SIGNS WITH SMART CONNECTIVITY FOR BETTER ROAD SAFETY

SUBMITTED BY

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Signs With Smart Connectivity For Better Road Safety

1.INTRODUCTION

In its Global Status Report on Road Safety – 2015, the World Health Organization (WHO) noted that the worldwide total number of road traffic deaths has plateaued at 1.25 million per year, with tens of million either injured or disabled. Different initiatives, such as the United Nations' initiative for the 2011-2020 Decade of Action for Road Safety, have led to improvements in road safety policies and enforcements. However, the WHO notes that the progress has been slow and has maintained the call for urgent action. In order to reduce the amount of road accidents due to road traffic we came up with a project on signs with smart connectivity for better road safety . Digital technologies like the Internet of Things (IoT) are reshaping road safety measures. Many technology initiatives are undertaken the world over to make smarter and safer roads, the ones that can interact with traffic and pedestrians. Assuming that by giving in vehicle technology information to the driver, accidents can be averted, several technology-based products have been developed. The latest technology researchers are working on is based on the Internet of Things (IoT). IoT is all about data. Data is becoming a valuable resource for our world.

Many sectors and industries have adopted IoT to reduce errors and improve performance in manufacturing, energy, health care, and communication. The WHO describes different measures that can be implemented with minimal economic impacts in its "Save LIVES: Road Safety Technical Package". A cornerstone of these steps is realizing economic systems for "monitoring road safety by strengthening data systems". Meanwhile, a key theme in the package is motivating the adoption of a Safe System approach, which is a holistic approach to road safety that parts from traditional management solutions by emphasizing safety by design.

Several methods have been implemented in advanced vehicles (Avs) for avoiding an accident. An accident threat is detected through sensors installed in vehicles or by using smartphone sensors. Previous researchers have used accelerometers, smoke detectors, infrared (IR) obstacle sensors, proximity sensors, and biosensors to detect an accident.

1.1 PROJECT OVERVIEW

This project proposes a system which has a smart connected digital sign boards on which the signs can be changed dynamically. These smart connected sign boards get the speed limitations from a web app using weather API and update automatically . Based on the weather changes or if there is rainfall then the roads will be slippery and this data is retrieved and displayed on the sign boards accordingly. The speed limit would be decreased based on the information available through the web app and the digital sign boards. Based on the traffic and fatal situations the diversion signs are also displayed on digital signs boards as well as the web app. It also helps to us to Guide(Schools), Warning and Service(Hospitals, Restaurant) signs are also displayed accordingly. Different modes of operations can be selected with the help of buttons.

1.2 PURPOSE

In present Systems the road signs and the speed limits are Static .Due to the lack of updated digital sign boards a lot accidents have occurred. So , the road signs should be changed accordingly. We can consider some cases when there are some road diversions due to heavy traffic or there is heavy rainfall and the road is slippery which can cause many 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. 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.

2. LITERATURE SURVEY

2.1 EXISTING PROBLEM

- Rain makes brakes inefficient where the roads are very slippery and leads to accidents
- Fog reduces visibility of the drivers and increases the probability of accidents
- Traffic diversion requires human intervention
- Lack of digitally updated sign boards causes many accidents
- No immediate updation of the fatal situations that occur in the road due to lack of digital sign boards

2.2 REFERENCES

PAPER 1 :
PUBLISHED YEAR : 2019
AUTHOR : Muhammed O. Sayin, Chung-Wei Lin
JOURNAL NAME: Reliable Smart Road Signs

SUMMARY: In this paper, we propose a game theoretical adversarial intervention detection mechanism for reliable smart road signs. A future trend in intelligent transportation systems is “smart road signs” that incorporate smart codes (e.g., visible at infrared) on their surface to provide more detailed information to smart vehicles. Such smart codes make road sign classification problem aligned with communication settings more than conventional classification. This enables us to integrate well-established results in communication theory, e.g., error-correction methods, into road sign classification problem. Recently, vision-based road sign classification algorithms have been shown to be vulnerable against (even) small scale adversarial interventions that are imperceptible for humans. On the other hand, smart codes constructed via error-correction methods can lead to robustness against small scale intelligent or random perturbations on them. In the recognition of smart road signs, however, humans are out of the loop since they cannot see or interpret them.

PAPER 2:
PUBLISHED YEAR : 2019
AUTHOR : Chai k.Toh,Juan-Carlos Cano
JOURNAL NAME : Wireless digital traffic signs of the future

SUMMARY: Traffic signs have come a long way since the first automobile was invented. They have long served the purpose of warning and guiding drivers and also enforcing the traffic laws governing speed, parking, turns, and stopping. In this study, the authors discuss 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. With technological advances in the areas of wireless communications and embedded electronics and software, we foresee that, in the future, digital traffic sign posts will be capable of transmitting the traffic sign information wirelessly to road users, and this will transform our roads into intelligent roads, where signs will appear promptly and automatically on in-vehicle displays to alert the driver. There is no longer the need to watch out for traffic signs since the detection will be automatic and performed wirelessly. This transformation will lessen burden on the drivers, so that they can then focus more on the traffic ahead while driving.

PAPER 3:
AUTHOR : Eric Masatu,Ramadhani Sinde,Anael Sam
JOURNAL NAME: Development and Testing of Road Signs Alert System Using a Smart Mobile Phone

SUMMARY: Road traffic accident is a major problem worldwide resulting in significant morbidity and mortality. Advanced driver assistance systems are one of the salient features of intelligent systems in transportation. They 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. However, static road signs are often seen too late for a driver to respond accordingly. In this study, a system for alerting drivers about road signs has been developed and tested using a smart mobile phone. The study was carried out in Tanzania along an 80 km highway stretch from Arusha to Moshi town. The Haversine formula was used to measure and estimate the distance between two pairs of coordinates using the smartphone-based navigation application, Google Map. The application provides a voice alert to a needed action that enhances driver's attention.

PAPER 4:
PUBLISHED YEAR : 2021
AUTHOR : Kailas Shindea , Pranjal Shindeb , Shivani Valhvankarc , Swapnil Narkheded
JOURNAL NAME : IoT Based Smart Road Safety and Vehicle Accident Prevention System

SUMMARY : There are a unit several existing plans towards safety against road accidents like thanks to advanced technology GSM associated GPS were introduced so they're useful in trailing the vehicles that met with an accident however they're not preventive for avoiding the accidents. Arduino based mostly vehicle accident detection system was planned as associate approach towards avoiding road accidents. During this planned model Arduino, GSM, GPS, LCD, vibration sensors were used. during this system vibration sensing element is employed as associate input supply to system that is analyzed by the Arduino and once the sensing element reading exceeds the conventional or threshold acceptable action starts going down because it can direct the GSM to send messages from the user mobile to the authority as they will send immediate facilitate to the accident victims

PAPER 5:
PUBLISHED YEAR : 2014
AUTHOR : Usha Devi Gandhi,Arun Singh, Arnab Mukherjee
JOURNAL NAME : Smart vehicle connectivity for safety applications

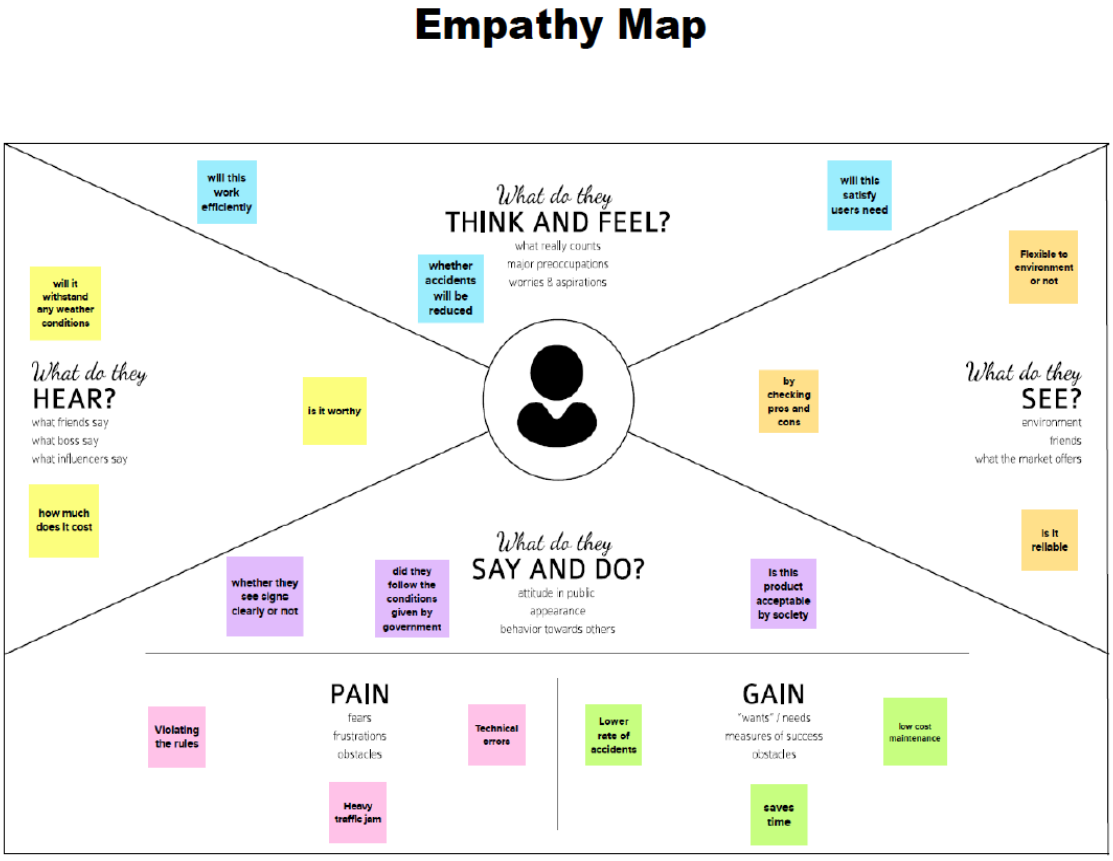
SUMMARY: Connected vehicle technology aim to solve some of the biggest challenges in the transportation in the areas of safety, mobility and environment. The safety application for Intelligent Transport System(ITS) is one of the main objectives in this project. Safety application is research and industrial initiative which aim to contribute to the global advancement of automobile industry. In this project we focus on V2V communication, once cars are connected which is able to share data with other cars on the road and which help to reduce Highway accidents. Ultimately, vehicles are connect via multiple complementary technologies of vehicle to-vehicle (V2V) and vehicle-to-infrastructure (V2I) connectivity based on Wi-Fi, GPS, Dedicated Short Range Communication (DSRC).

2.2 PROBLEM STATEMENT DEFINITION

In present Systems the road signs and the speed limits are Static. But the road signs can be changed in some cases. We can consider some cases when there are road diversions due to heavy traffic or due to accidents then we can change the road signs accordingly if they are digitalized. This project proposes a system that has digital signboards 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. There is a web app through which you can enter the data on road diversions, accident-prone areas, and information sign boards can be entered through the web app. This data is retrieved and displayed on the signboards accordingly.

3. IDEATION & PROPOSED SOLUTION

3.1 EMPATHY MAP CANVAS



3.2 IDEATION & BRAINSTORMING

Idea 1:

Smart connected Signs for Improved Road Safety

In present Systems the road signs and the speed limits are Static. But the road signs can be changed in some cases. We can consider some cases when there are 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.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.

Speed Indication Display

Warning signs can be beneficial for road users. The speed indication displays – that serve as a warning sign – are digital speed boards which are installed on roads for identifying whether a vehicle crosses the speed limit or not. These devices are installed along with a radar sensor, and can evaluate the speed of the vehicle, which is displayed on the LED displays, visible to all vehicles. Today, a wide range of speed indication display devices is available; while some display the vehicles which are driving under and over speed limits, others display the real-time speed of each vehicle. At times, the device captures and stores images of speeding vehicles. Speed Indication Displays have been implemented in Singapore and UK, and the Indian Government has already suggested the installation of these devices in its scheduled ‘Integrated Traffic Management System’.

Idea 2:

Basic elements of an effective automated traffic enforcement PPP Model

a.A study to identify the intersections or road sections that have a history of injuries or fatalities with the sole goal of improving road safety at these sites. The study should confirm that – besides safety cameras – a range of road safety countermeasures have been considered and thoroughly evaluated for effectiveness. b. A private party – either a supplier or a third party who is willing to supply the safety cameras for usage at no upfront charge to the public party, which could be a municipality, county, province, state, or nation, and provide a service to issue tickets and collect fines for traffic violations recorded by the

safety cameras. c. A contractual arrangement between the public and private party, allowing the private party to recover its investment over time by receiving an agreed and capped share of the revenue generated by the safety cameras. This contractual cap should not prevent the private party from issuing further tickets, which means a reasonable per ticket fee to cover the private party's additional costs should continue once the cap is reached. d. No citations may be issued unless an authorized official has verified the offense after viewing the image or video of the incident. e. The end-to-end integrity of the enforcement system (from cameras to back office processes) must be guaranteed to ensure public trust and optimise efficacy and efficiency. An independent third party must be hired to formally approve and authorise usage, but also routinely inspect, verify and calibrate each camera to confirm the intended measurements and performances. An independent party should also monitor, inspect and verify that the

Idea 3:

Reinventing the Traffic Light

Automated three color traffic lights have been around since the 1920s. They are usually round in shape, since incandescent round bulbs were used at their center. A recent technological improvement has been the switch from incandescent bulbs to LEDs. Although costlier in the short run, LED traffic lights have several advantages:

• More energy efficient (up to 98%).

• Low power consumption allows for battery backup in case of power outage. This improves safety and traffic flow during power outages.

• Very long life (5 to 10 years) as opposed to 1 year for incandescent. Maintenance cost savings.

• They do not just burn out, they slowly lose intensity. No down time due to burnt bulbs.

• No need for rear reflector. Eliminates the problem of false showing due to sunlight entering and being reflected back.

• Much brighter than incandescent, makes them easier to see in daylight and through rain and snow.

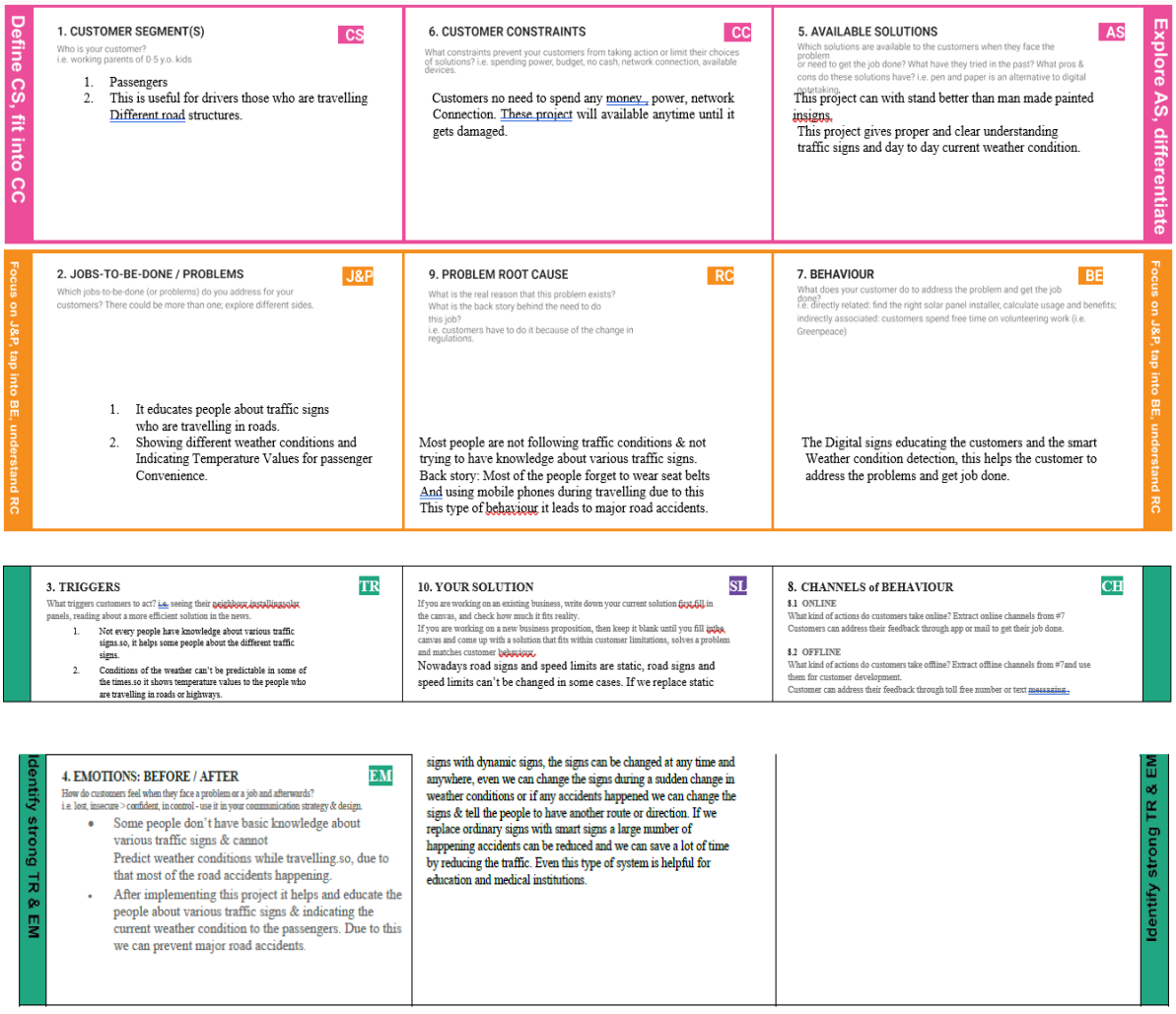
• The green light can be used for both left turn signal and straight through traffic (by selectively turning on some LEDs and then all of them). This allows for easy and cost-effective deployment of the left turn signal — a benefit for intersections that would otherwise not have justified the extra cost.

3.3 PROPOSED SOLUTION

S.No	Parameter	Description
1.	Problem Statement (Problem to be solved)	Project - Signs with Smart Connectivity for Better Road Safety is used to educate the drivers digitally using IOT who do not have knowledge about traffic signs and weather indication for the drivers and passengers convenience. Based on the traffic and fatal situations the diversion signs are Displayed. Guide(Schools), Warning and Service (Hospitals, Restaurant) signs are also displayed accordingly.
2.	Idea / Solution description	Replacing the man made painted signs into digital as well as their name which is more visible compared to current signs and also indicating weather in the same sign boards for driver where weather is not predictable. The weather and temperature details are obtained from the OpenWeatherMap API. Using these details, the speed limit will be updated automatically in accordance with the weather conditions
3.	Novelty / Uniqueness	Weather indication on sign boards is unique which will help mostly the two wheelers from unfortunate heavy rains and winds. Digital traffic signs also educates the drivers to follow traffic rules easily.
4.	Social Impact / Customer Satisfaction	It makes the people to know about traffic signs if they don't know ,it shows signs digitally to avoid the accidents and weather indication based on IOT to avoid accidents
5.	Business Model (Revenue Model)	This project can make revenue by selling many equipments to the government sector and also private sectors(educational & medical institutions).Maintain services are also taken by the company. The public will also gain all the information about the road, even if they are checking for an alternate path because of some mishaps that happen on the roads and these functionalities will increase the value of the product in the

		global market.
6.	Scalability of the Solution	It makes the daily life of drivers and passengers better. The product can be scalable by adding new features to the product makes more revenue. The hardware components can be directly interfaced with the microcontroller and small modifications can be made in the programming of the existing product. In case of the software, the website application has to be updated with the additional functionality by creating a new section for the updated hardware

3.4 PROPOSED SOLUTION FIT



4.REQUIREMENT ANALYSIS

4.1 FUNCTIONAL REQUIREMENT

FR No.	Functional Requirement (Epic)	Sub Requirement (Story / Sub-Task)
FR-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.
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	**Product Delivery and installation**	The installation fee will be depend upon the length of the road
FR-5	**User Convenience**	The display should be big enough that it should even be visible from far distance clearly.
FR-6	**Product Feedback**	Will be shared through a website via Gmail

4.2 NON-FUNCTIONAL REQUIREMENT

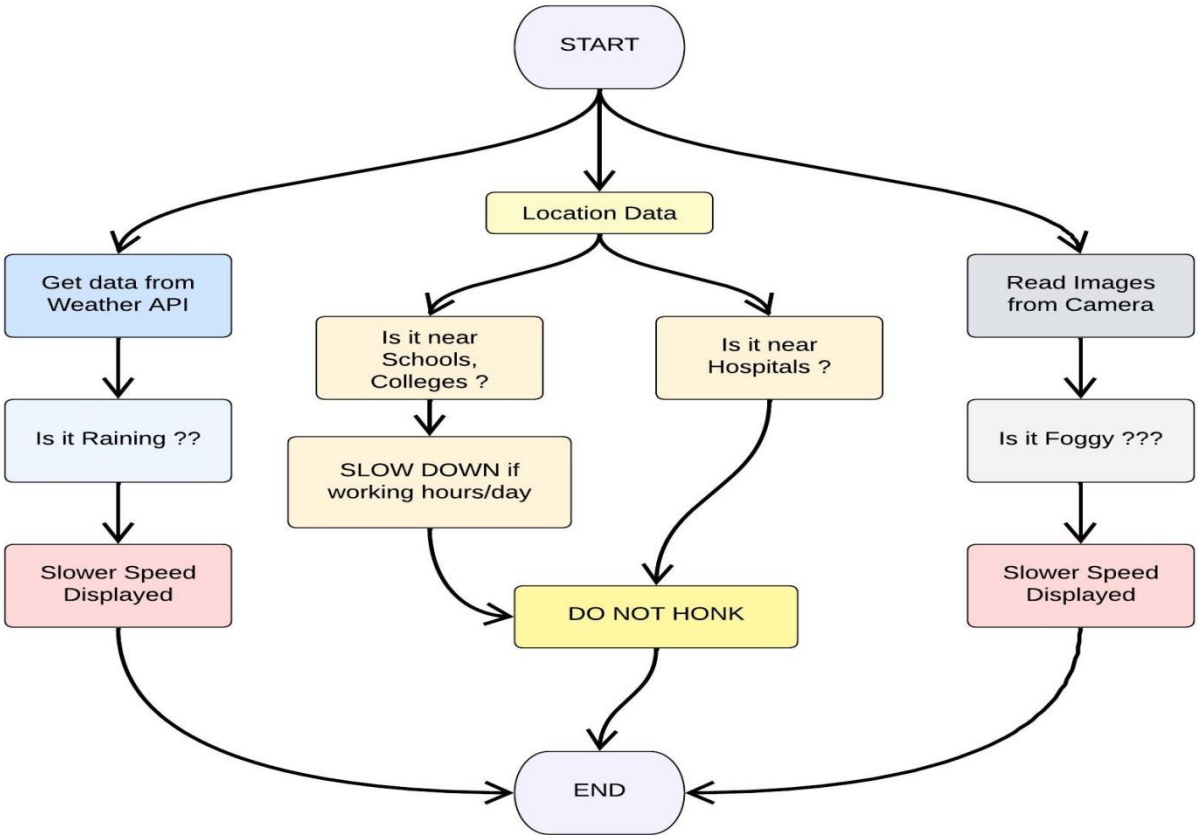
FR No.	Non-Functional Requirement	Description
NFR-1	**Usability**	It should be able to Upgrade and Update whenthere is a need for it.
NFR-2	**Security**	It should have good security system so that no other person is able to hack and display their owndirections.
NFR-3	**Reliability**	It should be able to display to information correctly and error-free.

NFR-4	**Performance**	It should be able to automatically update itself
NFR-5	**Availabilty**	All of the functions and the user demands will be provided depend upon the customer needs
NFR-6	**Scalability**	The product is based on road safety and should coverthe entire highway system

5.PROJECT DESIGN

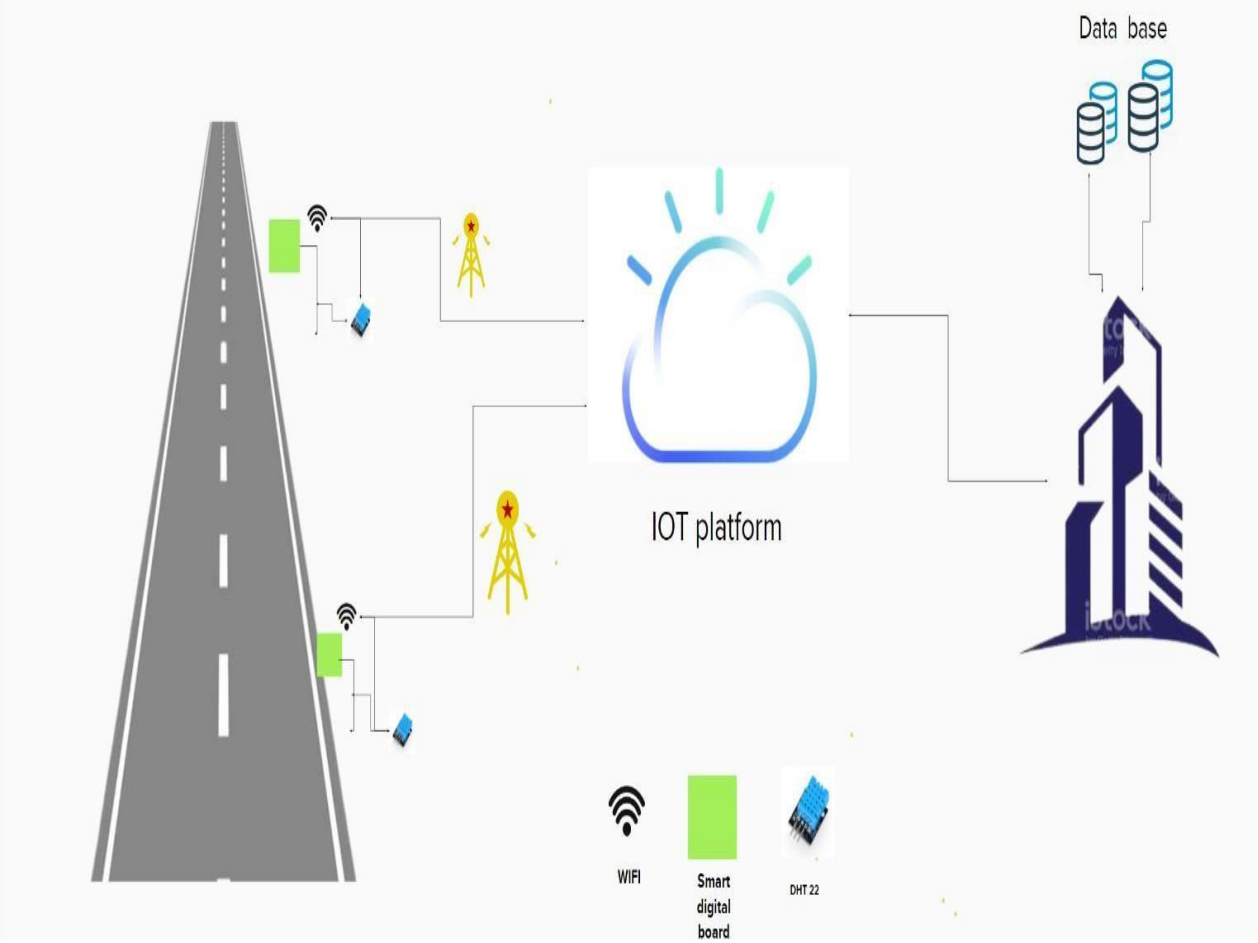
5.1 DATA FLOW DIAGRAMS

A Data Flow Diagram (DFD) is a traditional visual representation of the information flows within a system. A neat and clear DFD can depict the right amount of the system requirement graphically. It shows how data enters and leaves the system, what changes the information, and where data is stored.

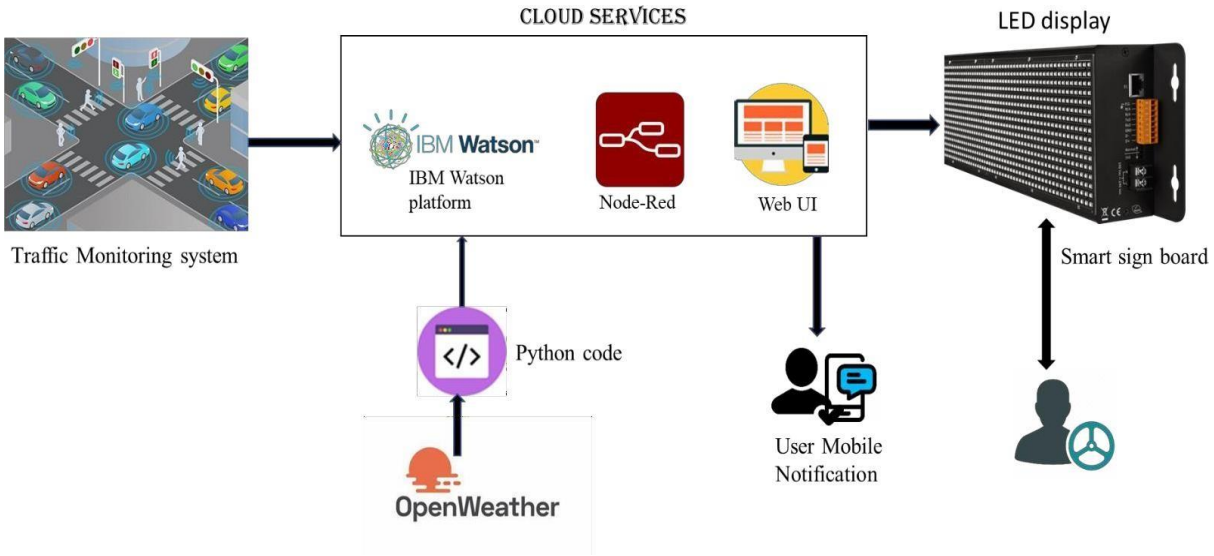


5.2 SOLUTION & TECHNICAL ARCHITECTURE

SOLUTION ARCHITECTURE



TECHNICAL ARCHITECTURE



5.3 USER STORIES

User Type	Functional Requirement (Epic)	User Story Number	User Story / Task	Acceptance criteria	Priority	Release
Customer (Mobile user)	Registration	USN-1	As a user, I can register for the application by entering my email, password, and confirming my password.	I can access my account / dashboard	High	Sprint-1
		USN-2	As a user, I will receive confirmation email once I have registered for the application	I can receive confirmation email & click confirm	High	Sprint-1
		USN-3	As a user, I can register for the application through Facebook	I can register & access the dashboard with Facebook Login	Low	Sprint-2
		USN-4	As a user, I can register for the application through Gmail	I can receive speed limitaions	Medium	Sprint-1
	Login	USN-5	As a user, I can log into the application byentering email & password	I can access the application through myGmail login	High	Sprint-2

Custom er (Web user)	Data generation	USN-6	As a user I use open weather applicatio nto access the data regarding the weather changes.	I can access the data regarding the weather through the applicatio n	High	Sprint-1
Administra tor (Officials)	Problem solving/ fault clearance	USN-7	As an official who is in charge for the proper functioning of the sign boards have to maintain it through periodic monitoring	Official s can monitor the sign boards for proper functio ning	Mediu m	Sprint-2

6.PROJECT PLANNING & SCHEDULING

The definition of a sprint is a dedicated period in which a set amount of work will be completed on a project. It's part of the agile methodology, and an Agile project will be broken down into a number of sprints, each sprint taking the project closer to completion**.**

6.1 SPRINT PLANNING & ESTIMATION

Sprint	Functional Requirement (Epic)	User Story/Task	Story Points	Priority
Sprint-1	Intializing the Resources	Create an account in Open Weather API	1	LOW
Sprint-1	Code in Software is written	Write a python script Using the inputs given from the open weather API	2	MEDIUM
	Sending the	The python code from		

Sprint-2	software to cloud	sprint 1 should be sent to cloud so that it is easily accessible	1	MEDIUM
Sprint-3	Initialising the connection between hardware and cloud	The hardware should be intergrated for the easy access of the cloud functions	2	HIGH
Sprint-4	User input-output optimisation and error identification and rectification	Rectify all the shortcomings/errors and initiate the optimisation for better	3	HIGH

6.2 SPRINT DELIVERY SCHEDULE

TITLE	DESCRIPTION	DATE
Literature Survey& Information Gathering	A literature review is a comprehensive summary of previous researches onthe topic. The literature review surveys scholarly articles, books, and other sources relevant to a particular area of research.	6 October 2022
Prepare Empathy Map	An empathy map is a collaborative tool teams can use to gain a deeper insight into their customers. It helps us to understand the customers' pain, gain and difficulties from their point of view.	5 October 2022

Ideation- Brainstorming	Brainstorming is a group problem-solving method that helped us to gather and organize various ideas and thoughts from team members.	5 October 2022
Define Problem Statement	The Customer Problem Statement helps us to focus on what matters to create experiences people will love. A well-articulated customer problem statement allowed us to findthe ideal solution for thechallenges customersface.	8 October 2022

Problem Solution Fit	It helped us understand and analyze all the thoughts of our customer, their choice ofoptions, problems, root cause, behavior and emotions.	16 October 2022
Proposed solution	It helped us analyze and examine our solution more inthe grounds of uniqueness, social impact, business model, scalability etc.	18 October 2022
Solution Architecture	Solution architecture is a complex process – with many sub-processes – that bridges the gap between business problems and technology solutions. It helped us understand the features and components used to complete the project.	15 October 2022
Customer journey map	It helped to analyse the various steps, interactions, goals and motivation, positives, negatives and opportunities.	17 October 2022

Solution requirements	It briefs about functional and non-functional requirements. It involves the various steps in the entire process. It also specifies features usability, security, reliability, performance, availability and scalability.	11 October 2022
Technology stack	A tech stack is the combination of technologies a company uses to build and run an application or project. It helps us analyse and understand various technologies that needs to be implemented in the project.	22 October 2022
Data flow	A Data Flow Diagram (DFD) is a traditional visual representation of	22 October 2022

6.3 REPORTS FROM JIRA

JIRA LINK:

https://vaseegaran76.atlassian.net/jira/software/projects/SA/boards/1/roadmap

7.CODING & SOLUTIONING

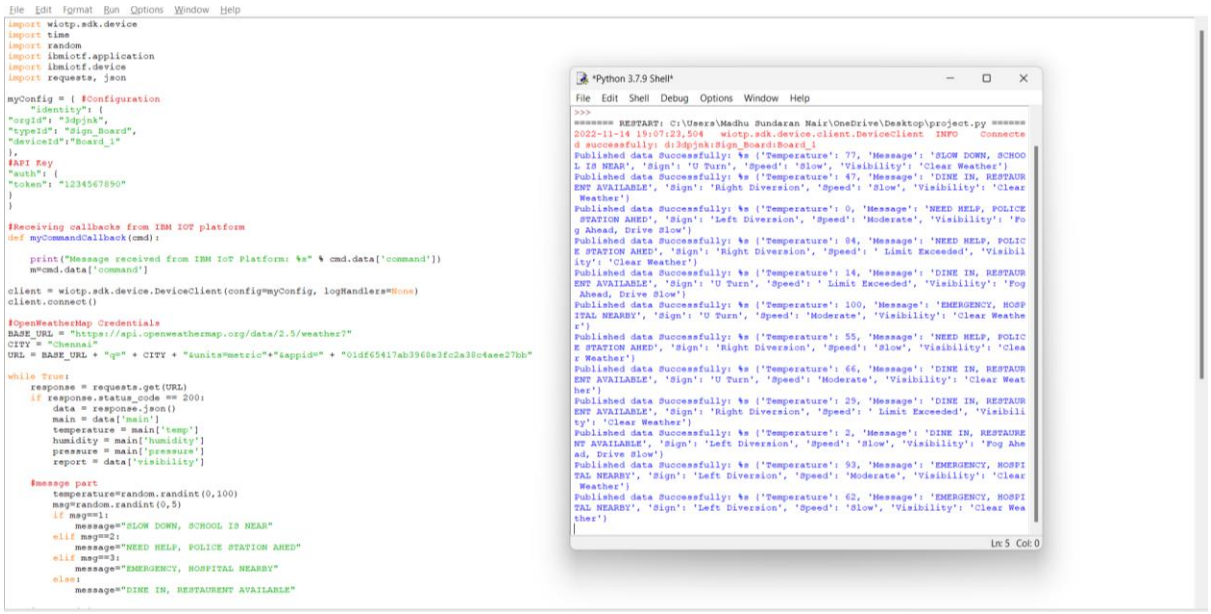
7.1 FEATURE 1

```
importwiotp.sdk.device
import time
import random
importibmiotf.application
import ibmiotf.device
import requests, json
myConfig = {
#Configuration
"identity": {
"orgId": "3dpjnk",
"typeId": "Sign_Board",
"deviceId":"Board_1"},
```

```
#API Key
"auth": {
"token": "1234567890"
}
}

#Receiving callbacks from IBM IOT platform
defmyCommandCallback(cmd):
print("Message received from IBM IoT Platform: %s" % cmd.data['command'])
m=cmd.data['command']

client = wiotp.sdk.device.DeviceClient(config=myConfig,logHandlers=None)
client.connect()

#OpenWeatherMap Credentials
BASE_URL =https://api.openweathermap.org/data/2.5/weather?
 CITY = "Nagercoil"
URL = BASE_URL + "q=" + CITY + "&units=metric"+"&appid=" +
"01df65417ab3968e3fc2a38c4aee27bb"

while True:
response = requests.get(URL)
if response.status_code ==200:
data = response.json()
main = data['main']
temperature =main['temp']
humidity = main['humidity']
pressure = main['pressure']
report = data['visibility']

#messge part
msg=random.randint(0,5)
 if msg==1:
message="SLOW DOWN, SCHOOL IS NEAR"
elifmsg==2:
message="NEED HELP, POLICE STATION AHED"
elifmsg==3:
message="EMERGENCY, HOSPITAL NEARBY"
elifmsg==4:
message="DINE IN, RESTAURENT AVAILABLE"
else:
message=""
 #Speed Limit part
```

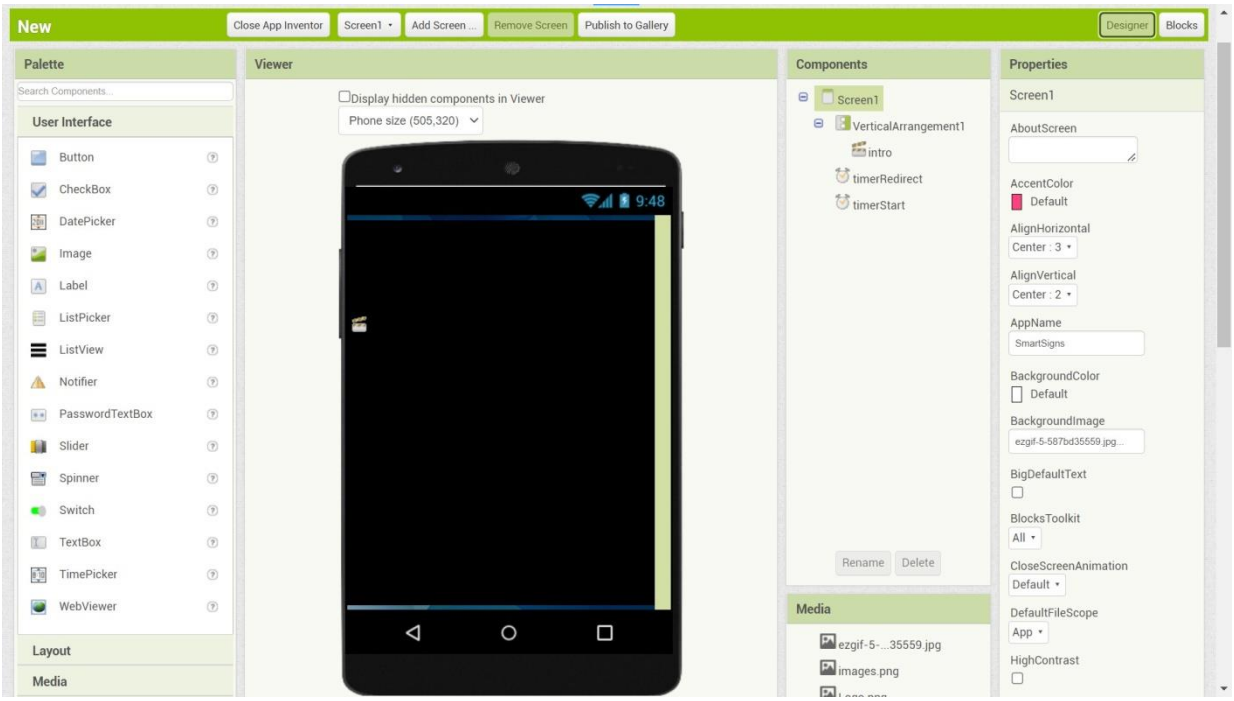
```
speed=random.randint(0,150)
 if speed>=100:
speedMsg=" Limit Exceeded"
 elif speed>=60 and speed<100:
speedMsg="Moderate"
 else:
speedMsg="Slow"

#Diversion part
sign=random.randint(0,5)
if sign==1:
signMsg="Right Diversion"
elifsign==3:
signMsg="Left Diversion"
 elifsign==5:
signmsg="U Turn"
else:
signMsg=""

#Visibility
if temperature < 24:
visibility="Fog Ahead, Drive Slow"
 elif temperature < 20:
visibility="Bad Weather"
 else:
visibility="Clear Weather"

else:
print("Error in the HTTP request")
myData={'Temperature':temperature, 'Message':message, 'Sign':signMsg,
'Speed':speedMsg, 'Visibility':visibility}
client.publishEvent(eventId="status", msgFormat="json", data=myData, qos=0,
onPublish=None) #PUBLISHING TO IOT WATSON
print("Published data Successfully: %s", myData) client.commandCallback =
myCommandCallbacktime.sleep(5)
client.disconnect()
```

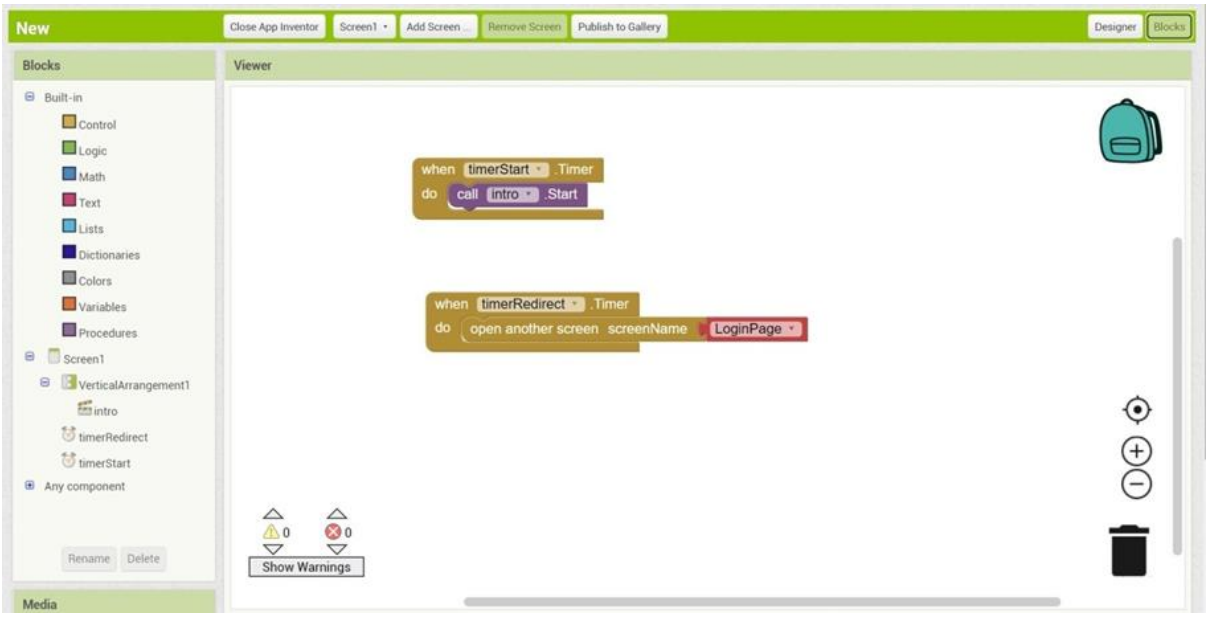
OUTPUT



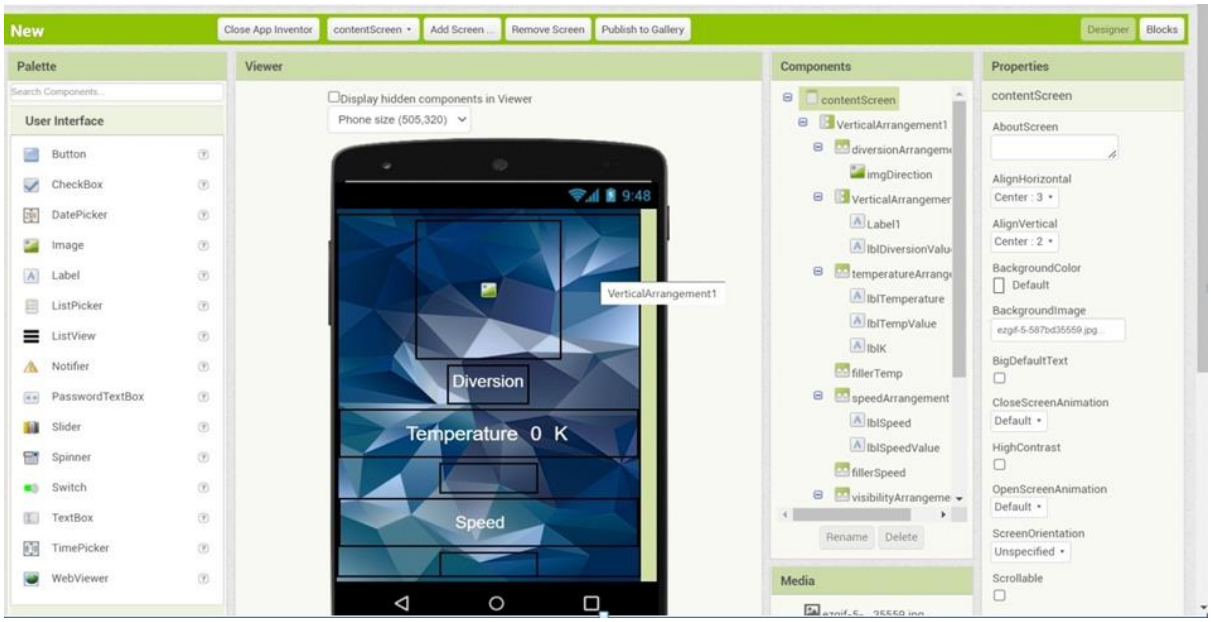
FEATURE 2: (MITAPPINVENTER):

MIT APP INVENTOR: ICON PAGE:




New
Close App Inventor
Screen1
Add Screen ...
Remove Screen
Publish to Gallery
Designer
Blocks
Blocks
Viewer
Built-in
Control
Logic
Math
Text
Lists
Dictionaries
Colors
Variables
Procedures
Screen1
VerticalArrangement1
intro
timerRedirect
timerStart
Any component
Rename
Delete
Media
when timerStart .Timer
do call intro .Start
when timerRedirect .Timer
do open another screen screenName LoginPage
0
0
Show Warnings


New
Close App Inventor
LoginPage
Add Screen ...
Remove Screen
Publish to Gallery
Designer
Blocks
Blocks
Viewer
Built-in
Control
Logic
Math
Text
Lists
Dictionaries
Colors
Variables
Procedures
LoginPage
loginPageArrangemen
loginArrangement
imgLogo
fillerAfterLogo
usernameArranger
lblUsername
Rename
Delete
Media
when btnLogin .Click
do if txtUsername . Text = admin and txtPassword . Text = admin
then open another screen screenName contentScreen
else call checkCred .ShowAlert
notice Admin for both
0
0
Show Warnings


New
Close App Inventor
contentScreen
Add Screen ...
Remove Screen
Publish to Gallery
Designer
Blocks
Palette
User Interface
Button
CheckBox
DatePicker
Image
Label
ListPicker
ListView
Notifier
PasswordTextBox
Slider
Spinner
Switch
TextBox
TimePicker
WebViewer
Viewer
Display hidden components in Viewer
Phone size (505,320)
9:48
VerticalArrangement1
Diversion
Temperature 0 K
Speed
Components
contentScreen
VerticalArrangement1
imgDirection
Label1
lblTemperature
lblTempValue
lblK
fillerTemp
lblSpeed
lblSpeedValue
fillerSpeed
Rename
Delete
Media
Properties
contentScreen
AboutScreen
AlignHorizontal
Center : 3
AlignVertical
Center : 2
BackgroundColor
Default
BackgroundImage
BigDefaultText
CloseScreenAnimation
Default
HighContrast
OpenScreenAnimation
Default
ScreenOrientation
Unspecified
Scrollable

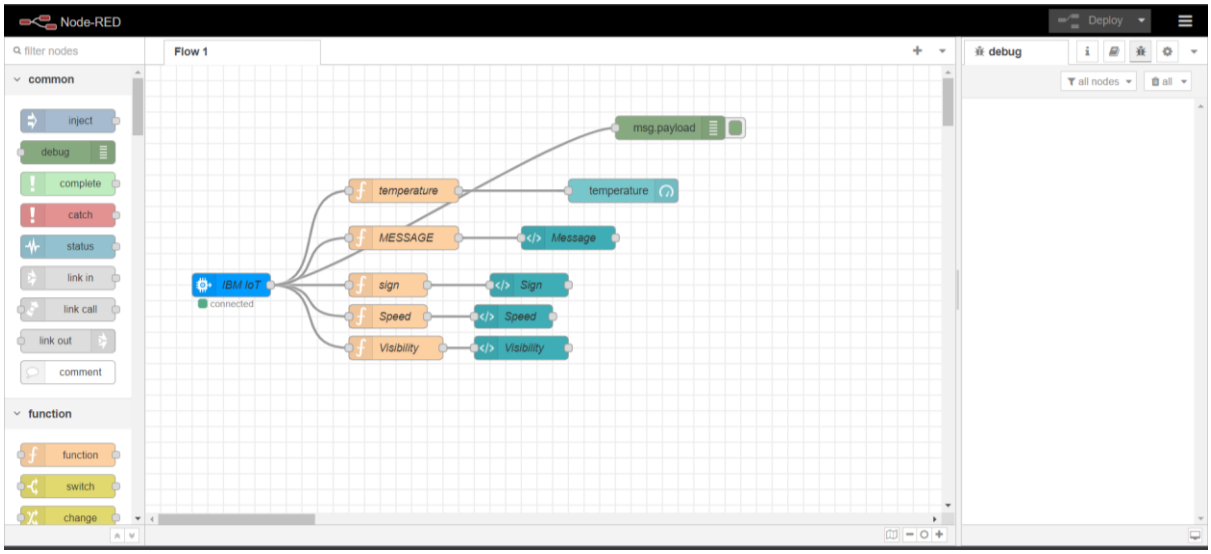

New
Close App Inventor
contentScreen
Add Screen ...
Remove Screen
Publish to Gallery
Designer
Blocks
Blocks
Built-in
Control
Logic
Math
Text
Lists
Dictionaries
Colors
Variables
Procedures
contentScreen
VerticalArrangement1
imgDirection
Label1
Rename
Delete
Media
Viewer
Show Warnings

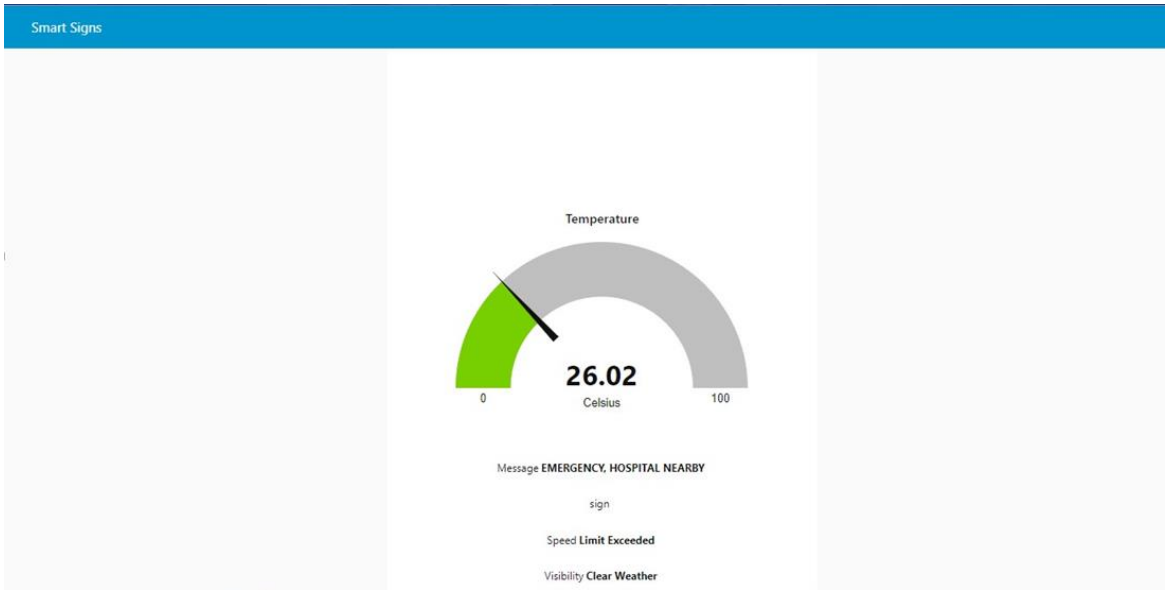
8.TESTING

8.1 TEST CASES

Test cases help guide the tester through a sequence of steps to validate whether a software application is free of bugs, and working as required by the end-user.

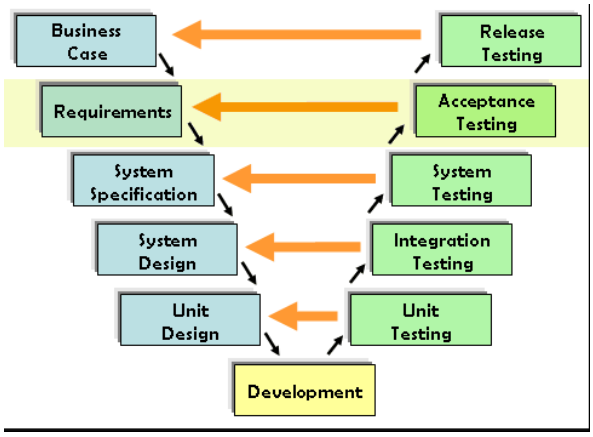
Learning how to write test cases for software requires basic writing skills, attention to detail, and a good understanding of the application under test (AUT).





8.2 User AcceptanceTesting:

User Acceptance Testing consists, in practice, of people from the target audience using the application. The defects they find are then reported and fixed. This scenario is what most closely resembles “the real world.” The process allows users to “get their hands dirty” with the application. They can see if things work as intended.

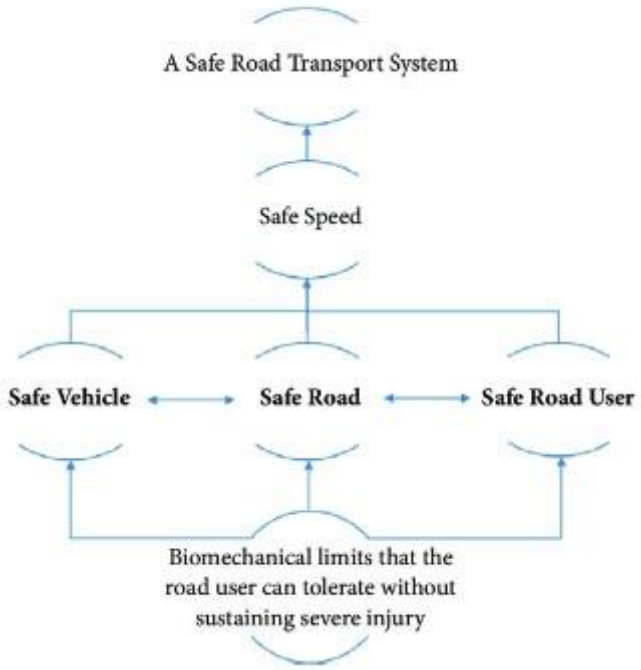


The main purpose of User Acceptance Testing is to validate end-to-end business flow. It does not focus on cosmetic errors, spelling mistakes, or system testing. User Acceptance Testing is carried out in a separate testing environment with a production-like data setup. It is a kind of black box testing where two or more end-users will be involved.

9.RESULTS

9.1 PERFORMANCE METRICS

Based on the IBM pack we chose, the performance of the website varies. Built upon NodeJS, a light and high performance engine, NodeRED is capable of handling upto 10,000 requests per second. Moreover, since the system is horizontally scalable, a even higher demand of customers can be served.



10. ADVANTAGES & DISADVANTAGES

ADVANTAGES:

Connected vehicles have various benefits such as

- Multimodalsensorsandedgecomputinghelpspeeduptheflowoftraffic withreal-time processing, reducing congestion and emissions.
- Smart road technology can assist in optimizing traffic flow
- It will manage road conditions, creating a more sustainable environment

within cities.

- Improved control and safety can be achieved through IoT-enabled cars. In case of over-speeding, the notification gets displayed
- Ensuring a safe driving experience with real-time assistance, navigation, and even monitoring driving patterns and any emergency. Additionally, along with the state of the traffic, IoT drivers can receive updated information on the state of the roads, i.e., potholes, ice, grade changes, black spots,etc.

DISADVANTAGES:

- Security and privacy. Keeping the data gathered and transmitted by IoT devices safe is challenging, as they evolve and expand in use....
- Technical complexity....
- Connectivity and power dependence.
- Integration....
- Higher costs (time andmoney)

11. CONCLUSION

The world doesn’t change on its own but we humans can change the world to be safe, better, and harmless. Since the road isn’t said to be safe let’s make it safer with the technologies present and available to us. The Internet of Things is one of the technologies that can lead us to travel on enhanced safe roads. So let's come together to create a better world with no accidents and a smart road for the future generation.

12. FUTURESCOPE

IoT obtains the majority of its data with the help of connected cars. These incorporate a large number of sensors that establish communication with the cloud, other vehicles, and devices. Thanks to this it provides data and information of great utility for the improvement of road safety. The safe system approach to road safety emphasizes safety by design ensuring safe vehicles, road networks, and road users. Evolving towards the future, the road needs to boil with advanced sensors and antenna systems to have peace with the new era.

13.APPENDIX

Source Code:

```
importwiotp.sdk.device

import time

import random

importibmiotf.application

import ibmiotf.device

import requests, json

myConfig = {

      #Configuration

     "identity": {

        "orgId": " gcwwwd",

       "typeId": " Mydevice",

       "deviceId":" 12345"},

    #API Key

   "auth": {

      "token": " fK(dcV+Y-i5HxLguYx"

  }

#Receiving callbacks from IBM IOT platform
defmyCommandCallback(cmd):print("Message

 received from IBM IoT Platform: %s" %
```

```
 cmd.data['command']) m=cmd.data['command']
client = wiotp.sdk.device.DeviceClient(config=myConfig,logHandlers=None)
client.connect()
#OpenWeatherMap Credentials
BASE_URL =https://api.openweathermap.org/data/2.5/weather?
 CITY = "Chennai"
URL = BASE_URL + "q=" + CITY + "&units=metric"+"&appid=" +
"01df65417ab3968e3fc2a38c4aee27bb"
while True:
response = requests.get(URL)
if response.status_code ==200:
  data = response.json()
  main = data['main']
  temperature =main['temp']
  humidity = main['humidity']
  pressure = main['pressure']
  report = data['visibility']
#messge part
 msg=random.randint(0,5)
if msg==1:
    message="SLOW DOWN, SCHOOL IS NEAR"
elifmsg==2:
    message="NEED HELP, POLICE STATION AHED"
elifmsg==3:
    message="EMERGENCY, HOSPITAL NEARBY"
elifmsg==4:
    message="DINE IN, RESTAURENT AVAILABLE"
else:
```

```
message=""
#Speed Limit part
speed=random.randint(0,150)
if speed>=100:
    speedMsg=" Limit Exceeded"
elif speed>=60 and speed<100:
    speedMsg="Moderate"
else:
speedMsg="Slow"
#Diversion part
sign=random.randint(0,5)
if sign==1:
    signMsg="Right Diversion"
elifsign==3:
    signMsg="Left Diversion"
elifsign==5:
    signmsg="U Turn"
else:
signMsg=""
#Visibility
if temperature < 24:
    visibility="Fog Ahead, Drive Slow"
elif temperature < 20:
   visibility="Bad Weather"
else:
   visibility="Clear Weather"
```

```
else:

print("Error in the HTTP request")

myData={'Temperature':temperature, 'Message':message, 'Sign':signMsg,
'Speed':speedMsg, 'Visibility':visibility}

client.publishEvent(eventId="status", msgFormat="json", data=myData, qos=0,
onPublish=None)

#PUBLISHING TO IOT WATSON

print("Published data Successfully: %s", myData)

client.commandCallback = myCommandCallbacktime.sleep(5)

client.disconnect()
```

GITHUB LINK:

https://github.com/IBM-EPBL/IBM-Project-51000-1660963604

PROJECT DEMO LINK:

https://drive.google.com/file/d/1kUNoH-590ThIwgzHFHHMHlFWVEVVHRWV/view?usp=share_link

IBM Watson IOT link:https://gcwwwd.internetofthings.ibmcloud.com/dashboard/devices/browse

Node-red link:

https://node-red-hxhcf-2022-11-16.eu-gb.mybluemix.net/ui/#!/0?socketid=vHyMA3-vwuQdNumJAAAs