SIGNS WITH SMART CONNECTIVITY FOR BETTER ROAD SAFETY

PROJECTREPORT

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Submitted By

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1. INTRODUCTION:

1.1 Project overview:

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

The basic steps of this system are:

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

1.2 Purpose:

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

2. LITERATURE SURVEY

2.1 Existing Problem:

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

• Over Speed : These systems cannot control speed at some specific zones.

• Exact location of accident occured: These systems cannot give the precise location of accident .

2.2 References:

Assistant Prof. Ankita Gandhi, Dhrumil Nanavati, Tushar Mandloi, Gaurav Sagar, Dhruv Sevak Students, Department of Computer Science and Engineering, Parul Institute of Engineering and Technology, Vadodara, India.

Ashok Kumar K, Karunakar Reddy Vanga, International Journal of Recent Technology and Engineering (IJRTE) ISSN: 2277-3878, Volume-8, Issue-1, May 2019.

Rashmi R K, Poonam Avinash Gulwane, Rahul Kudgi, Anaan Shaikh, Vaishnavi Laxmanrao Gadewar," AUTOMATIC SPEED CONTROL SYSTEM FOR VEHICLES USING COLOR AND HALL SENSORS", International Research Journal of Engineering and Technology (IRJET) E-ISSN: 2395 - 0056, p-ISSN: 2395-0072, Volume: 04 Issue: 04 | Apr -2017.

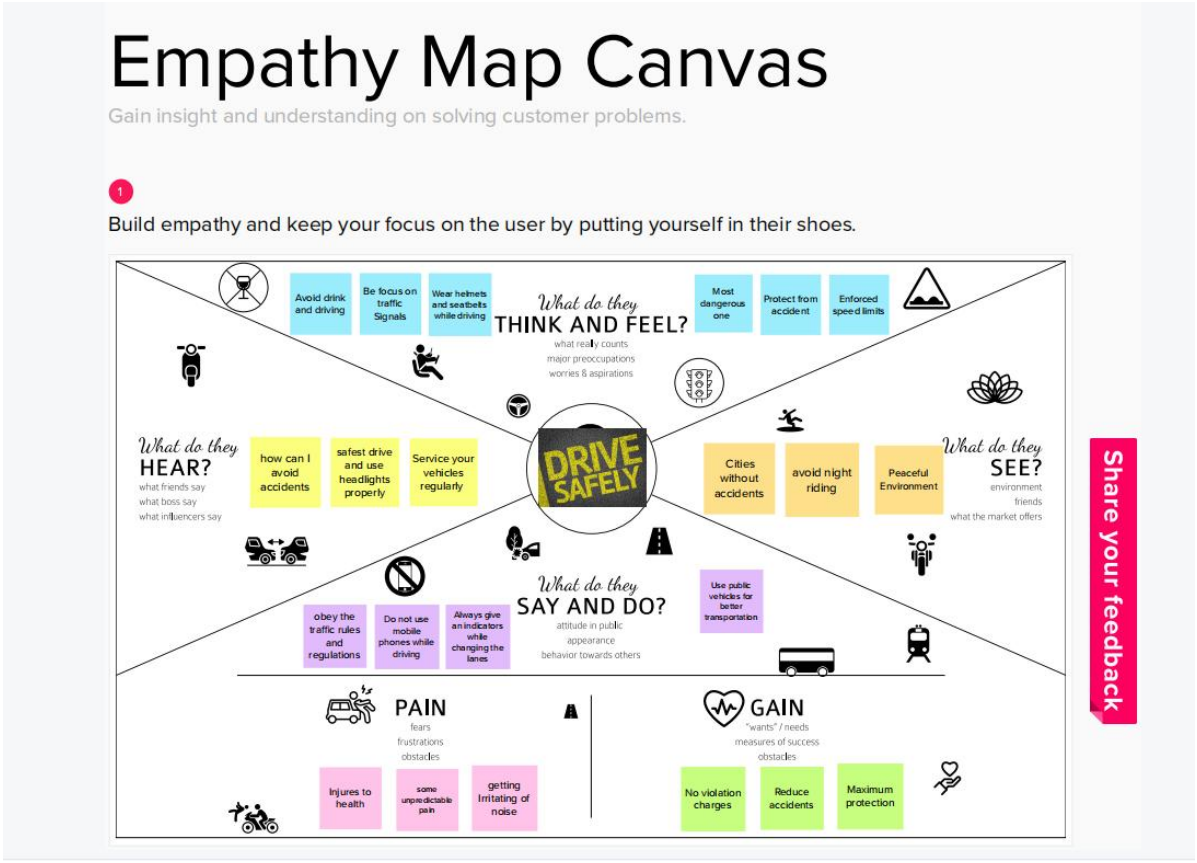
"Automatic speed controller for automobile", International Journal of Trend in Scientific Research and Development (IJTSRD), e-ISSN: 2456-6470, vol. 3, Issue-4 | June 2019

2.3 Problem Statement and Definition:

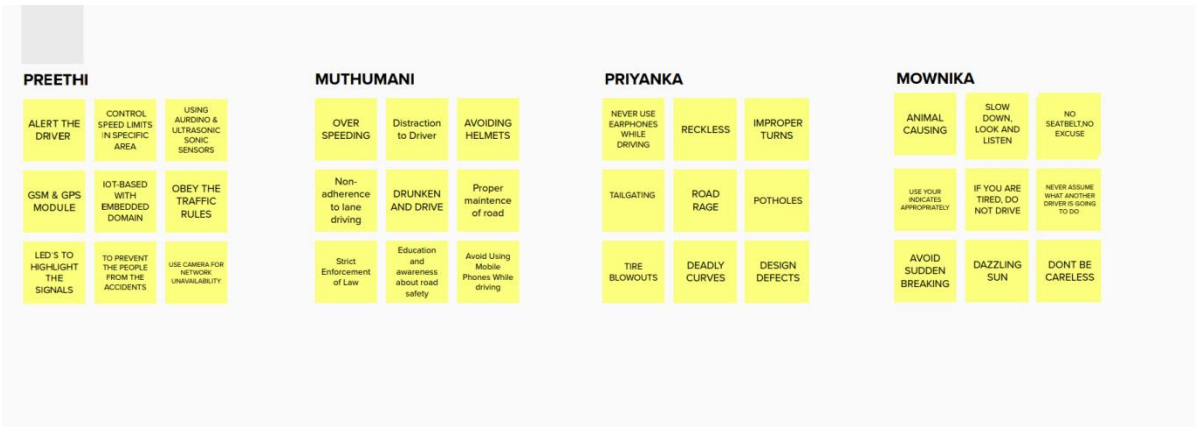
The early effects to prevent road accidents and to ensure road safety includes the use of speed detection devices,CCTVs,speed limiters and emergency accident units.Old approaches emphasize the concept of problem-solving in Road safety, but it is more correct to recognize that Road safety activities doesn't solve problems. For instance, when a safer road design is implemented, hopefully the number of crashes, or their seriousness, will go down, but they will not disappear. It is more correct to say the implementation of correct policies, programs and measures will reduce numbers or consequences of crashes, but they will no be solved.This realization is important, because it changes the focus from a problem that will go away if we devote enough resources to it, to a situation requiring on-going management. This management in turn requires the development of scientifically based techniques, witch will enable us to predict with confidence that safety resources are well-spent and likely to be effective.The standard measures used in assessing road safety interventions are fatalities and killed or seriously injured (KSI) rates, usually per billion (109) passenger kilometres.Vehicle speed within the human tolerances for avoiding serious injury and death is a key goal of modern road design because impact speed affects the severity of injury to both occupants and pedestrians.

3. IDEATION AND PROPOSED SOLUTION

3.1 Empathy Map Canvas:



3.2 Ideation and Brainstroming:



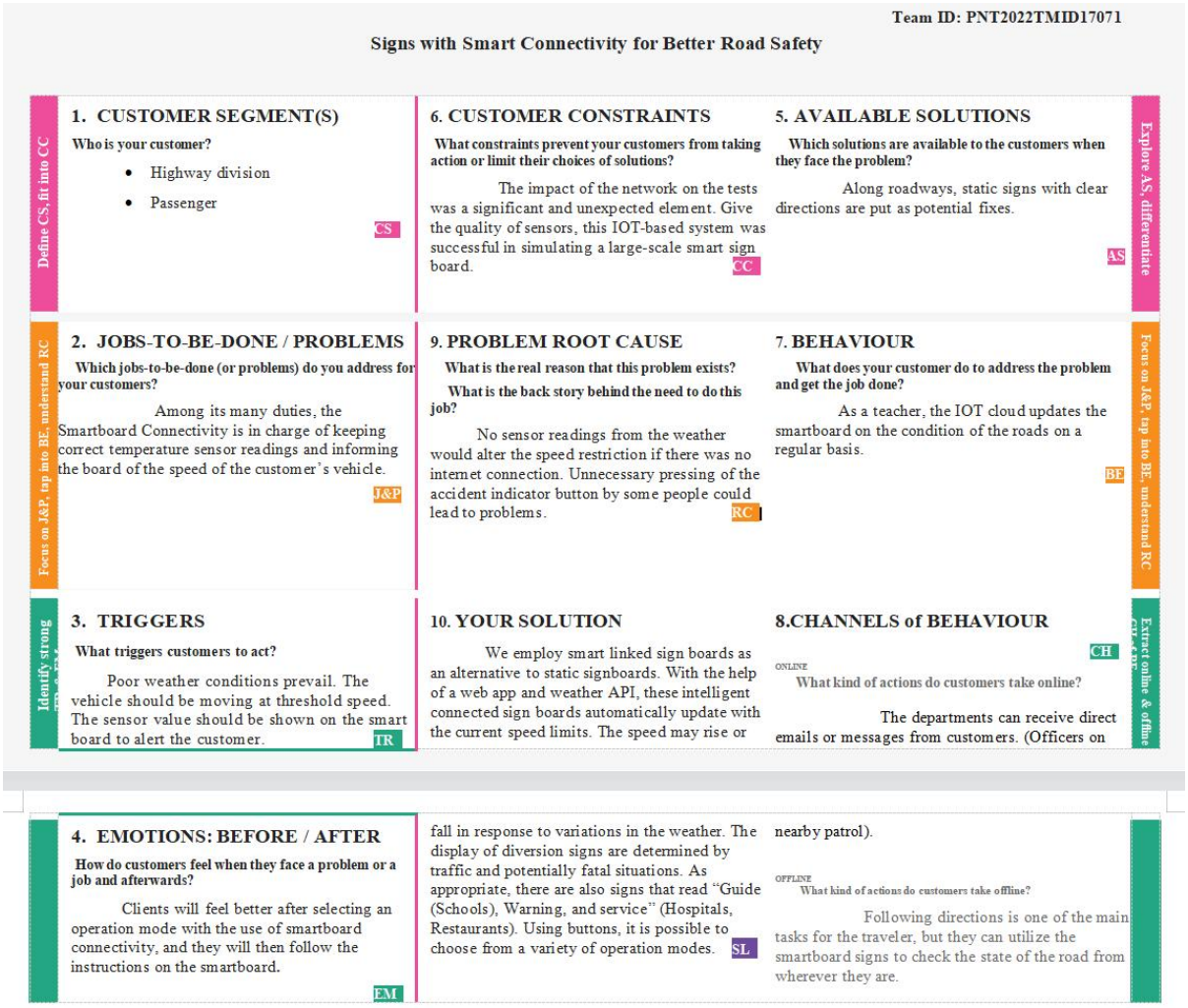
3.3 Proposed Solution:

S.No.	PARAMETERS	DESCRIPTION
1.	Problem Statement	To replace the static signboards, 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 decreaseBased on the traffic and fatal situations the diversion signs are displayed.Guide(Schools), Warning and Service(Hospitals, Restaurant) signs are also displayed accordingly.Different modes of operations can be selected with the help of buttons.
2.	Idea description	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. Also, the details regarding any accidents and traffic congestion faced on the particular road are obtained .Based on this,the traffic is diverted followed by a change in map path and the traffic is cleared. So in the traffic sign board , some buttons will be placed which will be used to make it generic; where each button will be given a functionality such as changing the warning signs, which are predefined and separate signs will be present for both school and hospital zones.By activating this button, either through the web application or the physical buttons, sign of the board can be changed accordingly, and the speed limit will also be set depending upon the zones. Also, the

		pedestrians are given an option to change the traffic signs if they want to cross the road. If the pedestrian presses the button that is present on the post at the end of the road, then the traffic will be analyzed immediately. Accordingly, the sign of the traffic signal will be changed. This inturn reduces the frequent changing of the traffic signs even if the pedestrians are not present.
3.	Novelty	Generic Sign board for all applications that uses both buttons and web service for updation. Pedestrians are given the access to request the sign change of the signal to cross the road.
4.	Customer Satisfaction	Diversion reasons will be displayed.If there is no traffic, pedestrians can cross the street without waiting.Customer can reach the destination before the expected time
5.	Business Model	Since APIs are used to actively monitor the customer's environment, this project employs a business strategy in which revenue will be generated on the basis of the length of time in which the customers actively interact with the product. This product is aimed to be free of cost to the public, but the revenue will be generated by selling this product to the government at a low cost, so there will be less accidents and the public will be aware of the discrepancies or accidents in the particular road. 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	In the future, if any update is required either on the hardware or software side, it can be easily implemented. 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. So this will not affect the existing functionality of the product and new functionality can be easily integrated. In addition, a separate circuit will be kept along with the hardware to detect any problem which informs the web application. Also a notification will be sent to the product service department.

3.4 Problem Solution Fit:



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Signs with Smart Connectivity for Better Road Safety

Define CS, fit into CC

1. CUSTOMER SEGMENT(S)

Who is your customer?

- Highway division
- Passenger

CS

6. CUSTOMER CONSTRAINTS

What constraints prevent your customers from taking action or limit their choices of solutions?

The impact of the network on the tests was a significant and unexpected element. Give the quality of sensors, this IOT-based system was successful in simulating a large-scale smart sign board.

CC

5. AVAILABLE SOLUTIONS

Which solutions are available to the customers when they face the problem?

Along roadways, static signs with clear directions are put as potential fixes.

AS

Explore AS, differentiate

Focus on J&P, tap into BE, understand RC

2. JOBS-TO-BE-DONE / PROBLEMS

Which jobs-to-be-done (or problems) do you address for your customers?

Among its many duties, the Smartboard Connectivity is in charge of keeping correct temperature sensor readings and informing the board of the speed of the customer's vehicle.

J&P

9. PROBLEM ROOT CAUSE

What is the real reason that this problem exists?

What is the back story behind the need to do this job?

No sensor readings from the weather would alter the speed restriction if there was no internet connection. Unnecessary pressing of the accident indicator button by some people could lead to problems.

RC

7. BEHAVIOUR

What does your customer do to address the problem and get the job done?

As a teacher, the IOT cloud updates the smartboard on the condition of the roads on a regular basis.

BE

Focus on J&P, tap into BE, understand RC

Identify strong

3. TRIGGERS

What triggers customers to act?

Poor weather conditions prevail. The vehicle should be moving at threshold speed. The sensor value should be shown on the smart board to alert the customer.

TR

10. YOUR SOLUTION

We employ smart linked sign boards as an alternative to static signboards. With the help of a web app and weather API, these intelligent connected sign boards automatically update with the current speed limits. The speed may rise or fall in response to variations in the weather. The display of diversion signs are determined by traffic and potentially fatal situations. As appropriate, there are also signs that read "Guide (Schools), Warning, and service" (Hospitals, Restaurants). Using buttons, it is possible to choose from a variety of operation modes.

SL

8.CHANNELS of BEHAVIOUR

CH

ONLINE

What kind of actions do customers take online?

The departments can receive direct emails or messages from customers. (Officers on nearby patrol).

OFFLINE

What kind of actions do customers take offline?

Following directions is one of the main tasks for the traveler, but they can utilize the smartboard signs to check the state of the road from wherever they are.

Extract online & offline

4. EMOTIONS: BEFORE / AFTER

How do customers feel when they face a problem or a job and afterwards?

Clients will feel better after selecting an operation mode with the use of smartboard connectivity, and they will then follow the instructions on the smartboard.

EM

4. REQUIREMENT ANALYSIS:

4.1 Functional Requirements:

Following are the functional requirements of the proposed solution.

FR No.	Functional Requirement (Epic)	Sub Requirement (Story / Sub-Task)
FR-1	User Visibility	Sign Boards should be made of bright coloured LED (such as red,green,yellow) 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 textso 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
FR-4	User Confirmation	Phone confrimation

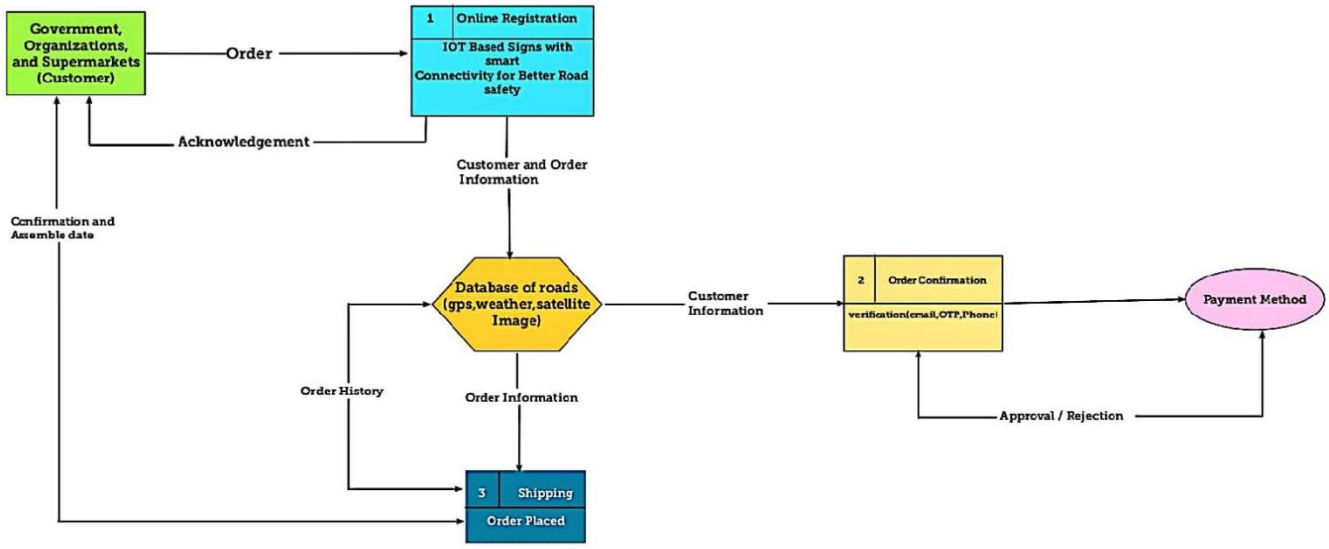
4.2 Non-Functional Requirements:

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

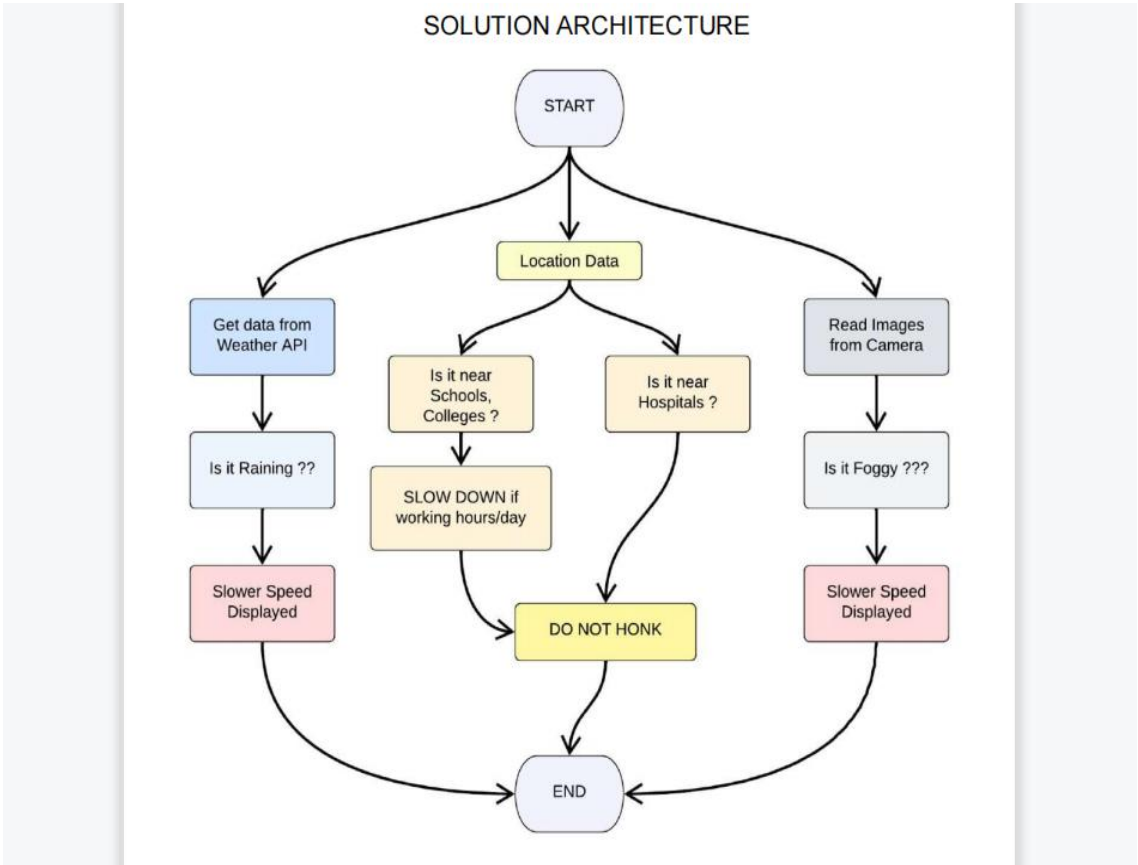
FR No.	**Non-Functional Requirement**	**Description**
NFR-1	Usability	Should be able to dynamically update with respect to time. Have to clear instructions that the government given to users.
NFR-2	Security	Should be secure enough that only the intended messages are displayed in the display.
NFR-3	Reliability	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 Diagram:



5.2 Solution and Technical Architecture:



6. PROJECT PLANNING AND SCHEDULING:

6.1 Sprint Planning And Estimation:

Sprint	Functional Requirement (Epic)	User Story / Task	Story Points	Priority
Sprint-1	Initialization of Resources	Create and initialize accounts in various publicAPIs likeOpen Weather API.	1	Low
Sprint-1	LocalServer/Software Run	Write a Python program that outputs results given the inputs like weather and location.	1	Medium
Sprint-2	Push the software tocloud	Push the code from Sprint 1 to cloud so it canbeaccessed from anywhere	2	Medium
Sprint-3	Hardware Intialization	Integrate the hardware to be able to access the cloudfunctions and provide inputs to the same.	2	High
Sprint-4	UI/UX Optimization and debugging	Optimize all the shortcomings and provide betteruser experience	2	Medium

6.2 Sprint Delivery Schedule:

Sprint	Total Story Points	Duration	Sprint Start Date	Sprint End Date(Planned)	Story Points Completed (as on Planned End Date)	Sprint Release Date (Actual)
Sprint-1	20	5 Days	24 Oct 2022	29 Oct 2022	20	29 Oct 2022
Sprint-2	20	5 Days	31 Oct 2022	05 Nov 2022	20	31 Oct 2022
Sprint-3	20	5 Days	07 Nov 2022	12 Nov 2022	20	07 Nov 2022
Sprint-4	20	5 Days	14 Nov 2022	19 Nov 2022	20	14 Nov 2022

7. SOLUTIONING:

7.1 Feature :

ArduinoDroid is a free app that will let you edit, compile and upload sketches to your Arduino board directly from an Android phone or tablet.It also needs an Android devicewith USB-host support.

8. TESTING:

8.1 Test Cases:

A test plan documents strategy that will be used to verify and ensure that a product or system meets its design specification and other requirements. A test plan 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:

User interface design (UI) or user interface engineering is the design of user interfaces for machines and software, such as computers, home appliances, mobile devices, and other electronic devices, with the focus on maximizing usability and the user experience. The goal of user interface design is to make the user's interaction as simple and efficient as possible, in terms of accomplishing user goals (user-centered design).Good user interface design facilitates finishing the task at hand without drawing unneces- sary attention to itself. Graphic design and typography are utilized to support its usability, influencing how the user performs certain interactions and improving the aesthetic appeal of the design; design aesthetics may enhance or detract from the ability of users to use the functions of the Interface.The design process must balance technical functionality and visual elements (e.g., mental model) to create a system that is not only operational but also usable and adaptable to changing user needs.

9. RESULTS:

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

10. ADVANTAGES:

Multimodal sensors and edge computing help speed up the flow of traffic with real-time processing,reducing congestion and emissions.Smart road technology can assist in optimizing traffic flow anmd managing road conditions,creating a more sustainable environment within cities.

11. FUTURE SCOPE

We can be enhanced this system by implementing camera using Raspberri pi, GSM module in case of network unavailability and low RAM module/zigbee module for long range communication.

12. APPENDIX

12.1 Circuit Diagram:

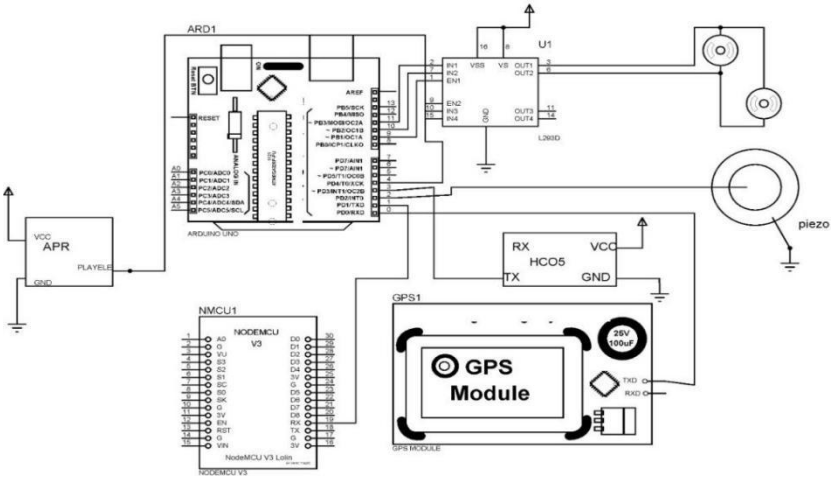


Figure 1: Vechile Side

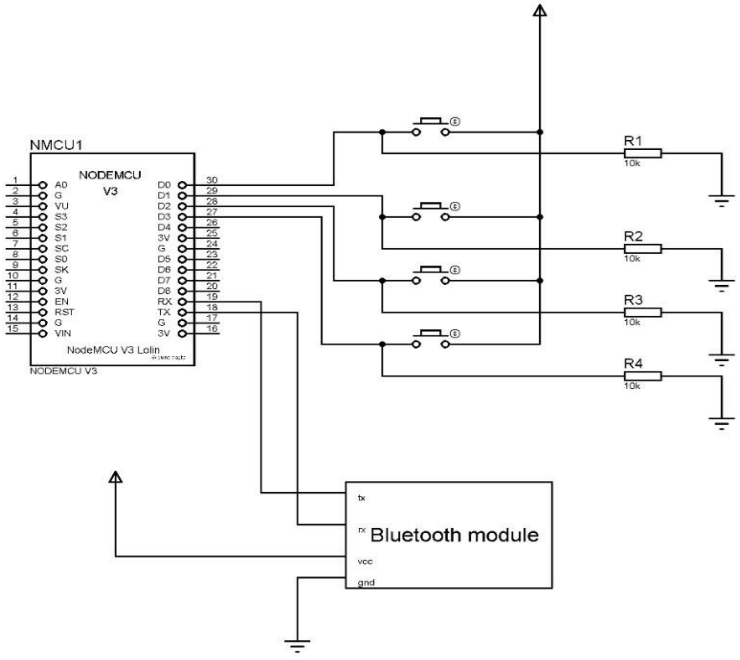


Figure 2:Control Side

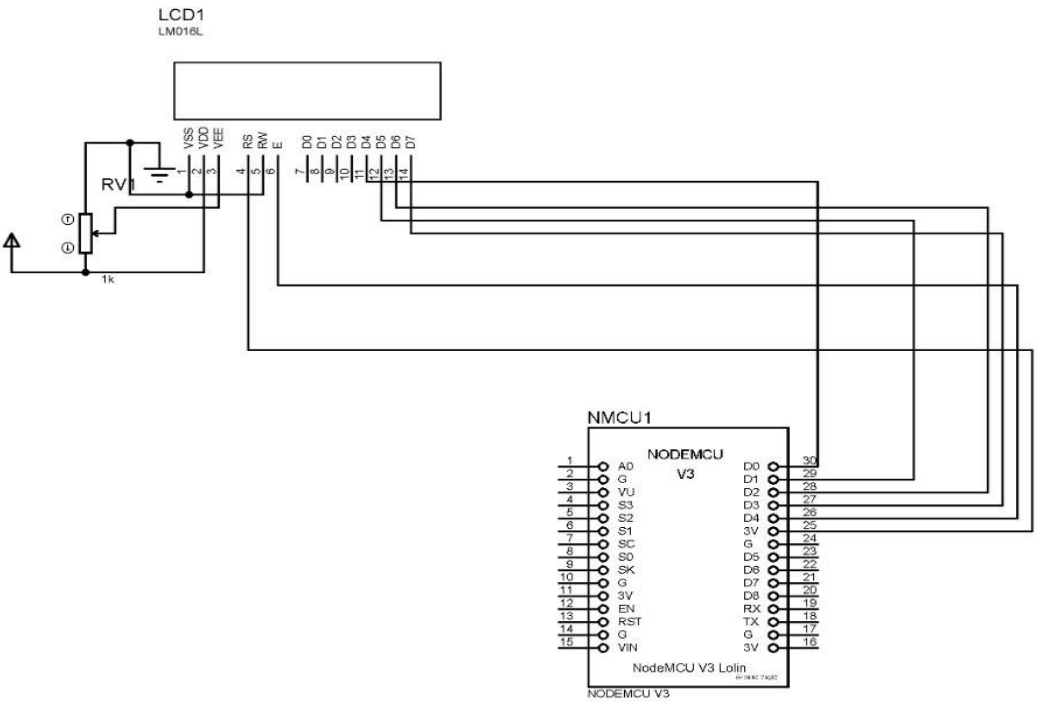


Figure 3:Another Vechile

12.2 Code:

```
#include
<LiquidCrystal.h>
#define
BLYNK_PRINT
Serial #include
<ESP8266WiFi.h>
#include<BlynkSim
pleEsp8266.h>

char auth[] = "Y4DsRJfvnDUee9LMZHCWT7pdmVLolRGU";

// Your WiFi credentials.
// Set password to "" for
open networks.char ssid[]
= "hellow";
char pass[] = "12345678";
const int rs = D5, en = D6, d4 = D1, d5 = D2,
d6 = D3, d7 = D4;LiquidCrystal lcd(rs, en,
d4, d5, d6, d7);
int
a=0;
BLY
NK_
WRIT
E(V2)
```

```
{
  a=param.asInt();
}
void setup() {
  // set up the LCD's number of
     columns and rows:
     Serial.begin(9600);
      Blynk.begin(auth,
  ssid, pass);lcd.begin(16,
  2);

}

void loop()
 { Blynk.r
 un();
 lcd.setCu
 rsor(0, 1);
 if(a==1)
 {
  lcd.print("accident
  occured");
  Serial.print("hi");
 }
 else
 {
  lcd.print("welcome");
 }
}

#define BLYNK_PRINT  Serial


#include
<ESP8266WiFi.h>
#include
<BlynkSimpleEsp82
66.h>
char auth[] =
"q6FAQIggdIxznS2kMIbxAPn8E6nnv
116";char ssid[] = "hellow";
char pass[] = "12345678";

Stri
ng
str;
voi
d
setu
p()
{
```

```
 Serial.begin(96
00);
Blynk.begin(auth,
ssid, pass);

}

void
  loo
  p()
  {
  Bl
  yn
  k.r
  un()
  ;
if(Serial.available()>0)
{
  str=Serial.readStringUntil('/n');
 //  Serial.print(str);
 //
  Blynk.notify("l
  ocation:");
  Blynk.notify(st
  r);
}

}

#include
<TinyGPS++.h
> #include
<SoftwareSerial.
h>
TinyGPSPlus
gps;
SoftwareSerial
ss(3,4); char  n;
int  a;
void
 setup()
 { Serial.
 begin(9
 600);
 ss.begin
 (9600);
    pinMode(2,
  INPUT);
  pinMode(6,OUTP
  UT);
  pinMode(11,OUT
  PUT);
```

```
  pinMode(10,OUT
  PUT);
  pinMode(9,OUTP
  UT);
  pinMode(12,OUT
  PUT);//apr
  digitalWrite(11,H
  IGH);
  digitalWrite(6,HI
  GH);
  attachInterrupt(digitalPinToInterrupt(2),piezo,     CHANGE);
}
void
  loop()
  { n=Seri
  al.read();
//
    Serial.
  println("
  ");
  delay(2
  00);
 if(n==’3’)
 {
 digitalWrite(6,HI
 GH);
 digitalWrite(11,
 HIGH);
 digitalWrite(12,
 HIGH);
 delay(200);
 digitalWrite(12,L
 OW);
 }
 else if(n==’2’)
 {
 digitalWrite(6,L
 OW);
 digitalWrite(11,L
 OW);
 digitalWrite(10,L
 OW);
 digitalWrite(9,L
 OW);
 digitalWrite(12,
 HIGH);
 delay(200);
 digitalWrite(12,L
 OW);

 }
 else if(n==’1’)
```

```
 {
 analogWrite(11,1
 00);
 analogWrite(6,10
 0);
 digitalWrite(12,
 HIGH);
 delay(200);
 digitalWrite(12,L
 OW);

 }

}

 // while (ss.available() > 0)
 //    if (gps.encode(ss.read()))
   //    displayInfo();


void displayInfo()
{
 //
  Serial.print(F("Lo
  cation: "));if
  (gps.location.isVa
  lid())
   {
    Serial.print(gps.locat
    ion.lat(), 6);
    Serial.print(F(","));
    Serial.print(gps.locat
    ion.lng(), 6);
   }
  else
   {
    //
    Serial.print(F("I
    NVALID"));
    Serial.print("10.
    305125");
    Serial.print(',');
    Serial.print("76.
    389582");

   }

 /*  Serial.print(F("
                        Date/
  Time: "));if
  (gps.date.isValid())
   {
```

```
    Serial.print(gps.date.m
    onth());
    Serial.print(F("/"));
    Serial.print(gps.date.
    day());
    Serial.print(F("/"));
    Serial.print(gps.date.
    year());
  }
  else
  {
    Serial.print(F("INVALID"));
  }

  Serial.pri
  nt(F("  "));
  if
  (gps.time.i
  sValid())
  {
    if (gps.time.hour() < 10)
    Serial.print(F("0"));
    Serial.print(gps.time.hour());
    Serial.print(F(":"));
    if (gps.time.minute() < 10)
    Serial.print(F("0"));
    Serial.print(gps.time.minute());
    Serial.print(F(":"));
    if (gps.time.second() < 10)
    Serial.print(F("0"));
    Serial.print(gps.time.second());
    Serial.print(F("."));
    if (gps.time.centisecond() < 10)
    Serial.print(F("0"));
    Serial.print(gps.time.centisecond());
  }
  else
  {
   // Serial.print(F("INVALID"));

  }*/

  Serial.p

  rintln();

}
void piezo()
{
   while
    (ss.available()
      >  0) if
```

```
    (gps.encode(s
    s.read()))
      displayInfo();
}

int
a=0,b=0,
c=0,d=0;
void
setup()  {
  pinMode(D1,INP
   UT);
   pinMode(D2,INP
   UT);
   pinMode(D3,INP
   UT);
     pinMode(D4,I
NPUT);
digitalWrite(D1,L
OW);
digitalWrite(D2,L
OW);
digitalWrite(D3,L
OW);
digitalWrite(D4,L
OW);
Serial.begin(9600);
}

void  loop()
{
 a=digit
alRead(
D1);
if(a==1)
  {
   Serial.print("1");
  }
b=digitalRe
 ad(D2);
 if(b==1)
  {
   Serial.print("2");
  }
 d=digitalR
 ead(D4);
 if(d==1)
  {
   Serial.print("3");
  }
```