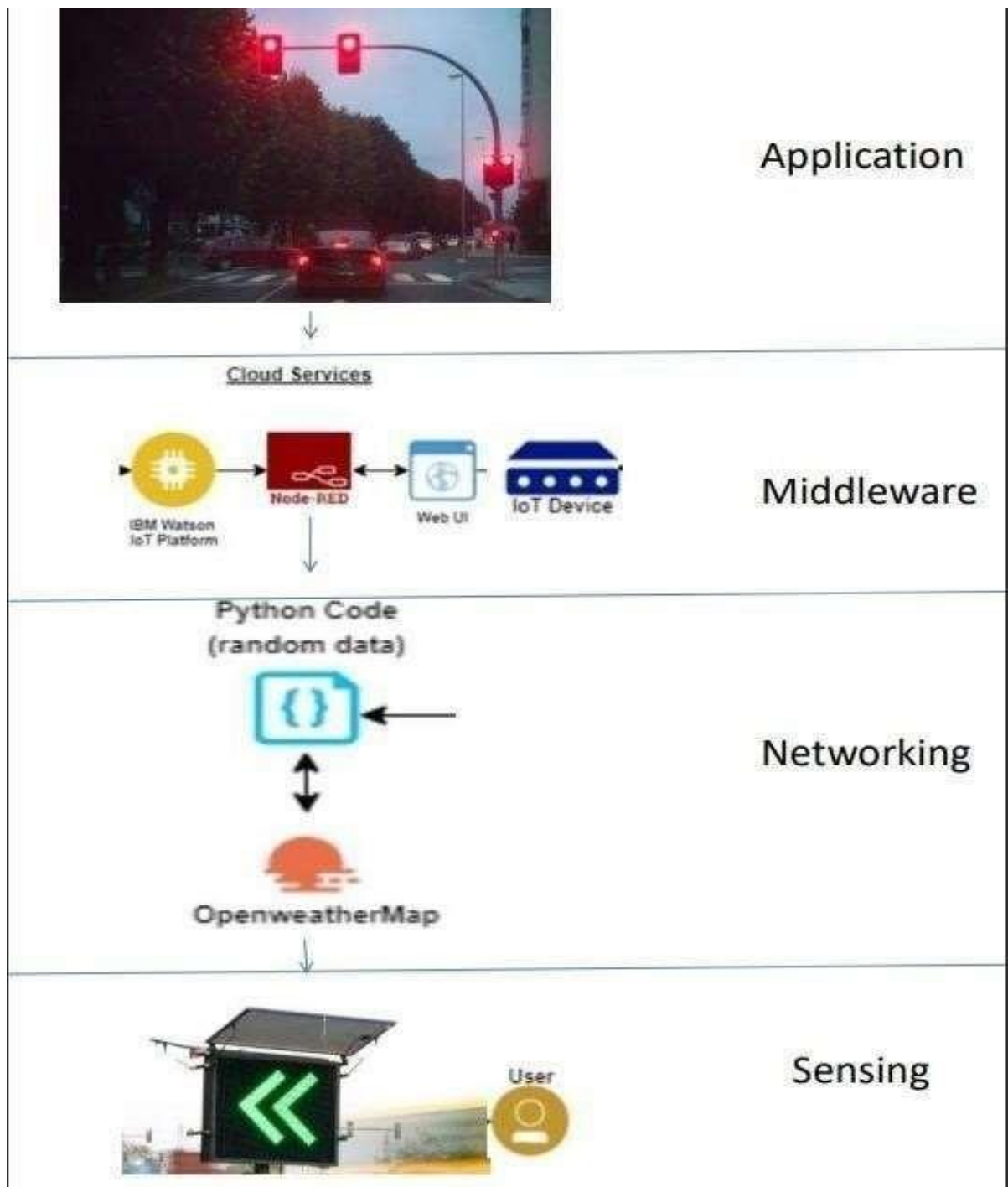
## 4.2 Non-Functional Requirements:

FR No.	Non-Functional Requirement	Description
NFR-1	Usability	Should be able to dynamically update with respect to time.
NFR-2	Security	Should be secure enough that only the intended messages are displayed in the display.
NFR-3	Reliability	Should convey the traffic information correctly.
NFR-4	Performance	Display should update dynamically whenever the weather or traffic values are updated
NFR-5	Availability	Should be on service 24/7
NFR-6	Scalability	Should be modular and hence able to scale on servers horizontally.

5.PROJECT DESIGN:  
5.1 Data Flow Diagrams:



## 5.2 Solution & Technical Architecture:



### 5.3 User Stories:

<b>FR No.</b>	<b>Functional Requirement (Epic)</b>	<b>Sub Requirement (Story / Sub-Task)</b>
FR-1	User Visibility	Sign Boards should be made with LED's which are bright coloured and are capable of attracting the drivers attention but it should also not be too distracting or blinding cause it may lead to accidents.
FR-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.
FR-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 easily understandable to the driver.
FR-4	User Convenience	The display should be big enough that it should even be visible from far distance clearly.

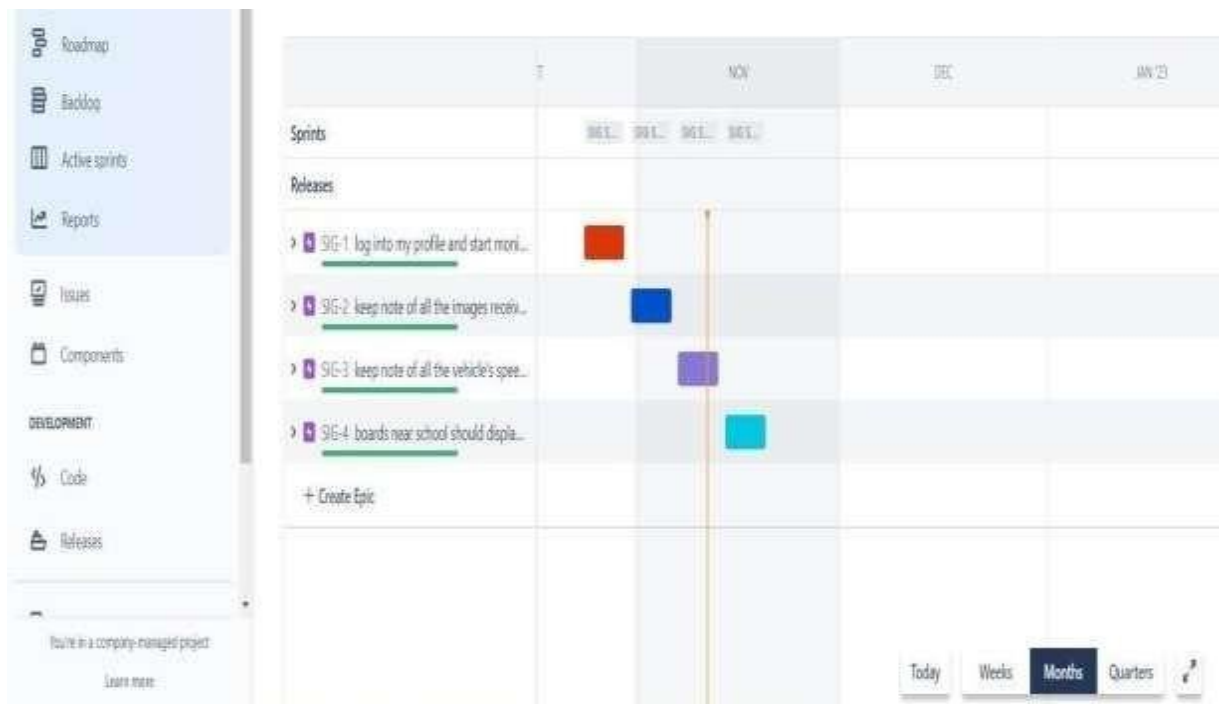
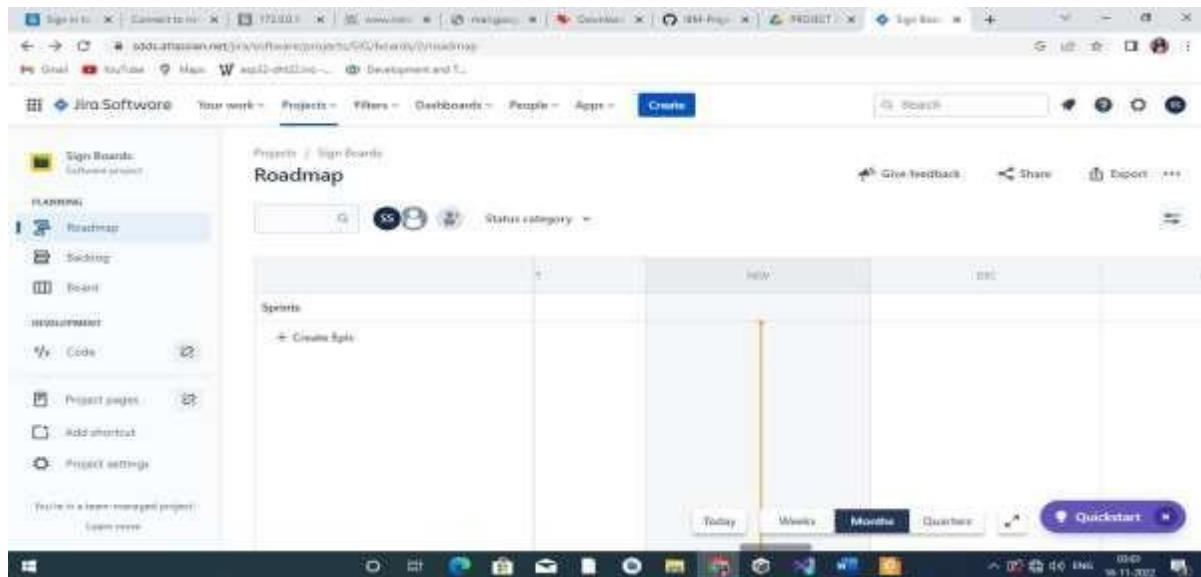


## 6.PROJECT PLANNING & SCHEDULING:

### Sprint Planning & Estimation:

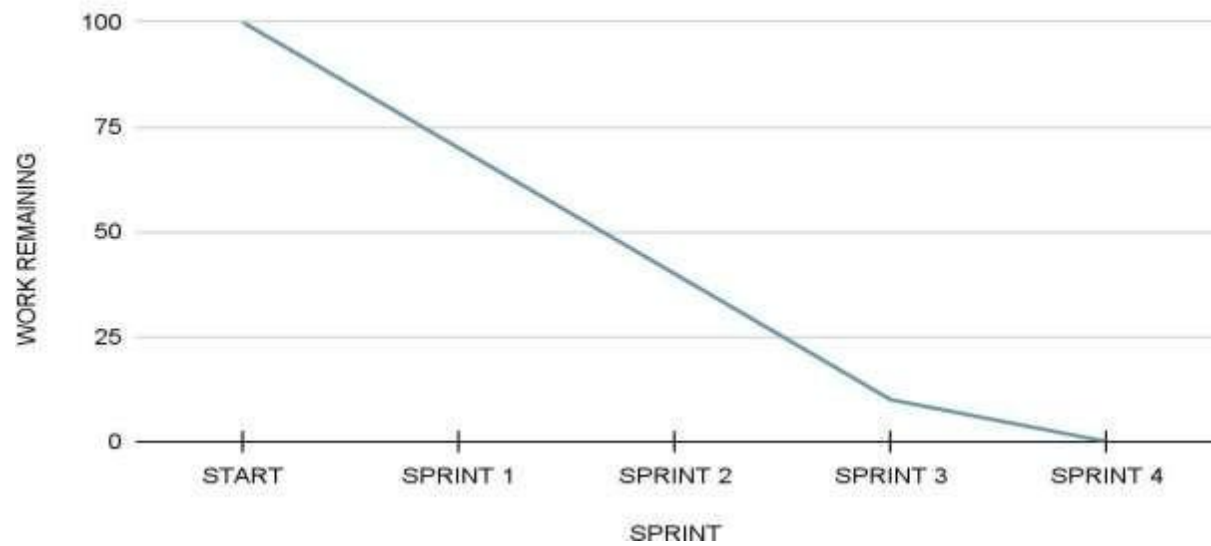
Sprint-1	Resources Initialization	Create and initialize accounts in various public APIs like OpenWeatherMap API.	1	Low	Sandheep kumar Vincent paul raj Nivas Sugandhar
Sprint-1	Local Server/Software Run	Write a Python program that outputs results given the inputs like weather and location.	1	Medium	Sandheep kumar Vincent paul raj Nivas Sugandhar
Sprint-2	Push the server/software to cloud	Push the code from sprint 1 to cloud so it can be accessed from anywhere	2	Medium	Sandheep kumar Vincent paul raj Nivas Sugandhar
Sprint-3	Hardware initialization	Integrate the hardware to be able to access the cloud functions and provide inputs to the same.	2	High	Sandheep kumar Vincent paul raj Nivas Sugandhar
Sprint-4	UI/UX optimisation and debugging	Optimize all the shortcomings and provide better user experience.	2	Low	Sandheep kumar Vincent paul raj Nivas Sugandhar

## 6.1 Reports From JIRA:



## Burndown Chart:

Balance Work



## 7.CODING & SOLUTIONING:

Code Explanation:

Libraries:

Including all libraries like json, random, time, sys, ibmiotf etc.

PROJECTFINALDND.py - D:/1ibm/PROJECTFINALDND.py (3.7.0)

File Edit Format Run Options Window Help

```
import requests #importing a library
import json
import ibmiotf.application
import ibmiotf.device
import time
import random
import sys
```

Credentials:

Entering all the credentials corresponding to IoT Watson device in order to publish data to it.

```
# watson device details

organization = "2s7yy7"
devicType = "project"
deviceId = "projectid"
authMethod= "token"
authToken= "projecttoken"
```

## MIT Inventor Interruption:

Receiving commands as inputs when buttons are pressed in MIT inventor in order to perform separate functions.

```
def myCommandCallback(cmd):
    global a
    #print("command recieved: %s" %cmd.data['command'])
    #status=cmd.data['command']
    print("command recieved: %s" %cmd.data['command'])
    control=cmd.data['command']
    print(control)

try:
    deviceOptions={"org": organization, "type": deviceType,"id": deviceId,"auth-method":authMethod,"auth-token":authToken}
    deviceCli = ibmiotf.device.Client(deviceOptions)
except Exception as e:
    print("caught exception connecting device %s" %str(e))
    sys.exit()
```

## Exception Handling:

To handle exception if occurs while connecting with IBM IOT WATSON device

```
try:
    deviceOptions={"org": organization, "type": deviceType,"id": deviceId,"auth-method":authMethod,"auth-token":authToken}
    deviceCli = ibmiotf.device.Client(deviceOptions)
except Exception as e:
    print("caught exception connecting device %s" %str(e))
    sys.exit()
```

## Main Body:

- Connecting to IBM IoT device.
- Getting temperature and humidity values in json format from open weather map as inputs.
- Accessing the values using their corresponding keys.
- Generating random values for distance since hardware sensors are not implemented.
- Passing a warning “stating please slow down” when humidity is less than 100 in order to promote safe driving experience.
- Passing instruction when distance is less than 20 in order to avoid accidents and clashes.

```

PROJECTINALDND.py - D:\IBM\PROJECTINALDND.py (3.7.0)
File Edit Format Run Options Window Help

#connect and send a datapoint "temp" with value integer value into the cloud as a type of event for every 10 seconds
deviceCli.connect()

while True:

    #get sensor data from DHT11

    x = "https://api.openweathermap.org/data/2.5/weather?q=Chennai,%30IN&appid=c2bea247ed9ad641a04d9a8e5549ed8f"
    r=requests.get(url=x)
    data=r.json()

    Temp= data['main']['temp']
    Humd= data['main']['humidity']
    data= {'temp':Temp,'humid':Humd}
    dist=random.randint(0,50)
    dis={'dista':dist}

    if(Humd<100):
        warn={'alert':'PLEASE SLOW DOWN!!!!!!'}
    if(dist<20):
        inst={'inst':'stop'}

```

## Publish Data To IBM IOT WATSON Platform:

- Passing all the data(temperature, humidity, warning, instruction) to ibm iot Watson.
- Disconnecting the connection established with IoT Watson device.

```

PROJECTINALDND.py - D:\IBM\PROJECTINALDND.py (3.7.0)
File Edit Format Run Options Window Help

data= {'temp':Temp,'humid':Humd}
dist=random.randint(0,20)
dis={'dista':dist}

if(Humd<100):
    warn={'alert':'PLEASE SLOW DOWN!!!!!!'}
if(dist<20):
    inst={'inst':'stop'}

def myOnPublishCallback():

    print("published Temperature = %s °C" %Temp,"humidity is %s" %Humd)
    print(warn)
    print(dis)
    print(inst)

success=deviceCli.publishEvent ("IoTDevice","temp",inst,qos=0,on_publish= myOnPublishCallback)
success=deviceCli.publishEvent ("IoTDevice","temp",data,qos=0,on_publish= myOnPublishCallback)
success=deviceCli.publishEvent ("IoTDevice","temp",warn,qos=0,on_publish= myOnPublishCallback)
success=deviceCli.publishEvent ("IoTDevice","temp",dis,qos=0,on_publish= myOnPublishCallback)

if not success:
    print("Not connected to Watson")
    time.sleep(5)

deviceCli.commandCallback=myCommandCallback
#Disconnect the device
deviceCli.disconnect()

```

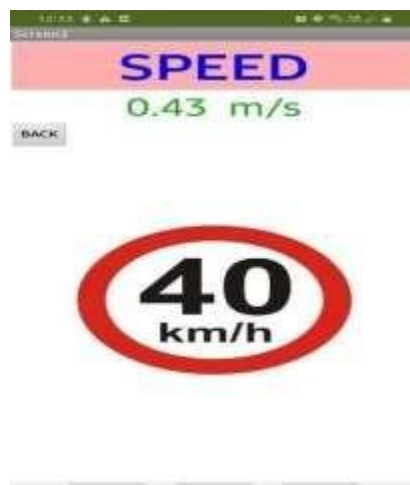
## 7.1 Feature 1: WEATHER UPDATE AND CORRESPONDING COMMAND:

Getting temperature and humidity from Open Weather Map for a particular city and displaying warning regarding the speed when humidity is below 100.



## 7.2 Feature 2: SPEED DETECTION

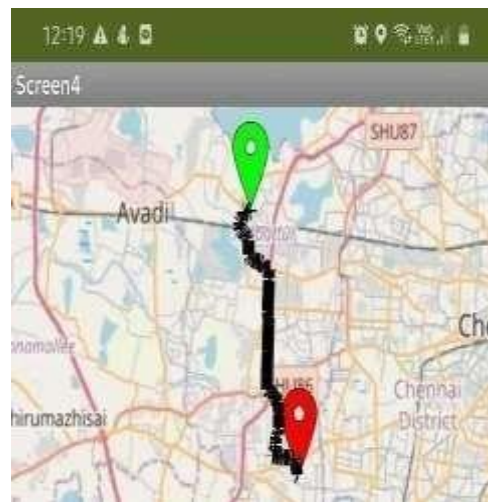
- By implementing a location sensor in MIT APP INVENTOR, with changes in the location with respect to time, speed can easily be detected and displayed in the app to the user.
- This requires location settings from user's phone to be active.
- An image of normal speed limit is also displayed which means that, travelling within that range would be safe.



## 7.3 Feature 3: MAP AND NAVIGATION

- By implementing same location sensor, current location can be detected. This also requires location settings in user's phone to be active.
- By dragging the green marker to start location and red marker to the destination location to be reached and clicking on the navigate button, displays the street path that connects the start and end point specified.
- In addition to this, it also displays the directions to be followed to reach the destination.





#### 7.4 Feature 4: ZONAL CLASSIFICATION:

- Here, displays few sign boards indicating different zones like school zone, hospital zone, railway track etc. By clicking on the button below the sign displays the meaning and instruction to be followed in the particular region.
- This provides the user with better understanding about the sign boards and to act accordingly.



## 7.4 Feature 5: DETERMINING TRAFFIC:

- Since hardware sensors are not implemented, we have used random function to generate values for the distance between the user and the vehicle ahead.
- If the distance is below 20, it instructs the driver or the user to stop immediately and try moving forward with different direction or to take diversion.

```
dist=random.randint(0,50)
dis={'dista':dist}

if(dist<20):
    inst={'inst':'stop'}
```



## 8. TESTING

### 8.1 Test Cases

A test case documents strategy that will be used to verify and ensure that a product or system meets its design specification and other requirements. A test case is usually prepared by or with significant input from the engineer. This document describes the plans for testing the architectural prototype of System. In my Project the system has to be tested to get the Desired Output. I use different speed for testing the system.

### 8.2 User Acceptance Testing

In engineering and its various sub disciplines, acceptance testing is black- box testing performed on a system (e.g. software, lots of manufactured mechanical parts, or batches of chemical products) prior to its delivery. It is also known as functional testing, black-box testing, release acceptance, QA testing, application testing, confidence testing, final testing, validation testing, or factory acceptance testing.

In software development, acceptance testing by the system provider is often distinguished from acceptance testing by the customer (the user or client) prior to accepting transfer of ownership. In such environments, acceptance testing performed by the customer is known as user acceptance testing (UAT). This is also known as end-user testing, site (acceptance) testing, or field (acceptance) testing.

A smoke test is used as an acceptance test prior to introducing a build to the main testing process. Acceptance test cards are ideally created during sprint planning or iteration planning meeting, before development begins so that the developers have a clear idea of what to develop. Sometimes (due to bad planning!) acceptance tests may span multiple stories (that are not implemented in the same sprint) and there are different ways to test them out during actual sprints.

One popular technique is to mock external interfaces or data to mimick other stories which might not be played out during an iteration (as those stories may have been relatively lower business priority). A user story is not considered complete until the acceptance tests have passed.

The acceptance test suite is run against the supplied input data or using an acceptance test script to direct the testers. Then the results obtained are compared with the expected results. If there is a correct match for every case, the test suite is said to pass. If not, the system may either be rejected or accepted on conditions previously agreed between the sponsor and the manufacturer.

The objective is to provide confidence that the delivered system meets the business requirements of both sponsors and users. The acceptance phase may also act as the final quality gateway, where any quality defects not previously detected may be uncovered.

In these testing procedures the project is given to the customer to test whether all requirements have been fulfilled and after the user is fully satisfied. The project is perfectly ready. If the user makes request for any change and if they found any errors those all errors has to be taken into consideration and to be correct it to make a project a perfect project.

## 9. Results:

### 9.1 Performance matrices :



## 10. ADVANTAGES:

- Signs with smart connectivity are an inexpensive and flexible medium that can help transmit information according to particular situation and entertain passengers.
- The digital signboards helps in reducing the air pollution due the emission of vehicles in heavy traffic area.
- The drivers can able to know about the weather condition and accordingly follow the speed limit displayed on the sign boards.
- The increased flexibility of these digital sign boards makes it easy for any private or government department to change the message as per the need of the hour.
- The driver can easily find the route and navigation instructions to reach the destination.
- The speed of the vehicle can be identified using location sensor.
- The digitals sign boards and the app are user-friendly.

## DISADVANTAGES:

- The digital signboards involves high Installation Costs.
- Getting digital signboards up and running is a far more involved process than print media.
- If the people managing the screens are not graphic designers, it can be difficult to update the content regularly on the screen.
- The digital sign boards are still new and developing technology in the road safety sector.
- While digital sign boards require power and therefore can't claim to be green, there is high energy use in the printing, erecting and replacement of traditional print media.

## 11. CONCLUSION:

Digital road signs are an important part of modern infrastructure and are becoming increasingly common. Digital road signs are becoming more common as technology improves and more states adopt 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 signs can help drivers by providing information that is not always available from traditional signs.

## 12. FUTURE SCOPE:

One of the benefits of digital road signs is that they can be updated in real-time, which means that they can be used to provide motorists with up-to-the-minute information about conditions on the road ahead. This can be particularly useful in the case of accidents or other incidents that might cause delays. In the future, digital road signs could also be used to provide information about alternative routes that might be available in the event of a problem on the road. This could be particularly useful in the case of major incidents, such as road closures due to bad weather. Finally, digital road signs could be used to provide motorists with information about the best times to travel in order to avoid traffic congestion. This could be particularly useful in areas where there is a lot of traffic.

## APPENDIX:

### Source Code:

```
import requests #importing a library

import json

import ibmiotf.application

import ibmiotf.device

import time

import random

import sys

# watson device details

organization = "2s7yy7"

devicType = "project"

deviceId = "projectid"

authMethod= "token"

authToken= "projecttoken"

#generate random values for random variables (temperature&humidity)

def myCommandCallback(cmd):

    global a

    #print("command recieved:%s" %cmd.data['command'])

    #status=cmd.data['command']
```

```

print("command recieved:%s"%cmd.data['command'])

control=cmd.data['command']

print(control)

try:

deviceOptions={"org": organization, "type": devicType,"id": deviceId,"auth-
method":authMethod,"auth-token":authToken}

deviceCli = ibmiotf.device.Client(deviceOptions)

except Exception as e:

print("caught exception connecting device %s" %str(e))

sys.exit()

#connect and send a datapoint "temp" with value integer value into the cloudas
a type of

event for every 10 seconds

deviceCli.connect()

while True:

#get sensor data from DHT11

a =

"https://api.openweathermap.org/data/2.5/weather?q=Chennai,%20IN&appid=e
2bea247ed9ad643a04d9a8e55499d5f"

r=requests.get(url=a)

data=r.json()

Temp= data['main']['temp']

```

```

Humd=data['main']['humidity']

data= {'temp':Temp,'humid':Humd}

dist=random.randint(0,20)

dis={'dista':dist}

if(Humd<100):

warn={'alert':'PLEASE SLOW DOWN!!!!!!'}

if(dist<20):

insta={'inst':'stop'}

def myOnPublishCallback():

print("published Temperature = %s c" %Temp,"humidity:%s %" %Humd)

print(warn)

print(dis)

print(insta)

success=deviceCli.publishEvent("IoTSensor","json",insta,qos=0,on_publish=
myOnPublishCallback)

success=deviceCli.publishEvent ("IoTSensor","json",data,qos=0,on_publish=
myOnPublishCallback)

success=deviceCli.publishEvent

("IoTSensor","json",warn,qos=0,on_publish=myOnPublishCallback)

success=deviceCli.publishEvent ("IoTSensor","json",dis,qos=0,on_publish=
myOnPublishCallback)

```



```
if not success:  
print("not connected to ibmiot") time.sleep(5)  
deviceCli.commandCallback=myCommandCallback  
#disconnect the device  
  
deviceCli.disconnect()
```

GITHUB LINK:

<https://github.com/IBM-EPBL/IBM-Project-54209-1661834039>

DEMO LINK:

<https://drive.google.com/drive/folders/1Sk1ePVjmFqB8SfRDG6BQ81ZcQruAAHpS>