Smart Waste Management System For Metropolitan Cities

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In

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Dr . MAHALINGAM COLLEGE OF ENGINEERING AND TECHNOLOGY An Autonomous Institution Affiliated to ANNAUNIVERSITY CHENNAI – 600 025

1. INTRODUCTION

1.1. PROJECT OVERVIEW:

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 wefocus 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). VANETS are also considered as one of the most important Simulator for safety of intelligent transportation systems. The use of the DSRC technologies support low latency vehicle-to-vehicle (V2V) communication. Inpresent 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. Clearly, intelligent roadway placads can be a vital part of our driving experience. They enable a better way for drivers to access the information they need in real time on the roads. These signs can increase awareness of upcoming issues, which people might otherwise discover too late. They may also augment the functionality of driverless vehicles.

1.2. PURPOSE

The value of implementing this technology should not be underestimated. Smart roadway indicators have the potential to increase cost-efficiency, which eases the burden on governments and taxpayers. They facilitate a smoother driving process for both human drivers and autonomous vehicles. The placards can be more user-friendly than the analog route signs we currently employ. Above all, they may ultimately lead to a safer network of roads for everyone. Smart roadway signage is not simply an objective for the future. Two UK Companies have collaborated to produce these signs for use on England's roads. The signs are technologically advanced, with graphics and text that drivers can see clearly. The messages are easy to comprehendquickly, keeping drivers informed of route conditions as they change. In addition to enhancing theroadway experience for users, this new signage costs less to maintain than traditional indicators. The new signs require fewer materials and less cabling, resulting in less time, upkeep, and expense. Increasing volumes of traffic are using municipal road infrastructure, with severe consequences fortraffic efficiency and the safety of road users. Vulnerable roads users (VRUs), such as pedestrians or cyclists, are involved in 46 % of lethal accidents. Exchanging information between road users increases their perception and is thus a critical building block to improve this situation. 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 takenautomatically by the use of a wireless local area networks.

2. LITERATURE

2.1. EXISTING PROBLEM

The Existing road system and connectivity, emphasis on the traffic and route reckoning features which cordially provisions the user acceptability to have better connectivity management. But, this often results in nonparallel road conditions and high noise ratios through the calibrations. It reiterates various subjections in its compilation and leading to segmentation error throughout. It penetrates the various unit cases in order to subsequently manifest the output. This alternatively symbolizes the ineffectively programmed web user interface. The IOT based model of our project complies of the verdict to specify the soft zone in the path. It manually ask the user to turn off the horn, which in variably decreases the decibel level of the power output. Illustratively, it confides the work schematics of the precedent evaluation under the system and allows the user to access the terminals of the app nodes variably. IBM Cloud indefinitely helps in reviving the data sets required in web application. MIT app inventor segments the creation of the user interface.

2.2. REFERENCES

[1] The acceptance and road safety, ethical, legal, social and Economic implications of automated vehicles

Main Authors: Annika Johnsen (IfeS), Niklas Strand (VTI), Jan Andersson (VTI), Christopher Patten (VTI), Clemens Kraetsch (IfeS), Johanna Takman (VTI)

This deliverable summarizes the findings of an extensive literature review on the acceptance, behavioural intentions, road safety, as well as ethical, legal, social (ELSI) and economic considerations in the scope of vehicle automation. The theoretical fundaments and relevant findings of recent public opinion research regarding user acceptance of automation are presented. Also the view of organised stakeholders is taken into account. Regarding road safety there is a potential for increased road safety but drivers tend to pick up non-related driving tasks instead. These problems are due to several traditional HMI concerns. In the future autonomous cars must make decisions that touch on ethical issues that have not yet been sufficiently and transparently discussed. Although in many countries legislation is now reacting to the new technology, many aspects – like liability and privacy / data protection – are not yet regulated by law. Automated vehicles promise to have several clear benefits that might change the entire transport system. The positive externalities that come from the technological advantages of automated vehicles might be

outweighed by the negative externalities coming from the potential increases in travelling by private vehicles

Drawbacks:

Error in algorithm may leads to false detection of signs

[2] Effects of Anger and Display Urgency on Takeover Performance in Semi-automated Vehicles

Authors : Harsh Shangavi, Yiqi shang, Myounghoon jeon

As semi-automated vehicles get to have the ability to drive them-selves, it is important to explore drivers' affective states which may influence takeover performance and to design optimized control transition displays to warn drivers to take control back from the vehicles. The present study investigated the influence of anger on drivers' takeover reaction time and quality, with varying urgency of auditory takeover request displays. Using a driving simulator, 36 participants experienced takeover scenarios in a semi-automated vehicle with a secondary task (game). Higher frequency and more repetitions of the auditory displays led to faster take overreaction times, but there was no difference between angry and neutral drivers. For takeover quality, angry drivers drove faster, took longer to change lanes and had lower steering wheel angles than neutral drivers, which made riskier driving. Results are discussed with the necessity of affect research and display design guidelines in automated vehicles.

Drawback: Advanced innovation may use with great concern, otherwise leads to the exploitation of clean and renevable energy sources.

2.3. PROBLEM STATEMENT DEFINITION

In the existing system the road signs and speed limits are remain unchanged.If there is any possibility that a traffic jam may occur and the chance of getting accident, we can change the road signs accordingly if those road signs are digitalized.

Approaching better road safety:

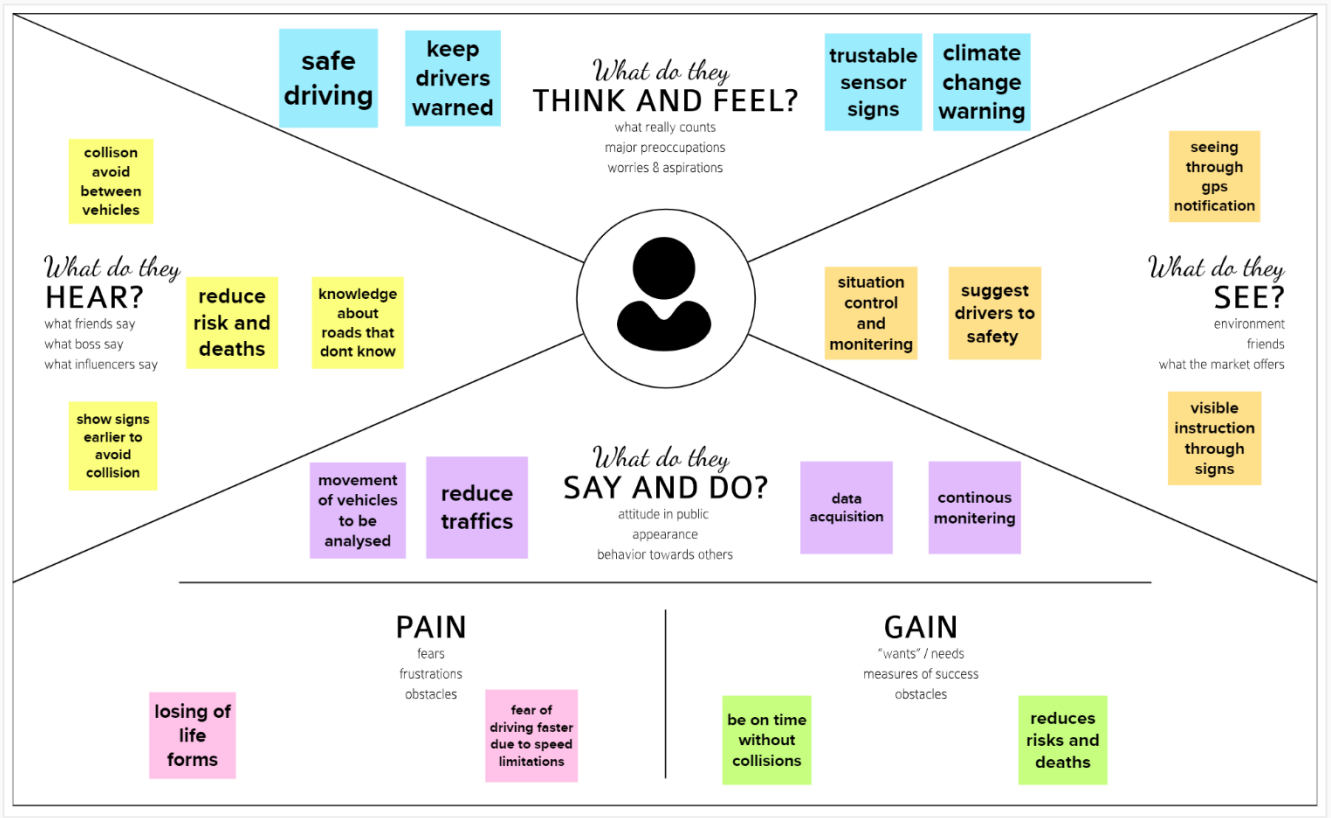
The assessment of road network safety is multifaceted. Road inspection enables clear and direct observation of the road's state. We can consider some cases when there are route diversions due to some repairing works, unfavorable climates and heavy traffic on roads then we can display the road signs according those varying parameters. This project proposes a system which has digital sign boards on which the signs can be varying accordingly. Consideration of those road's data offers further insights into general safety assessment.

Social impacts:

Avoid accidents and risks due to poor road construction, speed limits can be controlled in the accident prone zones, thereby keeping the society always safe.

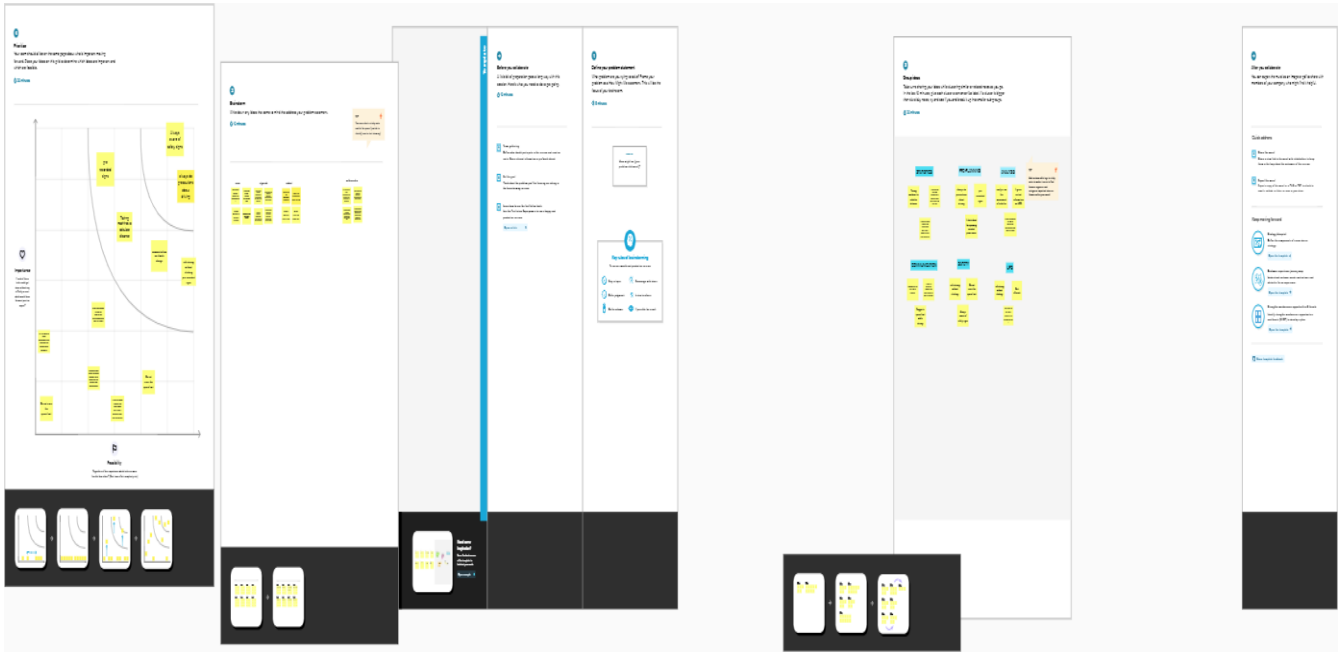
3.IDEATION AND PROPOSED SOLUTION

3.1.EMPATHY MAP



3.1.IDEATION & BRAINSTORMING

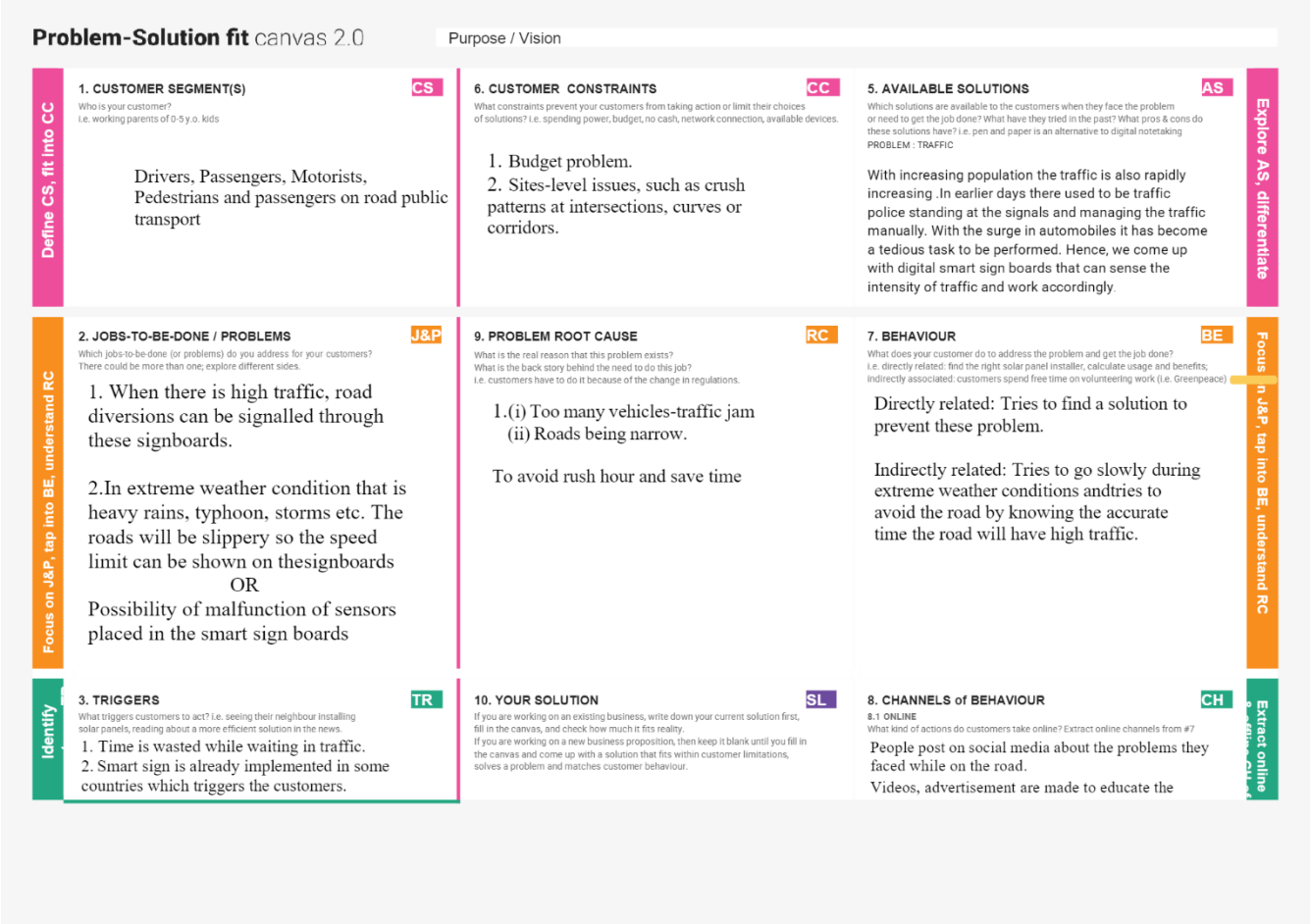
BRAINSTORMING, LISTING AND GROUPING



PROPOSED SOLUTION

S.NO	PARAMETER	DESCRIPTION
1.	We think that to avoid road accident	Prevent road users from being killed or seriously injured
2.	Idea / Solution 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.
3.	Novelty / Uniqueness	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.	Social Impact / 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 (Revenue 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

SOLUTION FIT



3. REQUIREMENT ANALYSIS

4.1.Functional Requirement

Following are the functional requirements of the proposed solution.

FR No.	Functional Requirement (Epic)	Sub Requirement (Story / Sub-Task)
FR-1	User Requirements	The static signboards to be replaced with the smart connectedsign boards with all requirements.
FR-2	User Registration	Manual Registration Registration through webpage or Gmail
FR-3	User Confirmation	Confirmation via Phone Confirmation via Email Confirmation via OTP
FR-4	Payments options	Bank Transaction
FR-5	Product Delivery and installation	Installation charge will be applied depending on the roadlength.
FR-6	Product Feedback	Through Webpage Through Gmail

4.2.Non-functional Requirements:

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

FR No.	Non-Functional Requirement	Description
NFR-1	**Usability**	Have clear instructions about the product and self -explanatory product and easy to use.
NFR-2	**Security**	Cloud data has to be within the network, collapsing to beavoided in real time and the board should be under surveillance always.
NFR-3	**Reliability**	Frequently checks hardware.
NFR-4	**Performance**	The smart board must have better user experience and theprecision output should generated.
NFR-5	**Availability**	All the features will be available what user requires itdepends on the need of customer.
NFR-6	**Scalability**	The product is based on road safety and should be coverall the area of highways.

4. PROJECT DESIGN

4.1. DATA FLOW DIAGRAM AND USER PLANNING

https://github.com/IBM-EPBL/IBM-Project-7039-1658845679/blob/main/Project%20Design%20%26%20Planning/Project%20Design%20Phase%20II/Data%20Flow%20Diagram.pdf

5.2 SOLUTION ARCHITECTURE

https://github.com/IBM-EPBL/IBM-Project-7039-1658845679/blob/main/Project%20Design%20%26%20Planning/Project%20Design%20Phase%201/solution%20%20Architecture.pdfC

5.PROJECT PLANNING

4.2. SPRINT PLANNING AND SCHEDUELING 1

https://github.com/IBM-EPBL/IBM-Project-7039-1658845679/tree/main/project%20development%20phase/sprint%201

5.2.SPRINT DELIVERY SCHEDUELE 2

https://github.com/IBM-EPBL/IBM-Project-7039-1658845679/tree/main/project%20development%20phase/sprint%202

5.3.SPRINT DELIVERY SCHEDUELE 3

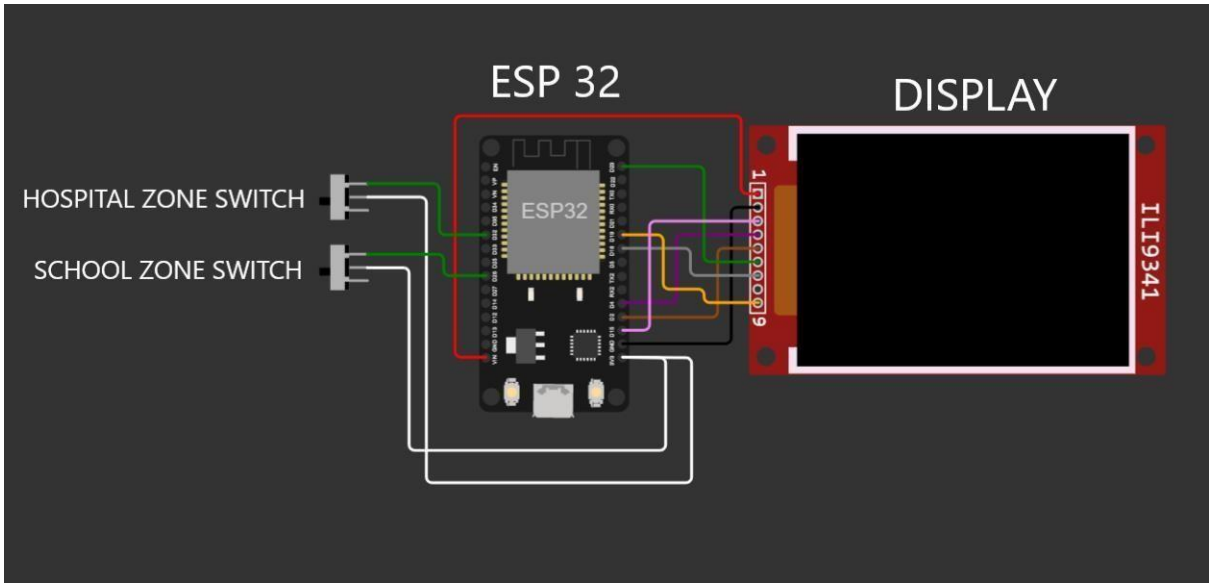
https://github.com/IBM-EPBL/IBM-Project-7039-1658845679/tree/main/project%20development%20phase/sprint%203

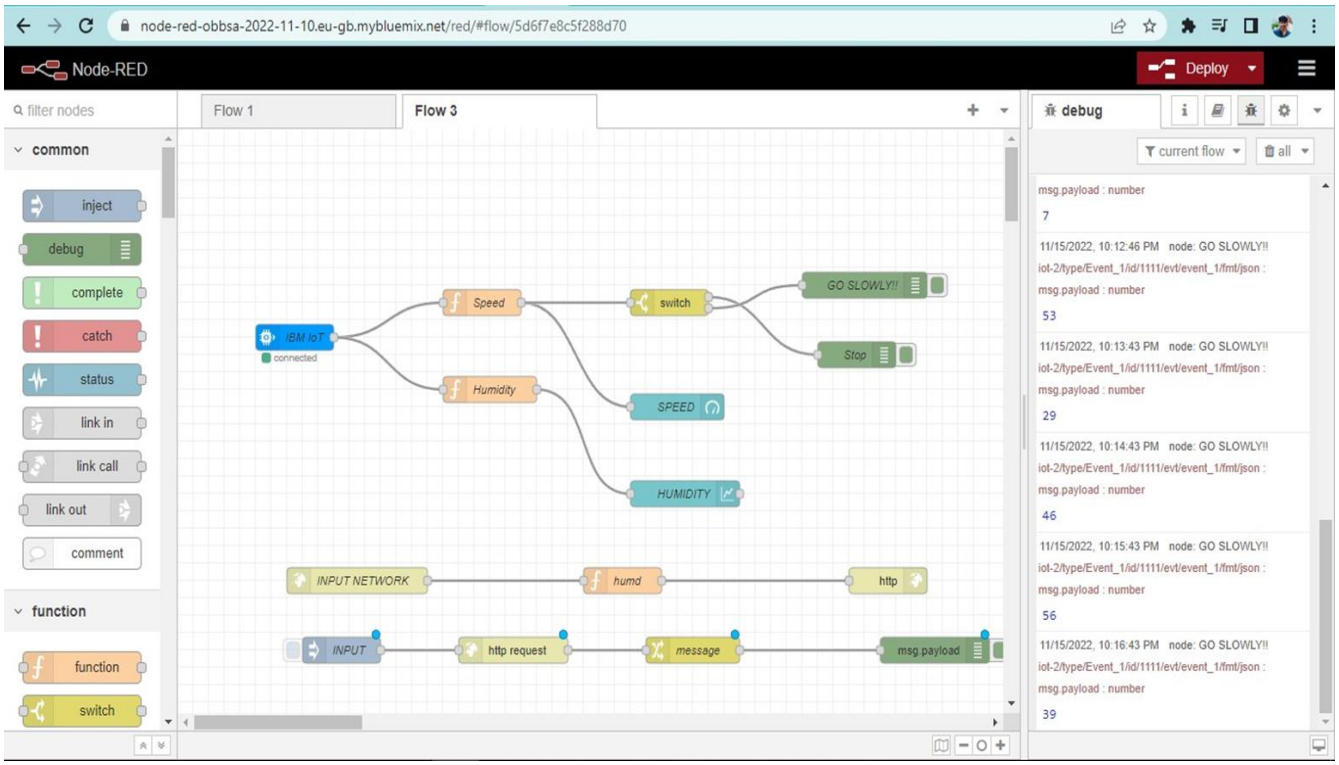
5.4.SPRINT DELIVERY SCHEDUELE 4

https://github.com/IBM-EPBL/IBM-Project-7039-1658845679/tree/main/project%20development%20phase/sprint%204

5. SCHEMATIC CIRCUIT AND CODING SOLUTION

5.1. CIRCUIT





- "IBM IOT" node connects the backend to Node RED UI. The function nodes such as "get Direction given UID", "get UID", "get Location", "get Visibility" & "get Temperature" extract the respective data out and provides them to the UI nodes "Direction UI", "UID UI", "Location UI", "Visibility UI" & "Temperature UI".

8.1 USER ACCEPTANCE TESTING

Dynamic speed & divertion variations based on the weather and traffic helps user to avoid traffic and have a safe journey home. The users would welcome this idea to be implemented everywhere.

6. 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.

7. ADVANTAGES & DISADVANTAGES

- **ADVANTAGE**

- Lower battery consumption since processing is done mostly by Node RED servers in
- Cheaper and low requirement micro controllers can be used since processing
- Longer lasting systems.
- Dynamic Sign updation.
- School/Hospital Zone alerts

- **DISADVANTAGES**
  - The size of the display determines the requirement of the micro controller
  - Dependent on OpenWeatherAPI and hence the speed reduction is same for a large area in the scale of cities.

8. CONCLUSION

Our project is capable of serving as a replacement for static signs for a comparatively lower cost and can be implemented in the very near future. This will help reduce a lot of accidents and maintain a more peaceful traffic atmosphere in the country.

9. FUTURE SCOPE

Introduction of intelligent road sign groups in real life scenarios could have great impact on increasing the driving safety by providing the end-user (car driver) with the most accurate information regarding the current road and traffic conditions. Even displaying the information of a suggested driving speed and road surface condition (temperature, icy, wet or dry surface) could result in smoother traffic flows and, what is more important, in increasing a driver's awareness of the road situation.

10. APPENDIX

- **GITHUB AND PROJECT DEMO LINK**

  https://github.com/IBM-EPBL/IBM-Project-7039-1658845679/tree/main/final%20deliverables/demo%20video

VIDEO DOWNLOAD LINK

https://github.com/IBM-EPBL/IBM-Project-7039-1658845679/tree/main/final%20deliverables/demo%20video

SOURCE CODE - ESP 32

```
#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; // ID Unique to this Micro ContollerString 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);
}
```

SIGNS WITH SMART CONNECTIVITY FOR BETTER ROAD

```
    String APICall() { HTTPClient http;
```

```
String url = "https://node-red-grseb-2022-11-05-test.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();

LINK TO NODE RED DASHBOARD

https://github.com/IBM-EPBL/IBM-Project-7039-1658845679/tree/main/Develop%20a%20web%20application%20using%20node-red