# SIGNS WITH SMART CONNECTIVITY FOR BETTER ROAD SAFETY

## A PROJECT REPORT

*SUBMITTED BY*

| | |
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*in partial fulfillment for the award of the degree
of*

## BACHELOR OF ENGINEERING

in

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## VELALAR COLLEGE OF ENGINEERING AND TECHNOLOGY

(An Autonomous Institution Affiliated to Anna University, Chennai)

## ERODE – 638012

## VELALAR COLLEGE OF ENGINEERING ANDTECHNOLOGY

# BONAFIDE CERTIFICATE

Certified that this project report **"SIGNS WITH SMART CONNECTIVITY FOR BETTER ROAD SAFETY"** is the bonafide  of **"JENIFER J (19ECR052)**, **DEV PRASATH RP (19ECR024), GOWTHAM KP (19ECR039), JEEVITHA V (19ECR051),"** who carried out the project work under our supervision. Certified further that to the best of our knowledge the work reported herein does not form part of any other thesis or dissertation on the basis of which a degree or award was conferred on an earlier occasion on this or any other candidate.

|  |  |
|---|---|
| SIGNATURE | SIGNATURE |

|  |  |
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**ABSTRACT**

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 ofsmart road signs, however, humans are out of the loop since they cannot see or interpret them. Therefore, there is no equivalent concept of imperceptible perturbations in order to achieve a comparable performance with humans. Robustness against small scale perturbations would not be sufficient since the attacker can attack more aggressivelywithout such a constraint. Under a game theoretical solution concept, we seek to ensure certain measure of guarantees against even the worst case (intelligent) attackers that can perturb the signal even at large scale. We provide a randomized detection strategy basedon the distance between the decoder output and the received input, i.e., error rate. Finally, we examine the performance of the proposed scheme over various scenarios.

## INTRODUCTION

### Smart connected Signs for Improved Road Safety

Road signs and the speed limits are Static. But we look at how road signs can be changed in a few ways. We consider cases where thereare some road diversions and due to heavy traffic or due to some accidents, we will have to change the road signs as per our requirements if they are digitalized.

This project proposes a system in which digital sign boards can be changed dynamically. This can have various possibilities like when,If there is rainfall then the roads will be slippery and the speed limitwould have to be decreased. We can access them online through which we can enter the data of the road diversions, accident prone areas and the information sign boards. This data is transmitted and displayed on the sign boards accordingly.

## OBJECTIVES

By the end of this project we will :

- Connecting IoT devices to the Watson IoT platform and exchangingthe dataand to display values.

- Getting weather data from Open Weather Map API Service

- Connecting IoT devices to the Watson IoT platform and exchangingthe data to display values.

# LITERATURE REVIEW

**1. IoT Based Regional Speed Restriction Using Smart Sign Boards**

**Author: P.Madhumathy, H.K.Nithish Kumar, Pankhuri & D.S.Suspreeth Narayan**

https://link.springer.com/chapter/10.1007/978-3-030-65661-4_10

Major cause for fatal accidents on the road is over speeding. Accident risk increases with an increase in speed. The judging ability of upcoming events also gets declined while moving at higher pace, which causes judgment mistakes and leads to a crash. Around 30% of road accidents are due to over speeding. There have been various ways to avoid accidents due to over speeding, but none of them can automatically control the speed and customize the regional speed limit together. An IoT-based smart solution is discussed to overcome this, limiting the vehicle's top speed to a particular region even though peopleare unwilling to use control stations, smart signboards, and speed control unit in the vehicle.

**2. Smart transportation system using IoT Authors:**

**P.S.Saarika, K.Sandhya & T.Sudha**

https://ieeexplore.ieee.org/abstract/document/8358540

Nowadays the concept of smart cities became more popular. The evolution of internet of things (IoT) helps the idea of smart city more achievable. A major branch of smart city is smart transportation. Problems such as traffic congestion, road safety, accident detection, automatic fare collection and limited car parking facilities can be resolved by IoT. In this paper, an IoT based smart parking system along with an intelligent signboard is proposed. The smart parking system composed of intelligent sensors deployed on site and are used

to monitor and inform the availability of parking spaces. A mobile or internet application can be provided to check the availability of parking slot. The sign board with embeddedRF module and connected sensors working with solar energy as well as in battery will show the place, distance to that place, weather condition, temperature and different routes to those places.

**3. Smart city for VANETs using warning messages, traffic statistics and intelligenttraffic lights**

**Authors: Carolina Tripp Barba, Miguel Angel Mateos, Pablo Reganas Soto, AhmedMohamad Mezher & Monica Aguilar Igartua https://ieeexplore.ieee.org/abstract/document/6232229**

Road safety has become a main issue for governments and car manufacturers in the last twenty years. The development of new vehicular technologies has favoured companies, researchers and institutions to focus their efforts on improving road safety. During the last decades, the evolution of wireless technologies has allowed researchers to design communication systems where vehicles participate in the communication networks. Thus, new types of networks, such as Vehicular Ad Hoc Networks (VANETs), have been created to facilitate communication between vehicles themselves and between vehiclesand infrastructure. New concepts where vehicular networks play an important role have appeared the last years, such as smart cities and living labs [1]. Smart cities include intelligent traffic management in which data from the TIC (Traffic Information Centre) infrastructures could be reachable at any point. To test the possibilities of these future cities, living labs (cities in which new designed systems can be tested in real conditions) have been created all over Europe. In this work, the development of a warning system composed of Intelligent Traffic Lights (ITLs) that provides information to drivers about traffic density and weather conditions in the streets of a city is proposed and evaluated through simulations.

**4. Highway 4.0: Digitalization of highways for vulnerable road safety developmentwith intelligent IoT sensors and machine learning**

**Authors: Rajesh Singh, Rohit Sharma, Shaik Vaseem Akram, Anita Gehlot, Dharam Buddhi, Praveen Kumar Malik, Rajeev Arya**

https://www.sciencedirect.com/science/article/abs/pii/S0925753521002514 According to United Nations (UN) 2030 agenda, the transportation system needs to beenhanced for the establishment of access to safe, affordable, accessible, and sustainabletransport systems along with enhanced road safety. The highway road transport system isone of the transport systems that enables to transits goods and humans from one locationto another location.

The agenda of UN 2030 for the transport system will be accomplished with the assistance of digital technologies like the internet of things (IoT) and artificial intelligence (AI). The implementation of these digital technologies on highways empowers to provide reliable, smarter, intelligent, and renewable energy sources experience to the users travelling along the highways. This study discusses the significance of the digitalization of highways that supporting and realizing a sustainable environment on the highways. The significance of implementing smart display boards and renewable sources with real-time applications is also addressed in this study. Embedding the deep learning techniques in the vison node at the traffic junction and the highway lighting controller is able to deliver an intelligent system that provides sustained experience and management of the highways. Smart reflectors, adoption of renewable energy, developing vehicle-to-vehicle communication in vehicles, and smart lamppost are the few recommendations for the implementation of digitalizing highways.

## 5. Internet of Things Based Solutions for Road Safety and Traffic Management in Intelligent Transportation Systems

**Authors: Arnav Thakur, Reza Malekian & Dijana Capeska Bogatinoska**

https://link.springer.com/chapter/10.1007/978-3-319-67597-8_5

Road safety, traffic congestion and efficiency of the transport sector are major global concerns. Improving this is the primary objective of intelligent transport systems (ITS). Having Internet of things (IoT) based solutions for ITS would enable motorists to obtain prior contextual guidance to reduce congestion and avoid potential hazards. IoT based solutions enabling collection of data from client nodes in a wireless sensor network in the transport environment implementing ITS goals is studied. Road safety techniques studied include distance sensing, improper driving detection and accident prevention, weather related events and negligent driving detection and accident avoidance. Vehicle to vehicle communication and vehicle to infrastructure based channels are studied. Wireless communication technologies suitable for the channels are studied. Additional benefits and services that can be added to a system with the IoT approach are also studied. Theeffectiveness of such a system is studied with the use of validation framework. Multiple case studies of current and future IoT based ITS along with the challenges in  the application is discussed.

# EMPATY MAP

Empathy Map

Signs with Smart Connectivity for Better Road Safety

IMPROVED ROAD SAFETY

SAVE LIVES

BETTER ROAD CONNECTIVITY

DO MORE RESEARCH

BETTER SERVICES TO PEOPLE

WHY THIS IS SO HARD?

SAYS    THINKS

DOES    FEELS

TO IMPROVE THE ROAD CONDITIONS IN PIT AREA

WE PROVIDE EFFICIENT ROAD TECHNOLOGY TO PEOPLE

DEVELOP THE RIGHT ATTITUDE ABOUT DRIVING

TO AVOID ACCIDENTS AND KEEP THE PASSENGER SAFE

SPEED LIMITS ARE NOT DYNAMIC

THEY MAY FEEL ACCIDENT WILL OCCUR
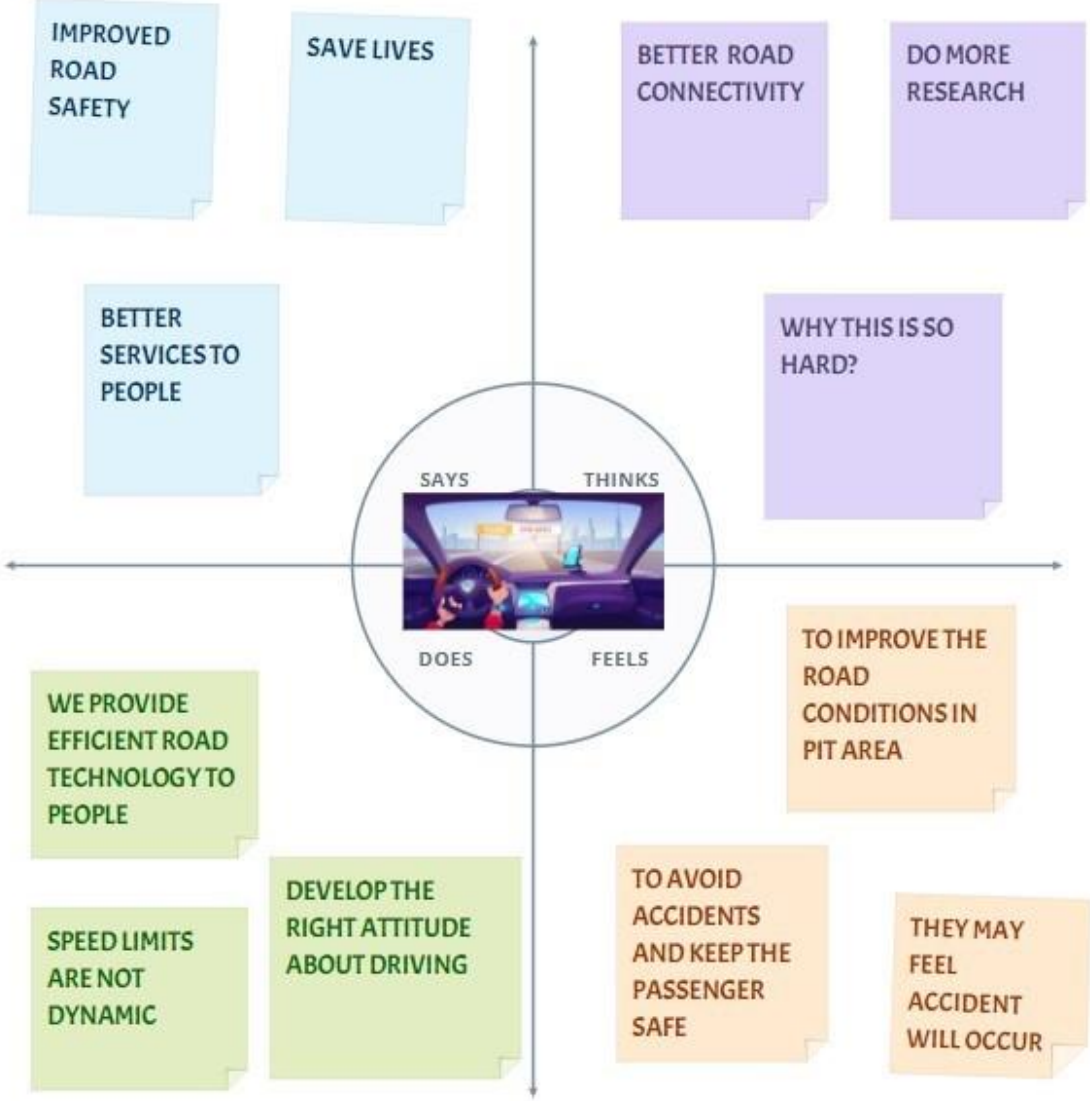
**1**

## 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

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PROBLEM

**How might we reduce the risk of accident and not cause any error and gives accurate information about the road safety and priortize the safety of the passengers?**

**2**

**Brainstorm**

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

⏱ 10 minutes

## Aneesh

| | | |
|---|---|---|
| Caution Signs | Suggest speed limit while driving | Strict follow of regulation |
| proper use of indicators | Weather monitoring | predicting traffic |
| it helps reducing risk of accident | detects weather | gives warning about any upcoming collapse |

## Dhesika

| | | |
|---|---|---|
| speed limits | gives infromation about nearest emergency sites | checking conditions of vehicle |
| automatic buzzer to alert us when we exceed speed limit | warns us about any pursue | using safety precautions |
| detects construction sites | restriction of Misdemeanor Offenses | checking vehicle conditions |

## Akash

| | | |
|---|---|---|
| Taligating should be avoided | Stable technology system for monitoring, maintenance and repair of roads | detect blind spots |
| it can provide real-time information to the user about the status of the trafc light | Look out for caution signs | Electronics were always the prime sponsors for an efcient no trafc pathway and secured roads |
| Density measures of trafc | Take caution when you see an animal crossing sign | All this helps to avoid breakdowns and, therefore, the prevention of accidents. |

## Charugnethra

| | | |
|---|---|---|
| Running Red Lights and Stop Signs | It gives instant information on LED | Maintain lane discipline |
| It can reduces the number of accidents and improves circulation. | Avoid using your mobile phone while driving | Prevent Reckless Driving |
| It makes the user aware about nearby whereabouts such as schools,hospitals...etc | Running Red Lights and Stop Signs | By knowing postions of other vehicles,the iot driver can decide regarding the speed and there is no need for emergency braking |

**3**

## Group ideas

Take turns sharing your ideas while clustering similar or related notes as you go.
In the last 10 minutes, give each cluster a sentence-like label. If a cluster is bigger
than six sticky notes, try and see if you and break it up into smaller sub-groups.

⏱ 20 minutes

Suggestion of nearby crowded places such as schools,colleges,hospitals

reduce alarming number of accidents on road

Speed limit suggestion by IOT based on environmental factors

it gives an accurate update on weather monitoring which gives an idea for iot drivers in route fnding and deciding spped limits

**4**

## Prioritize

Your team should all be on the same page about what's important moving forward. Place your ideas on this grid to determine which ideas are important and which are feasible.

⏱ 20 minutes

---

♡

**Importance**

If each of these tasks could get done without any difficulty or cost, which would have the most positive impact?

This aims to reduce accidents around trafic lights and reduce their violation too through better real-time monitoring.

By knowing postions of other vehicles,the iot driver can decide regarding the speed and there is no need for emergency braking

Stable technology system for monitoring, maintenance and repair of roads.

**It helps in reducing risks for accident**

the fundamental data to guarantee road safety of the connected cars is the geolocation.

It alerts the ofcials to nearest emergency service can reach there within minimum time.

**Arduino**

**LED Display**

**GSM**

**GPRS**

**Connecting Wires**

**LED Display**

It helps in detecting temperature both internal as well as extrenal

In case of emergency, connected cars send automatic messages and warnings to emergency services

Vehicle system always collect vehicle vitals by built in sensors and process it.

Some of the technology on and around roads has not seen the level of innovation demonstrated by the automobile itself. Examples of such technology include:

- Road Marks (introduced 1910s)

- Traffic Lights (1910-1920s)

- Traffic Signs (1910s)

- Cat's Eyes and Bott's Dots (1930s)

- Retroreflective sign paints (1939)

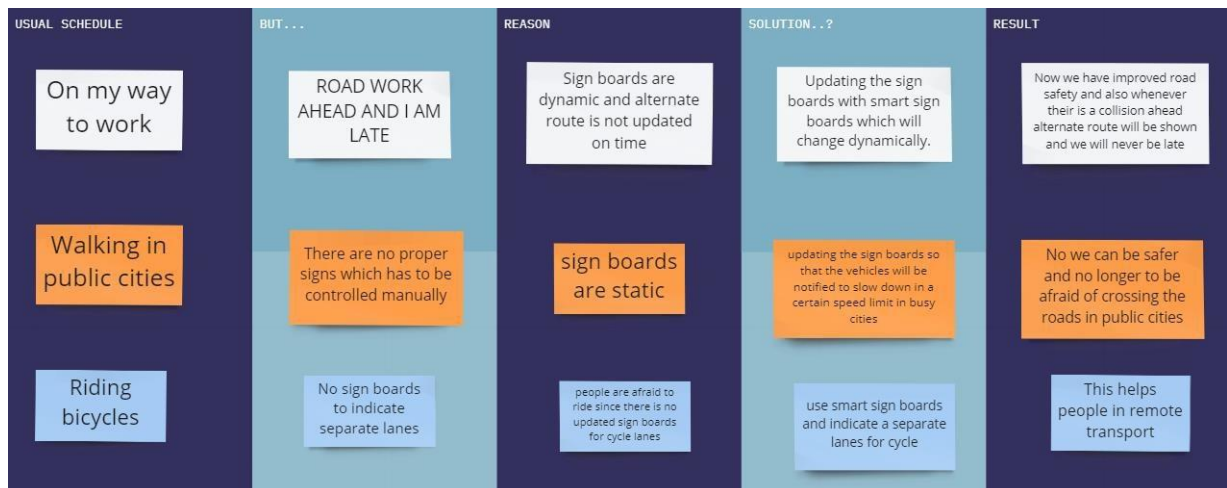**Smart Road Technology:**

- Traffic monitoring

- Real-time monitoring

- Active transportation

- Future Road Technology

- Remote monitoring

- Autonomously driving cars

- **PROBLEM STATEMENT**

The National Highway Traffic Safety Administration has stated that hundreds of lives are lost annually to wrong-way crashes. Thousands of people sustain injuries in such accidents. Based on research and field tests performed by the Public Welfare Development (PWD), certain kinds of intelligent road indicators may effectively catch the attention of people driving the wrong way on a roadway. The indicators that were tested included blank indicators that light up when they detect the presence of wrong-way vehicles. Another type of sign was designed with lights that light up in an asynchronous manner. Once a driver is alerted by the lights and can see the "Wrong Way" lettering, that person can turn around and proceed in the correct direction. This could save numerous lives and prevent countless injuries.

So in this project we will replace the static signboards with smart connected sign boards. Also based on the traffic and fatal situations the diversion signs are displayed. Guide, Warning and Service signs are also displayed accordingly.

Different modes of operations can be selected and performed in the smart traffic sign board.

| Problem Statement(PS) | USUAL SCHEDULE | But | REASON | SOLUTION..? | RESULT |
|---|---|---|---|---|---|
| PS-1 | On my way to work | ROAD WORK AHEAD AND I AM LATE | Sign boards are dynamic and alternate route is not updated on time | Updating the sign boards with smart sign boards which will change dynamically | Now we have improved road safety and also whenever their is a collision ahead alternate route will be shown and we will never be late |
| PS-2 | Walking in public cities | There are no proper signs which has to be controlled manually | sign boards are static | updating the sign boards so that the vehicles will be notified to slow down in a certain speed limit in busy cities | No we can be safer and no longer to be afraid of crossing the roads in public cities |

<div align="center">**PROJECT DESIGN PHASE – I**</div>

**PROPOSED SOLUTION**

**Title:** Signs with Smart Connectivity for Better RoadSafety

**Problem statement**: Signs with Smart Connectivity forBetter
Road Safety

**Signs with Smart Connectivity for Better Road Safety**

**1. Updating smart sign boards:**

The sign board are made digital instead of static. Considering different factors differentdynamic sign can be displayed in the sign board.

**2. Better road safety:**

The conventional sign board does not create more effect on the roads which is easily avoid. Instead creating an smart connectivity sign board which indicates the current situation of the road which include traffic around the area, accident zone, any institute around the  area ,hospital. This can achieve by sensing the condition of the area in an regular interval, creating an time based signal for the institute near area.

**3. Installing smart signs everywhere:**

The large-scale implementation of smart sign board will give better road safety and decrease the accident rate.

**4. Improved conditions:**

Based on weather, traffic diversion signs, guide signs and warning signs are displayed to the public to avoid and decrease accident rate**.**

**5. Result:**

The existing sign boards are replaced into digital sign boards and placed in the same location with better position and visibility. Traffic diversion are implemented with better route. Thus this model reduces the travel time and accident can be prevented.

**PROBLEM SOLUTION FIT**

## 1. CUSTOMER SEGMENT(S)

Who is your customer?
i.e. working parents of 0-5 y.o. kids

CS

- Drivers
- Passengers
- Highway Division

## 2. JOBS-TO-BE-DONE / PROBLEMS

Which jobs-to-be-done (or problems) do you address for
your customers? There could be more than one; explore
different sides.

- Reduce accidents
- Prevent traffic congestion
- Updates regarding diversions
- Speed limit during change in
  weather

## 3. TRIGGERS

Poor weather condition prevails. The vehicle should move with threshold speed. The sensor value should be shown on the smart board to alert customer.

## 4. EMOTIONS: BEFORE / AFTER

BEFORE: Irritated, frustrated, tensed
AFTER: Calm, relaxed

## 5. AVAILABLE SOLUTIONS

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

or need to get the job done? What have they tried in the past?
What pros & cons do these solutions have? i.e. pen and paper
is an alternative to digital notetaking

- This project can withstand better than man made static signs.
- Along roadways, static signs with clear direction put as potential fixes which gives clear solutions

## 6. CUSTOMER CONSTRAINTS

What constraints prevent your customers from taking action or limit
their choices
of solutions? i.e. spending power, budget, no cash, network
connection, available devices.

- No money
- Lack of awareness about Technology
- Might think unnecessary

## 7. BEHAVIOUR

**BE**

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

i.e. directly related: find the right solar panel installer, calculate usage and benefits; indirectly associated: customers spend free time on volunteering work (i.e. Greenpeace)

Directly related: Avoids over speed, follow traffic rules

Indirectly related: Advices to go slow, do not cause trouble to others

## 8. CHANNELS of BEHAVIOUR

**CH**

### 8.1 ONLINE

What kind of actions do customers take online? Extract online channels from #7

### 8.2 OFFLINE

What kind of actions do customers take offline? Extract offline channels from #7 and use them for customer development.

8.1 ONLINE: Create awareness using social media, give information about diversions, weather predictions

8.2 OFFLINE: Follow traffic rules, be prepared for unfavorable weather conditions

# 9. PROBLEM ROOT CAUSE

**RC**

What is the real reason that this
problem exists? What is the back
story behind the need to do this job?
i.e. customers have to do it because of the
change in regulations.

## Customer have to do it because of

- Improper maintenance of roads
- Lack of update in current technology
- Carelessness

# 10. YOUR SOLUTION

**SL**

If you are working on an existing business, write down your current solution first, fill in
the canvas, and check how much it fits reality.

If you are working on a new business proposition, then keep it blank until you fill in the
canvas and come up with a solution that fits within customer limitations, solves a
problem and matches customer behaviour.

We employ smart linked boards as an alternative to static
signboards. With the help of weather app and weather API,
these sign boards get automatically updated. The speed
may increase or decrease in response to variations in
weather. The diversion signs ae determined by traffic and
potentially fatal situations.

## SOLUTION ARCHITECTURE
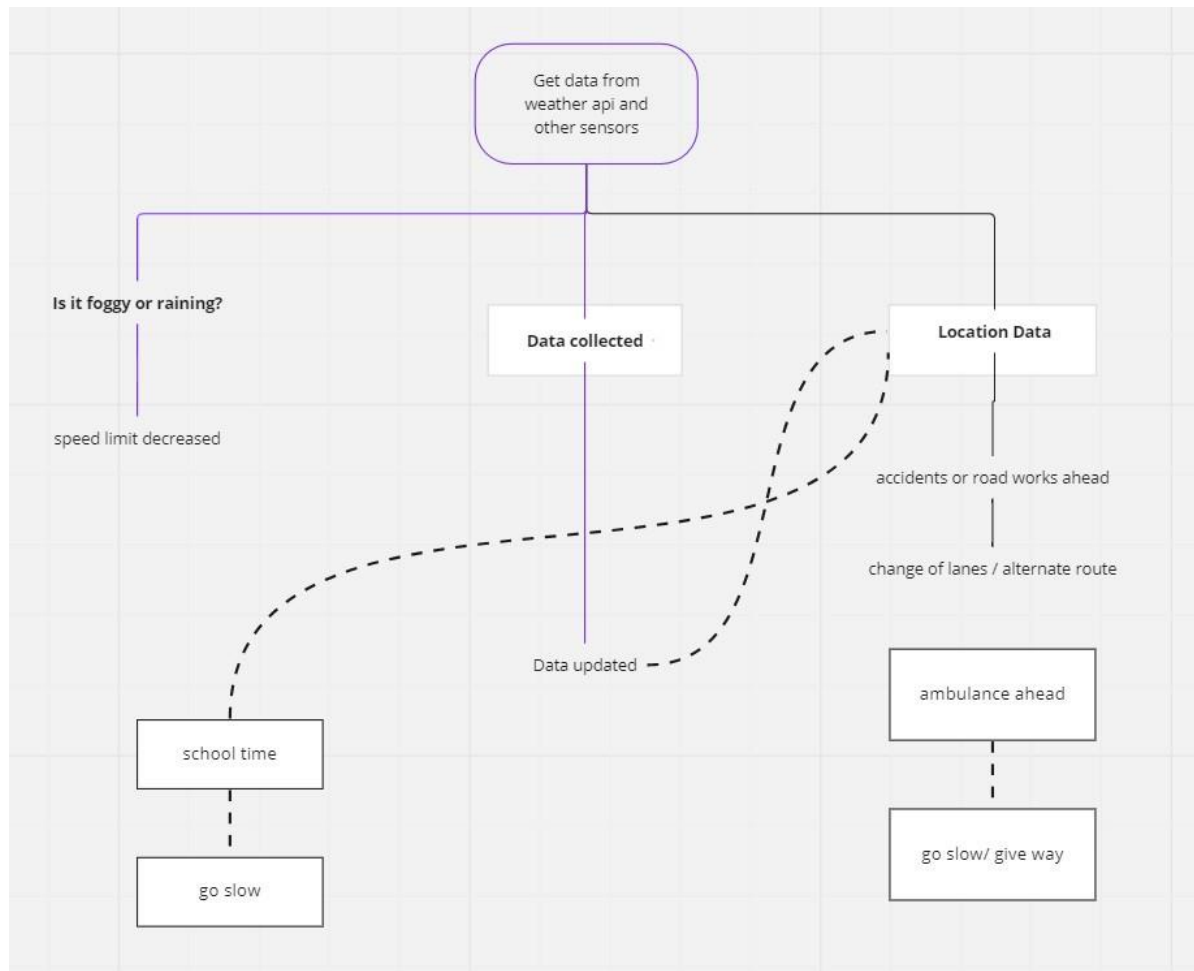


The proposed solution can be further developed and tested using hardware. This solution helps improve the traffic light's ability to adapt to the traffic condition along with the adjustable mode to different conditions of use.

# PROJECT DESIGN PHASE – 2

## SOLUTION REQUIREMENTS

- RAM-Minimum 4GB Processor-Min. Configuration OS-Windows/Linux/MAC

- To replace the static signboards, smart connected sign boards are used.

- These smart connected sign boards get the speed limitations from a web app usingweather API and update automatically.

- Based on the weather changes the speed may increase or decrease.

- Based on the traffic and fatal situations the diversion signs are displayed.

- Guide(Schools),  Warning and Service(Hospitals, Restaurant) signs are  alsodisplayed accordingly.

- Different modes of operations can be selected with the help of buttons.

## FUNCTIONAL REQUIREMENTS

**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 with LED's which are bright colored and are placed in a position where it is attracted by the drivers but it should also not be too bright and distracting. The Board should not in a place which hides the part of road thus blinding cause it may lead to accidents. |
| FR-2 | User Understanding | For better understanding of the driver, the signs should be repeated and it should in an order where the driver understands it properly. The sign should be in a symbol model thus the driver will understand without spending more time on it. |
| FR-3 | User Convenience | The display should be big enough that it should even be visible from far distance clearly. |

## NON - FUNCTIONAL REQUIREMENTS

**Non-Functional Requirements:**

| Following are the Non-FunctionalRequirements of the proposed solution **FR No.** | **Non-Functional Requirements** | **Description** |
|---|---|---|
| NFR-1 | **Usability** | It should be able to update in a time interval using the sensor and based on the data provided and it should be easily upgradable because of the technical advancement so it will be feasible for the interpreter to implementthe changes easily. |
| NFR-2 | **Security** | The sign Board should be highly secured, no one should have a chance to access which may cause the sign board to give wrong signs . |
| NFR-3 | **Reliability** | It should able to produce proper sign irrespective of the cause and sign board should not produce error. |

## 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.

## TECHNOLOGY STACK
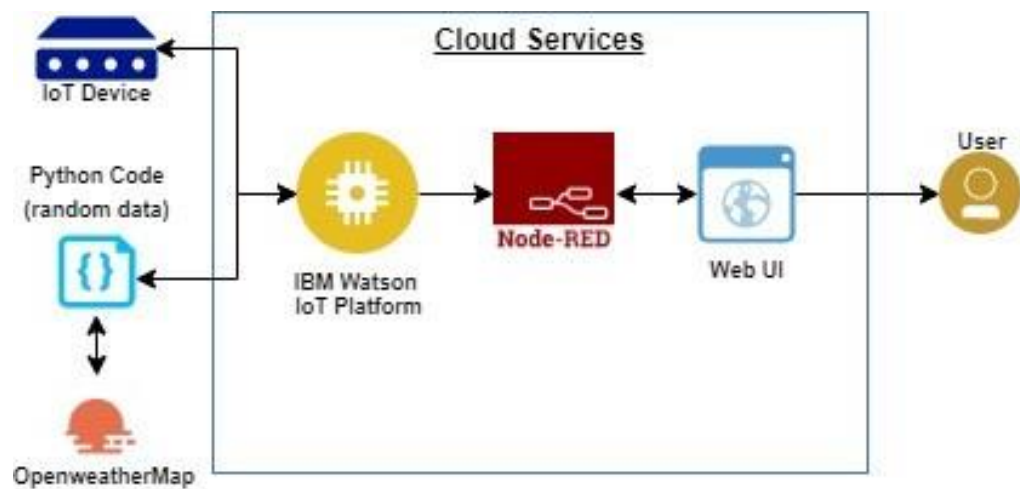


**Table-1 : Components & Technologies:**

| S.No | Component | Description | Technology |
|------|-----------|-------------|------------|
| 1. | User Interface | How user interacts with application e.g. Web UI, Mobile App. | HTML, CSS, JavaScript / Angular Js |
| 2. | Application Logic-1 | Logic for a process in the application | Python |
| 3. | Application Logic-2 | Logic for a process in the application | IBM Watson IoT Platform |
| 4. | Application Logic-3 | Logic for a process in the application | NODE-RED service |
| 5. | Application Logic-4 | Logic for a process in the application | Open Weather Map |
| 6. | Database | Data Type, Configurations etc. | MySQL |
| 7. | Cloud Database | Database Service on Cloud | IBM DB2, IBM Cloudant |
| 8. | File Storage | File storage requirements | IBM Block Storage or Other Storage Service or Local Filesystem |
| 9. | External API-1 | Purpose of External API used in the application | IBM Weather API,MQTT |
| 10. | Machine Learning Model | Purpose of Machine Learning Model | Object Recognition Model |
| 11. | Infrastructure (Server / Cloud) | Application Deployment on Local System / Cloud Local Server Configuration: Cloud Server Configuration : | Local, Cloud Foundry, Kubernetes |

**Table-2: Application Characteristics:**

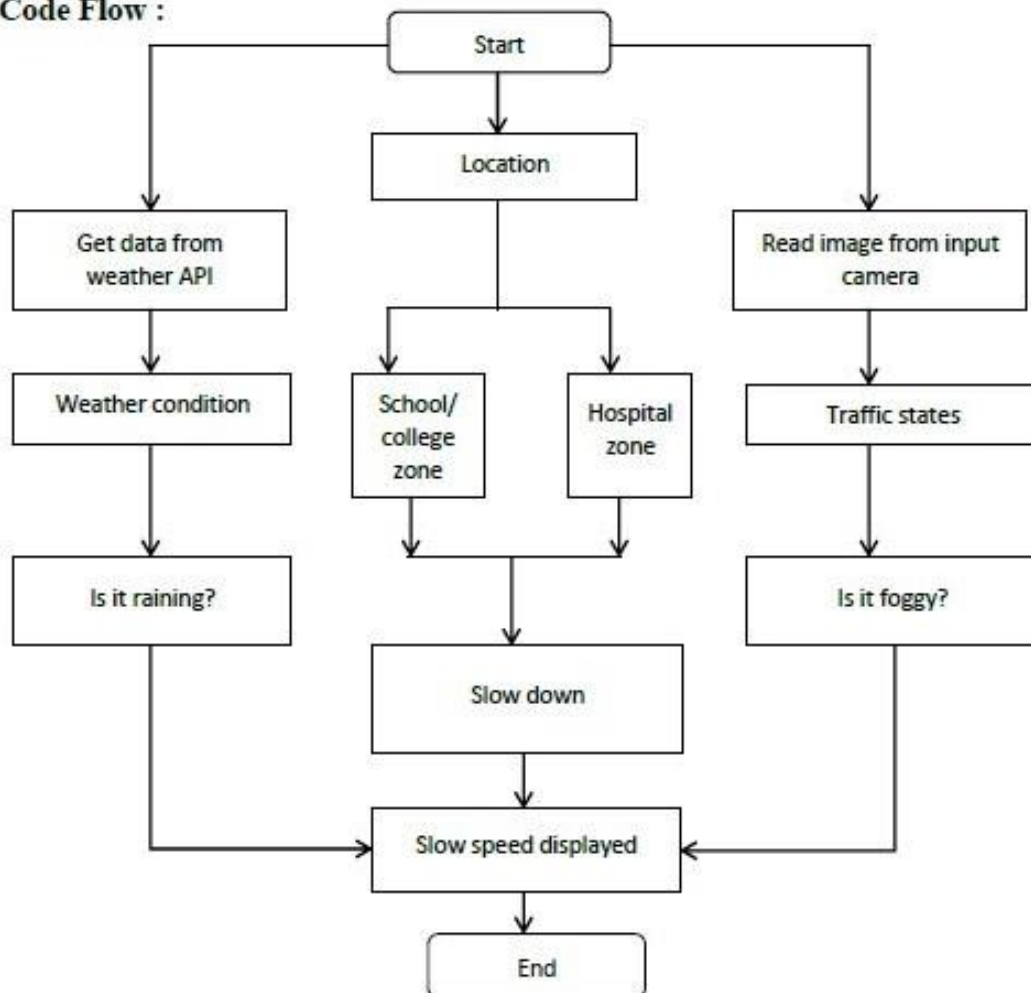| S .No | Characteristics | Description | Technology |
|---|---|---|---|
| 1. | Open-Source Frameworks | There are no open-source framework in this application. | Python,NODE-RED |
| 2. | Security Implementations | List all the security / access controls implemented, use of firewalls | Encryption |
| 3. | Scalable Architecture | User are provided with traffic symbol online .Give awareness to road rules. | IBM cloud |
| 4. | Availability | Controller recommendation ,Symbol ,Road rules , accident provided zones are available in applications. | IBM Waston Assistant |
| 5. | Performance | Artificial Intelligence (AI) such as Machine Learning (ML) algorithms are very helpful to improve the performance of the overall road safety management. | AI such as Machine learning |

# PROJECT DEVELOPMENT PHASE

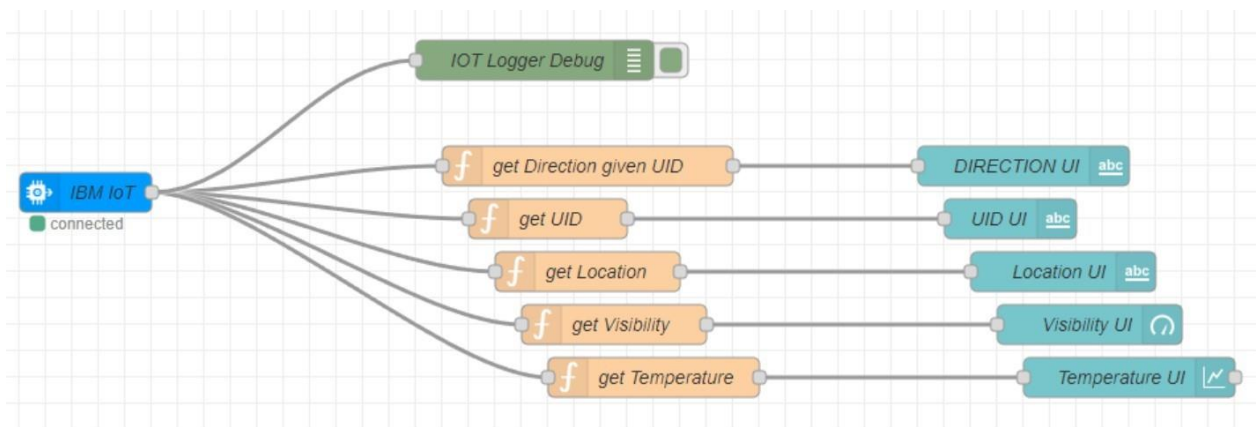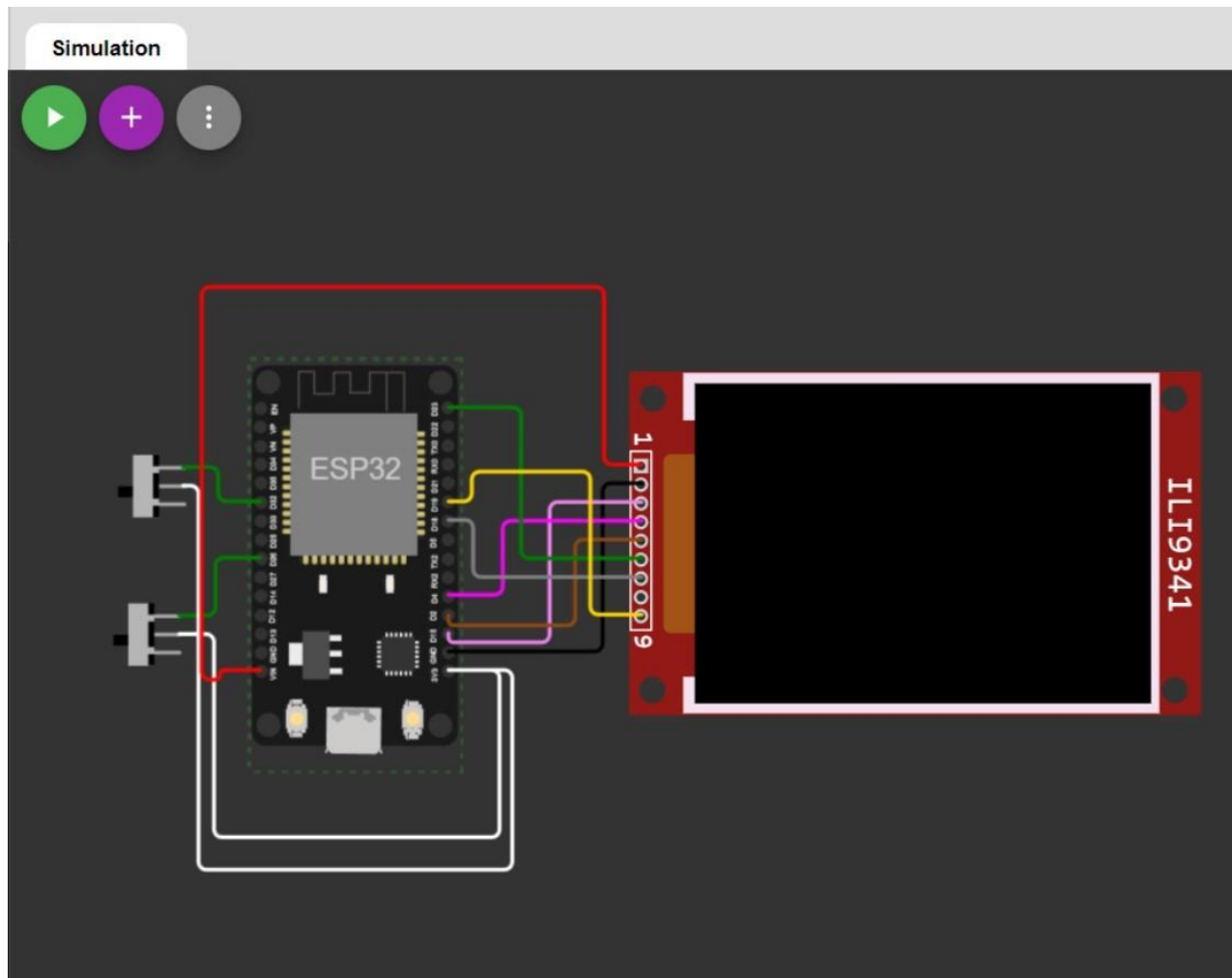| Project Name | Signs with Smart Connectivity for Better Road Safety. |
|---|---|

## Sprint Goals :

1.  Create and initialize accounts in various publicAPIs like OpenWeather API.
2.  Write a Python program that outputs results given the inputs like weather and location. 3. Extract data from OpenWeatherMap using APIs 4. Send the extracted data to the cloud.
5. Receive data from the cloud and view it in the python compiler.

## Code Flow :

```
                              ┌─────────┐
                              │  Start  │
                              └─────────┘
                                   │
                              ┌──────────┐
                              │ Location │
                              └──────────┘
        │                          │                          │
 ┌──────────────┐        ┌──────────┐  ┌──────────┐   ┌──────────────┐
 │ Get data from│        │ School/  │  │ Hospital │   │Read image from│
 │  weather API │        │ college  │  │  zone    │   │ input camera │
 └──────────────┘        │  zone    │  └──────────┘   └──────────────┘
        │                └──────────┘                         │
 ┌──────────────┐              │                       ┌──────────────┐
 │Weather       │              │                       │ Traffic states│
 │condition     │              │                       └──────────────┘
 └──────────────┘              │                              │
        │                      │                              │
 ┌──────────────┐        ┌──────────┐                  ┌──────────────┐
 │ Is it raining?│       │ Slow down│                  │ Is it foggy? │
 └──────────────┘        └──────────┘                  └──────────────┘
        │                      │                              │
        │               ┌──────────────────┐                 │
        └───────────────│Slow speed displayed│───────────────┘
                        └──────────────────┘
                                   │
                              ┌─────────┐
                              │   End   │
                              └─────────┘
```
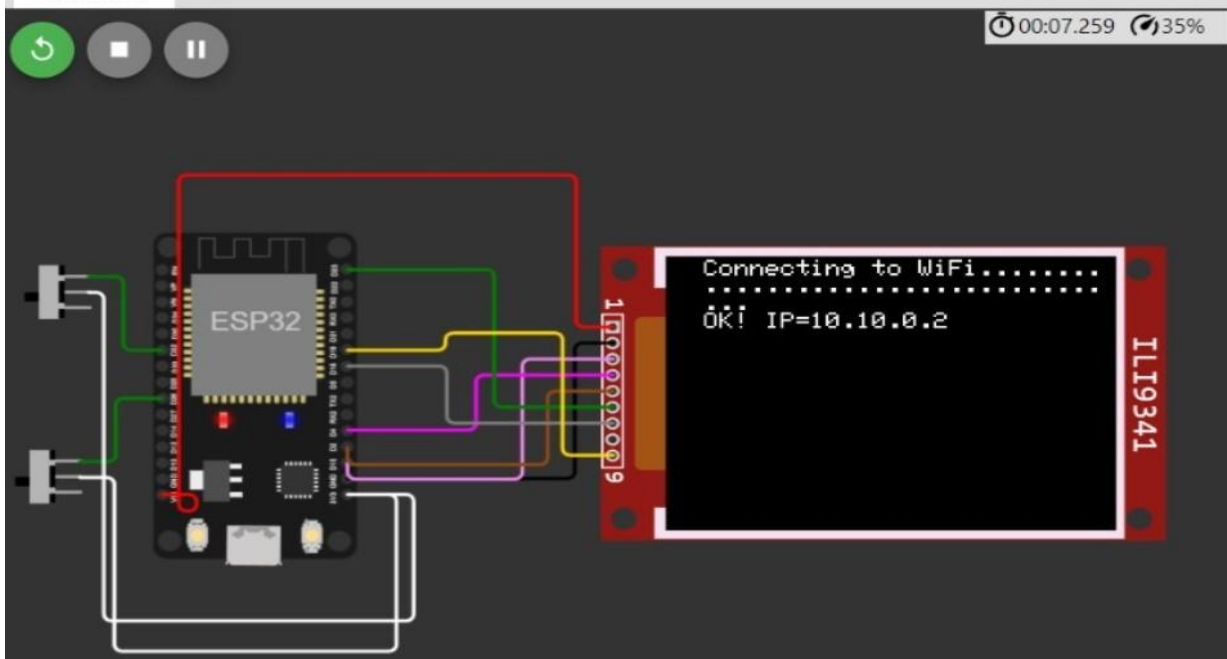
# Sprint-3

```
1   #include <WiFi.h>
2   #include <HTTPClient.h>
3   #include <Adafruit_GFX.h>
4   #include <Adafruit_ILI9341.h>
5   #include <string.h>
6
7   const char* ssid = "Wokwi-GUEST";
8   const char* password = "";
9
10  #define TFT_DC 2
11  #define TFT_CS 15
12  Adafruit_ILI9341 tft = Adafruit_ILI9341(TFT_CS, TFT_DC);
13
14  String myLocation = "Chennai,IN";
15  String usualSpeedLimit = "70"; // kmph
16
17  int schoolZone = 32;
18  int hospitalZone = 26;
19
20  int uid = 2504;
21
22  String getString(char x)
23  {
24      String s(1, x);
25      return s;
26  }
27
28  String stringSplitter1(String fullString,char delimiter='$')
29  {
30      String returnString = "";
31      for(int i = 0; i<fullString.length();i++) {
32          char c = fullString[i];
```

**Simulation**

```
1    #include <WiFi.h>
2    #include <HTTPClient.h>
3    #include <Adafruit_GFX.h>
4    #include <Adafruit_ILI9341.h>
5    #include <string.h>
6
7    const char* ssid = "Wokwi-GUEST";
8    const char* password = "";
9
10   #define TFT_DC 2
11   #define TFT_CS 15
12   Adafruit_ILI9341 tft = Adafruit_ILI9341(TFT_CS, TFT_DC);
13
14   String myLocation = "Chennai,IN";
15   String usualSpeedLimit = "70"; // kmph
16
17   int schoolZone = 32;
18   int hospitalZone = 26;
19
20   int uid = 2504;
21
22   String getString(char x)
23   {
24       String s(1, x);
25       return s;
26   }
27
28   String stringSplitter1(String fullString,char delimiter='$')
29   {
30       String returnString = "";
31       for(int i = 0; i<fullString.length();i++) {
32           char c = fullString[i];
```

Simulation

**Code**

```c
#include   <WiFi.h> #include
<HTTPClient.h> #include
<Adafruit_GFX.h>
#include <Adafruit_ILI9341.h>#include <string.h>

const char* ssid = "Wokwi-GUEST";const char* password =
"";

#define TFT_DC 2
#define TFT_CS 15
Adafruit_ILI9341 tft = Adafruit_ILI9341(TFT_CS, TFT_DC);

String myLocation = "Chennai,IN"; String usualSpeedLimit =
"70"; // kmph

int schoolZone = 32; int hospitalZone
= 26;

int uid = 2504;

String getString(char x)
{
```

```
        String s(1, x);return s;

}


String                    stringSplitter1(String                         fullString,char
delimiter='$')

{
        String returnString = "";
        for(int i = 0; i<fullString.length();i++) {char c = fullString[i];
                if(delimiter==c)
                        break; returnString+=String(c);
        }
        return(returnString);
}


String                   stringSplitter2(String                          fullString,char
delimiter='$')

{
        String returnString = "";bool flag = false;
        for(int i = 0; i<fullString.length();i++) {char c = fullString[i];
                if(flag)
```

```
                    returnString+=String(c);if(delimiter==c)

                    flag = true;

        }

        return(returnString);

}


void rightArrow()

{

    int refX = 50;

    int refY = tft.getCursorY() + 40;


    tft.fillRect(refX,refY,100,20,ILI9341_RED);

    tft.fillTriangle(refX+100,refY-
30,refX+100,refY+50,refX+40+100,refY+10,ILI9341_RED);

}


void leftArrow()

{

    int refX = 50;

    int refY = tft.getCursorY() + 40;


    tft.fillRect(refX+40,refY,100,20,ILI9341_RED);tft.fillTriangle(refX+40,refY-
30,refX+40,refY+50,refX,refY+10,ILI9341_RED);
```

```
}

void upArrow()
{
    int refX = 125;

    int refY = tft.getCursorY() + 30;

    tft.fillTriangle(refX- 40,refY+40,refX+40,refY+40,refX,refY,ILI9341_RED);

    tft.fillRect(refX-15,refY+40,30,20,ILI9341_RED);
}

String APICall() {HTTPClient http;

    String        url        =        "https://node-red-nwmrt-2022-11-04.eu-
gb.mybluemix.net/getSpeed?";

    url += "location="+myLocation+"&";

    url                                                                    +=
"schoolZone="+(String)digitalRead(schoolZone)+(String)"&";

    url                                                                    +=
"hospitalZone="+(String)digitalRead(hospitalZone)+(String)"&";

    url                                                                    +=
"usualSpeedLimit="+(String)usualSpeedLimit+(String)"&";url += "uid="+(String)uid;

    http.begin(url.c_str());
```

```
    int httpResponseCode = http.GET();

    if (httpResponseCode>0) {

        String payload = http.getString();http.end();

        return(payload);

    }

    else {

        Serial.print("Error code: "); Serial.println(httpResponseCode);

    }

    http.end();

}


void myPrint(String contents) {

    tft.fillScreen(ILI9341_BLACK);tft.setCursor(0, 20);

    tft.setTextSize(4); tft.setTextColor(ILI9341_RED);

    //tft.println(contents);


    tft.println(stringSplitter1(contents));String c2 = stringSplitter2(contents);

    if(c2=="s") // represents Straight

    {
```

```
        upArrow();

    }

    if(c2=="l") // represents left

    {

        leftArrow();

    }

    if(c2=="r") // represents right

    {

        rightArrow();

    }

}


void setup() {

    WiFi.begin(ssid, password, 6);


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


    tft.setTextColor(ILI9341_WHITE);tft.setTextSize(2);

    tft.print("Connecting to WiFi");


    while (WiFi.status() != WL_CONNECTED) {delay(100);

        tft.print(".");
```

```
    }


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

}


void loop() {

  myPrint(APICall());


  delay(100);
}
```

**Sprint Goals :**

**Objective :**

**Signs with smart connectivity for Better road safety**

>> To replace the static signboards, smart connected sign boards areused.

>> These smart connected sign boards get the speed limitations from aweb app using weather API and update automatically.

>> Based on the weather changes the speed may increase or decrease.

>> Based on the traffic and fatal situations the diversion signs aredisplayed.

>> Guide(Schools), Warning and Service(Hospitals, Restaurant) signsare also displayed accordingly.

>> Different modes of operations can be selected with the help ofbuttons.

# Sprint Goals :

1. Hardware & Cloud integration

## Process Flow :

**Code Flow :**



```
                          ┌──────────┐
                          │  Start   │
                          └──────────┘
                               │
                          ┌──────────┐
                          │ Location │
                          └──────────┘

┌─────────────────┐   ┌──────────┐  ┌──────────┐   ┌─────────────────┐
│ Get data from   │   │ School/  │  │ Hospital │   │ Read image from │
│ weather API     │   │ college  │  │ zone     │   │ input camera    │
└─────────────────┘   │ zone     │  └──────────┘   └─────────────────┘
                      └──────────┘

┌─────────────────┐                               ┌─────────────────┐
│ Weather         │                               │ Traffic states  │
│ condition       │                               └─────────────────┘
└─────────────────┘

┌─────────────────┐      ┌──────────┐             ┌─────────────────┐
│ Is it raining?  │      │ Slow down│             │ Is it foggy?    │
└─────────────────┘      └──────────┘             └─────────────────┘

              ┌──────────────────────────┐
              │ Slow speed displayed     │
              └──────────────────────────┘

                      ┌──────────┐
                      │   End    │
                      └──────────┘
```
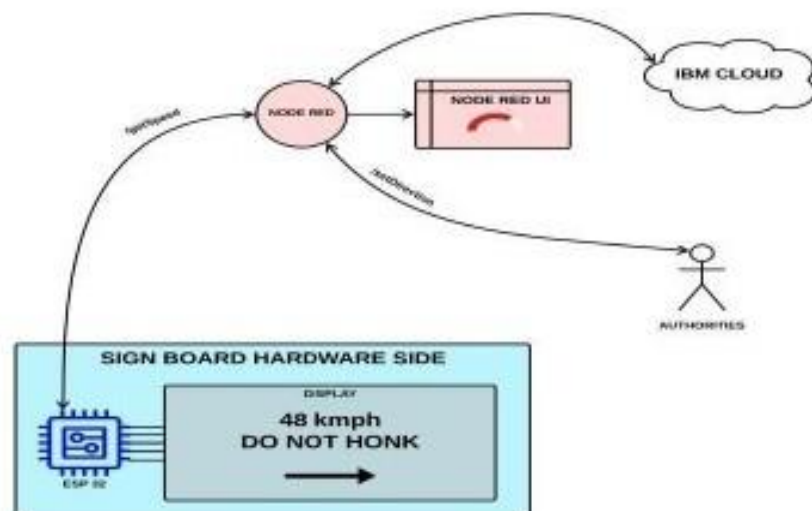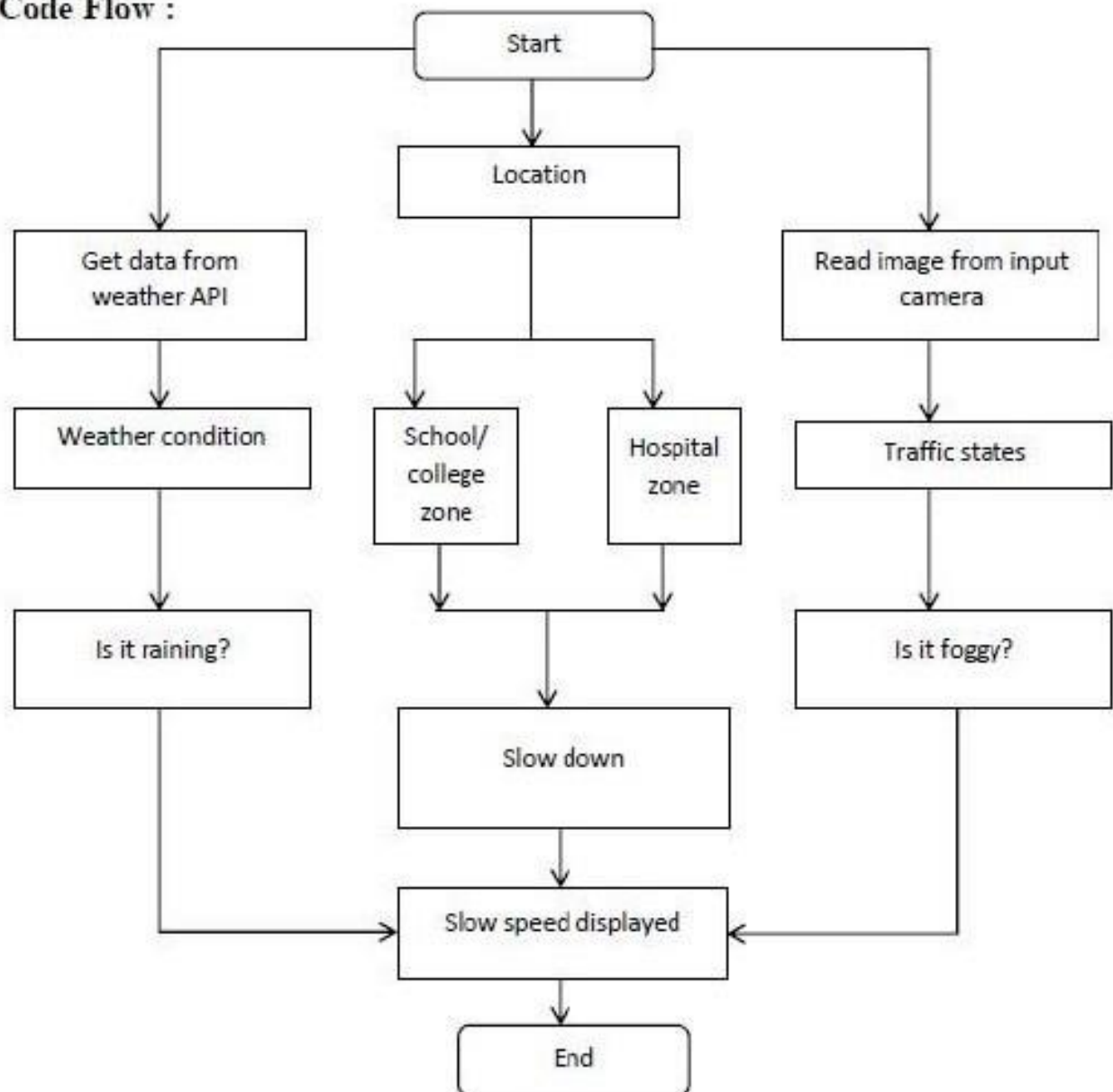
# CONCLUSION

In this paper, with regards to IBM Watson IoT Platform and Node – Red, we showed the importance of delegating resources to the infrastructure in Smart Road Signs. We have also proposed an architecture of what these Smart Road Signs(SRS) are supposed to look like. This architecture will bring automation and intelligence to the road signage and would play an important role in Road Safety by providing more intelligent processes and automated systems.

In this paper we focused on how agents can support the collaboration between Smart Road Signs and Connected Vehicles. This will benefit our traffic system by Monitoring traffic, reporting incidents, so that these road signs can clear an alternative route and warn other drivers as soon as possible.

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