Project Report Format

SIGNS WITH SMART CONNECTIVITY FOR BETTER ROAD SAFETY

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Abstract—The way of providing the end user with an accurate data regarding the current road conditions is one of the very important components in the area of Intelligent Transportation Systems (ITS). The most important issue in the process of building the trust between the road signalling infrastructure and the end user is the information significance and its value. The proposed system typically consists of a few road signs communicating with each other and exchanging measured data: weather conditions, road surface condition, traffic volume, avg. vehicles speed, detected road events, etc. On the basis of the information exchanged between road signs, each of them runs the autonomous algorithm to process that data and computes the current status of road section driving conditions. The process of the speed limit determination is often complicated and in many cases it is defined by numerous legal standards. In general, speed determination should take into account not only the technical aspect, but also social and legal aspects, which makes this process especially difficult. As a result, advanced conceptually products for increasing road safety for which there is a market demand are being prepared for future implementation.

A range of products is being developed, including intelligent road signs displaying the speed limit that is determined automatically, through an embedded electronic module, enabling multimodal measurement of traffic conditions. Solving a number of research and construction problems, such as: effective and independent of weather conditions traffic monitoring based on simultaneous analysis of several types of data representation, development of a method of calculating gradients and histograms of vehicle speed for various types of road situations or traffic topologies. Moreover, creating a platform for self-organizing reliable wireless connections among road signs equipped with innovative displays and power supplies and carrying out prototype tests are carried out.

1. INTRODUCTION

Nowadays, speed limits are mostly defined by experts taking into account qualitative and quantitative parameters of the considered road. The whole process should take into account not only technical but also local society expectations and existing law regulations, which complicates this process enough, even without considering dynamic aspects of traffic and weather conditions variations. The proposed approach in the project is based on the determination of speed limits using the rule system. It enables the determination of a variable speed limit on the basis of e.g. weather conditions and properties of the road section - road class, road characteristics (e.g. the number of lanes, intersections, junctions, exits, entrances),

surface quality, and geometric parameters (the size of the arc, the slope of the road). One of the key aims of the project is to create an Intelligent Road Sign, equipped with various sensors constantly monitoring the current road conditions in terms of weather, surface and traffic volume and based on the embedded logic to provide drivers with accurate road information and safe speed limit accordingly. To make the concept more reliable and driver-supporting, instead of a single road sign, the project assumes that intelligent road signs should be groupedinto road sign chains. Such a group could exchange measured values of monitored parametersamong signs and introduce smooth traffic management e.g. by notifying drivers in advance about traffic congestion or icy surface a few kilometres before it takes place. In order to achievethis goal an intelligent road signs group should be able to communicate and propagate information. Thus, the key aspect of the project is the introduction of reliable communication among all system elements: intelligent road signs of variable displayed content, weather stations, road management entity, I2V (infrastructure to vehicle) messages generator, drivers and system administrator.

2. LITERATURE SURVEY

Smart vehicle connectivity for safety applications
U. D. Gandhi, A. Singh, A. Mukherjee and A. Chandak, "Smart vehicle connectivity for safety applications," *2014 International Conference on Reliability Optimization and Information Technology (ICROIT)*, 2014, pp. 262-266, doi: 10.1109/ICROIT.2014.6798327.

An IoT Architecture for Assessing Road Safety in Smart Cities, November 2018 Wireless Communications and Mobile Computing 2018:1-11 by Abd-Elhamid M. Taha proposed Safety Road system to transport network originated with the “Safe Road Transport System” model developed by the Swedish Transport Agency.

Development and Testing of Road Signs Alert System Using a Smart Mobile Phone by Ramadhani Sinde proposed Road traffic accidents (RTA) are defined as accidents that occurred or originated on a way or street open to public traffic. These collisions result in injury or death between automobiles or humans. RTA is a major problem worldwide resulting in significant morbidity and mortality. According to the World Health Organization road safety report of 2018, the number of road traffic deaths increased to 1.35 million in 2016.

Reliable Smart Road Signs Muhammed O. Sayin, Chung-Wei Lin, Eunsuk Kang, Shinichi Shiraishi, and Tamer Bas¸ar, e 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

Communication system for Intelligent Road Signs network
J. Gozdecki et al., "Communication system for Intelligent Road Signs network," 2019 6th International Conference on Models and Technologies for Intelligent Transportation Systems (MT-ITS), 2019, pp. 1-6, doi: 10.1109/MTITS.2019.8883382.

Aravinda B, Chaithralakshmi C, Deeksha, Ashutha K from their report, it is concluded Accident prevention in U-turn, S-turn, hilly Ghats and mountain roads using modern sensor technology, which uses Aurdino UNO, Ultrasonic sensor, RF module LED etc.
R.Saranya, R.Arun Kumar : This paper conclude that, JAC : A Journal Of Composition

Theory Volume XIV, Issue VIII, AUGUST 2021 ISSN : 0731-6755 Accidents may takes place in various factors drunk and driving, Texting while driving, Speeding, Distractions, Sleeping while driving. Among Drowsiness is reason for most of the accidents. While driving at the speed of 100km/hr. Driver falls sleepy within 4 seconds the buzzer will enables.

Ranga Sreedhar Galla has studied the basic aim of their paper is to reduce accidents on hilly and slippery roads. In curve roads the other road end of vehicle cannot seen by driver. At night time accidents may happen by intensity of head light from opposite side of vehicles. Also, the light intensity problem occurs both curved roads and mountain roads; Thousands of people lose their lives. The solution for this problem is alerting the driver about the vehicle coming from opposite side. This is done by keeping an ultrasonic sensor in one side of the road before the curve and keeping a LED light after the curve, so that if vehicle comes from one end of the curve sensor senses and LED light glows at the opposite side.

Kartik Venkata Mutya, Sandeep Rudra has studied that road traffic accidents are being recognized as a major public health problem in numerous countries with alarmingly increasing fatalities in developing countries. Careless driving as a result of excessive waiting and blind corners is attributed as one of the most important factors for all road accidents. An estimated 1.2 million people lose their lives in road traffic crashes every year, and another 20 to 50million are injured. A docile, economical mechanism to prevent these road accidents is the need of the hour. It is hoped that the mechanism presented in this article would help in alleviating this concern especially in correspondence with large vehicle accident.

CONCLUSION

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. Future work involves exploring further applications, especially in the context of raising driver awareness of the road safety conditions during their trips.

REFERENCE

[1] ETSI EN 302 665 (V1.1.1): "Intelligent Transport Systems (ITS); Communications Architecture".
[2] ETSI ES 202 663: "Intelligent Transport Systems (ITS); European profile standard for the physical and medium access control layer of Intelligent Transport Systems operating in the 5 GHz frequency band".
[3] IEEE Std 802.11-2012, IEEE Standard for Information technology—Telecommunications and information exchange between systems—Local and metropolitan area networks—Specific requirements —Part 11: Wireless LAN Medium Access Control (MAC) and Physical Layer (PHY) specifications.
[4] ETSI TS 103 301: "Intelligent Transport Systems (ITS); Vehicular Communications; Basic Set of Applications; Facilities layer protocols a and communication requirements for infrastructure services"
[5] ETSI EN 302 637-3: "Intelligent Transport Systems (ITS); Vehicular Communications; Basic Set of Applications; Part 3: Specifications of

Decentralized Environmental Notification Basic Service”
[6] Florian Klingler, Gurjashan Singh Pannu, Christoph Sommer, Bastian Bloessl and Falko Dressler, "Field Testing Vehicular Networks using OpenC2X," Proceedings of 15th ACM International Conference on Mobile Systems, Applications, and Services (MobiSys 2017), Poster Session, Niagara Falls, NY, June 2017, pp. 178-178.
[7] ETSI TS 102 687 (V1.1.1): "Intelligent Transport Systems (ITS); Decentralized Congestion Control Mechanisms for Intelligent Transport Systems operating in the 5 GHz range; Access layer part".
[8] https://github.com/CTU-IIG/802.11p-linux
[9] [FiPy] https://docs.pycom.io/
[10] [MQTT] https://mosquitto.org/
[11] [NRed] https://nodered.org/-IIG/802.11p-linux

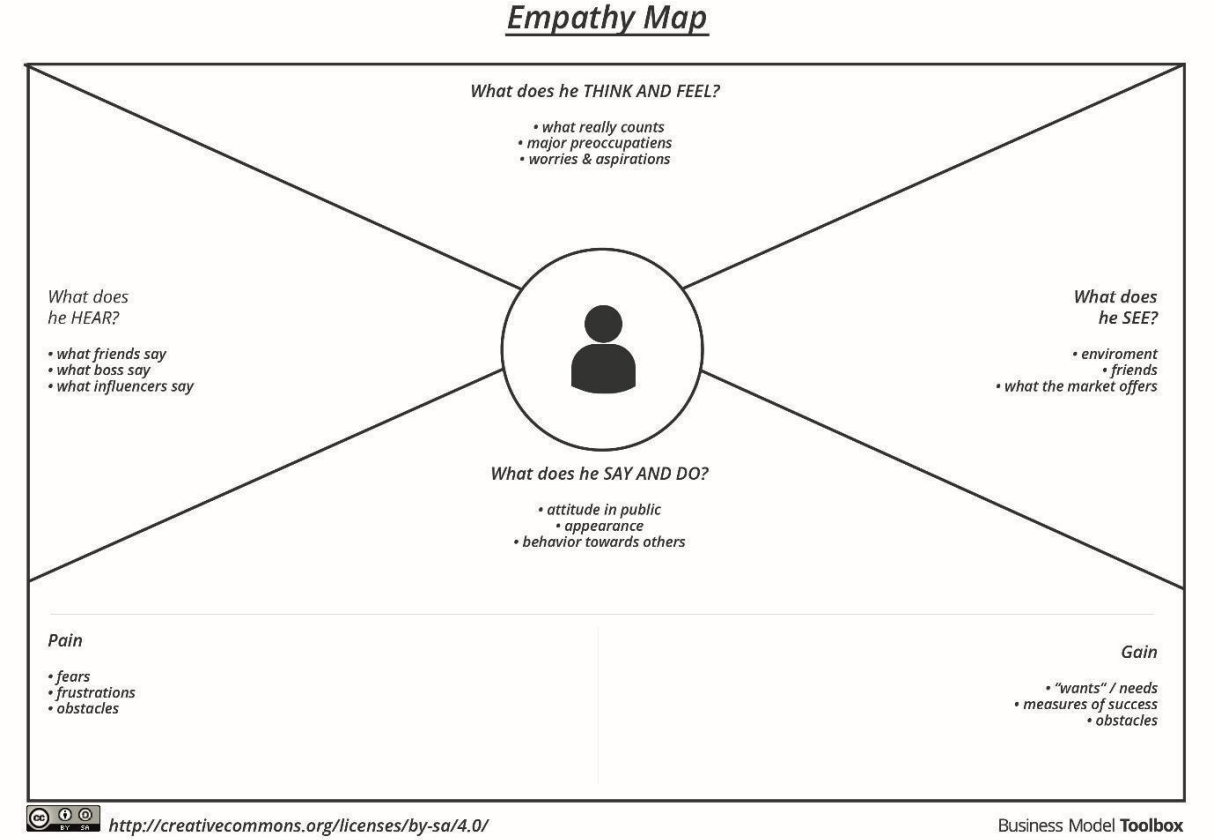
3. Ideation Phase

3.1 Empathy Map Canvas:

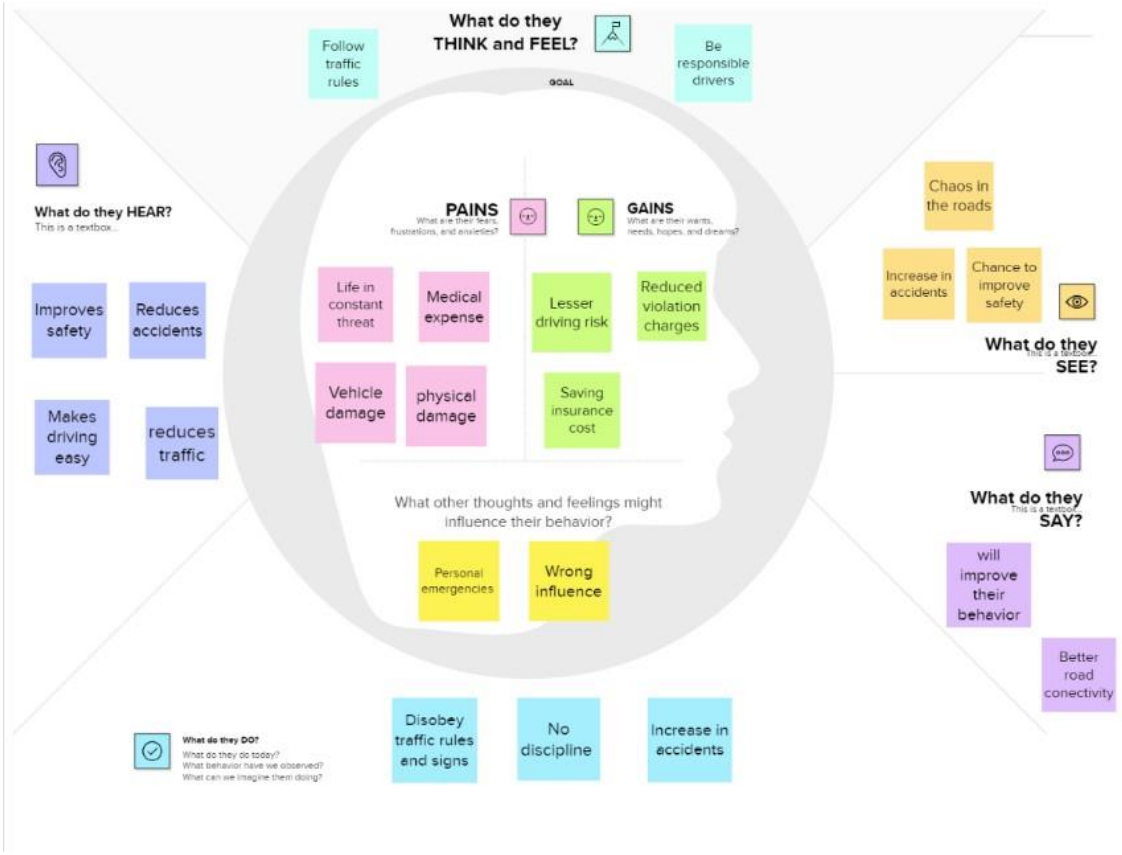
An empathy map is a simple, easy-to-digest visual that captures knowledge about a user's behaviours and attitudes.

It is a useful tool to helps teams better understand their users.
Creating an effective solution requires understanding the true problem and the person who is experiencing it. The exercise of creating the map helps participants consider things from the user's perspective along with his or her goals and challenges.

Example:



Reference: https://www.mural.co/templates/empathy-map-canvas


What do they THINK and FEEL?
Follow traffic rules
Be responsible drivers
GOAL
What do they HEAR?
This is a textbox...
Improves safety
Reduces accidents
Makes driving easy
reduces traffic
PAINS
What are their fears, frustrations, and anxieties?
GAINS
What are their wants, needs, hopes, and dreams?
Life in constant threat
Medical expense
Vehicle damage
physical damage
Lesser driving risk
Reduced violation charges
Saving insurance cost
What other thoughts and feelings might influence their behavior?
Personal emergencies
Wrong influence
Chaos in the roads
Increase in accidents
Chance to improve safety
What do they SEE?
What do they SAY?
will improve their behavior
Better road conectivity
What do they DO?
What do they do today?
What behavior have we observed?
What can we imagine them doing?
Disobey traffic rules and signs
No discipline
Increase in accidents

BRAINSTORMING

SAMYUKTHA K G

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.

VEERASAWAKAR R

Several studies on road safety have been conducted using a device onboard a vehicle to detect and recognize signs. Developing a **traffic sign recognition system** that uses a vision camera mounted on a vehicle that detects and recognises the colours and shapes of the road signs. The studies by Farhat et al and Hechri et al found a recognition of road signs with an average accuracy of about 95.53% and 92.8%, respectively. However, recognizing road signs based on colours and images presents numerous challenges. These include lighting conditions that vary naturally with the time of day and weather conditions, images that have been buffed by a moving vehicle's vibration, fading of paint on the sign and occlusion of the sign by obstacles such as a tree, street lamp, or buildings.

VARSHA B

Other approaches have used mobile devices on a vehicle and communication infrastructure on the road. The studies have developed a **road sign notification system** based on the global positioning system (GPS) and wireless radio frequency identification (RFID) technology. RFID transmitters were placed at the locations of road signs, and a receiver was placed in the vehicle. Using the system, drivers were alerted about the next road signs at some predetermined specific distance before the road signs were encountered. However, the use of RFID transmitters in two-way traffic could be limited, in the sense that their signals might be detected by vehicles traveling in the opposite direction. Thus, this situation can be misleading the drivers. Also, the devices are expensive and require a constant power supply and regular maintenance.

SHREYAS K

Road accidents cannot be eliminated but can be reduced by enhancing the safety of the drivers. This study developed a smart mobile-based application that uses in-built sensors to alert drivers with voice and image notifications. The application provides a voice alert to a needed action that enhances the driver’s attention. The smartphone is used to avoid the need for onboard devices to detect and recognize road signs, sensors on road infrastructure, and the use of WLAN.

3.3 Proposed Solution Template

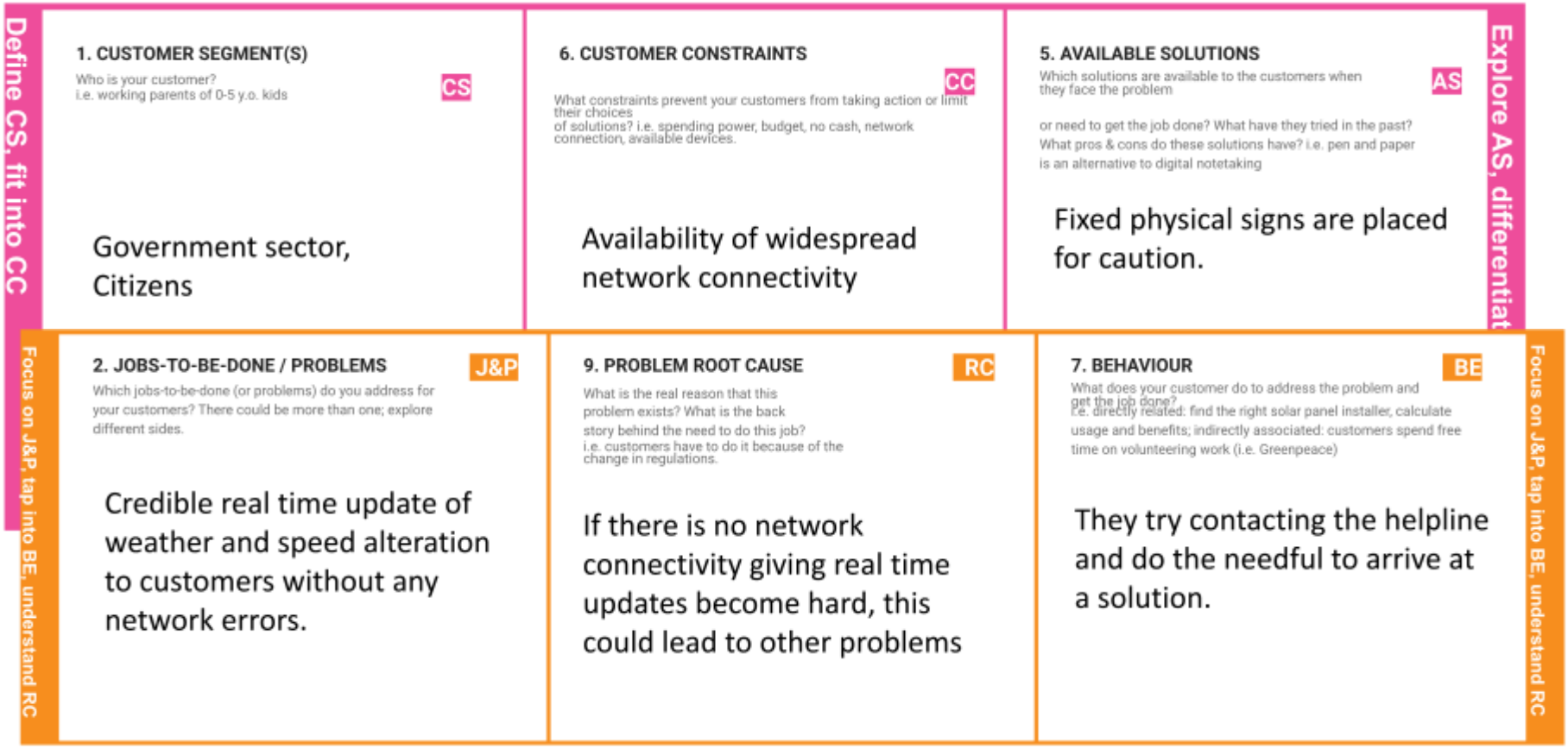
Proposed Solution Template:

Project team shall fill the following information in proposed solution template.

S.No.	Parameter	Description
1.	Problem Statement (Problem to be solved)	To replace the static signs with smart connected sign boards to avoid accidents caused by heavy traffic and collision. This also provides a smooth flow of traffic in adverse weather.
2.	Idea / Solution description	The project aims at digitalising the existing static signboards and enabling a smart connectivity between them to obtain and deliver data regarding the weather condition ,terrain condition ,speed limits etc to have a safe and smooth flow of vehicles. The temperature and weather conditions are obtain using OpenWeatherMap API and these data are used to update the speed limit in accordance with the weather or other issues. In this sign board buttons are present where each have a different functionality like warning signs near schools and hospitals. So when this button is activated via the web or physical buttons the speed limit will be set depending upon these zones. Based on the weather or sensitive zones the user is altered with suggested speed limits.
3.	Novelty / Uniqueness	Generic sign boards for all application that uses both web app and physical button for updating the traffic signs. Openweatherapp provides global weather data forecasts and historical weather data to enable alteration of traffic signal based on weather condition for long distance travel. Speed alteration in accordance with sensitive zones.
4.	Social Impact / Customer Satisfaction	Customer reach destination before the expected time. Pedestrians can cross the road when there is no traffic without waiting for the change in the signboard. Need for Speed limit alteration is indicated to the driver.

5.	Business Model (Revenue Model)	Since API is used to obtain information about the customer's travelling environment the revenue depends on the length of time the product is used. Though it is free to public and provides them with various information regarding road for different functionalities and these functionalities will increase the value of the product in the global market.
6.	Scalability of the Solution	This product is highly feasible as the hardware components can be easily interfaced with the microcontroller and programmed according to the change made. similarly the software should be updated according to the change. By this the new functionality can easily be integrated to the existing functionality without affecting it .a separate circuit is connected to the hardware to detect any problem and notification will also be sent to product service department.

Project Title: **3.4 Solution Fit Template** **Team ID:** PNT2022TMID54421



3. TRIGGERS
What triggers customers to act? i.e. seeing their neighbour installing solar panels, reading about a more efficient solution in the news.
TR

Seeing the efficiency with the updates and reviews regarding the smooth assistance for long drives will trigger customers to act

10. YOUR SOLUTION
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.
SL

The temperature and weather conditions are obtained using OpenWeatherMap API and these data are used to update the speed limit in accordance with the weather or

8. CHANNELS of BEHAVIOUR
CH

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

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

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

Following directions is one of the major tasks for the traveler, but they can utilize the

	4. EMOTIONS: BEFORE / AFTER EM How do customers feel when they face a problem or a job and afterwards? i.e. lost, insecure > confident, in control - use it in your communication strategy & design. The clients will feel safe and satisfied with the experience and confident in following the different instructions.	other issues. In this sign board buttons are present where each has a different functionality like warning signs near schools and hospitals. So when this button is activated via the web or physical buttons the speed limit will be set depending upon these zones. Based on the weather or sensitive zones the user is altered with suggested speed limits.	smartboard signs to checkthe state of the road from wherever they are standing.	

Ideation Phase

Define the Problem Statements

Date	**10 November 2022**
Team ID	**Project-55124-1665392156**
Project Name	**SIGNS WITH SMART CONNECTIVITY FOR BETTER ROAD SAFETY**
Maximum Marks	**2 Marks**

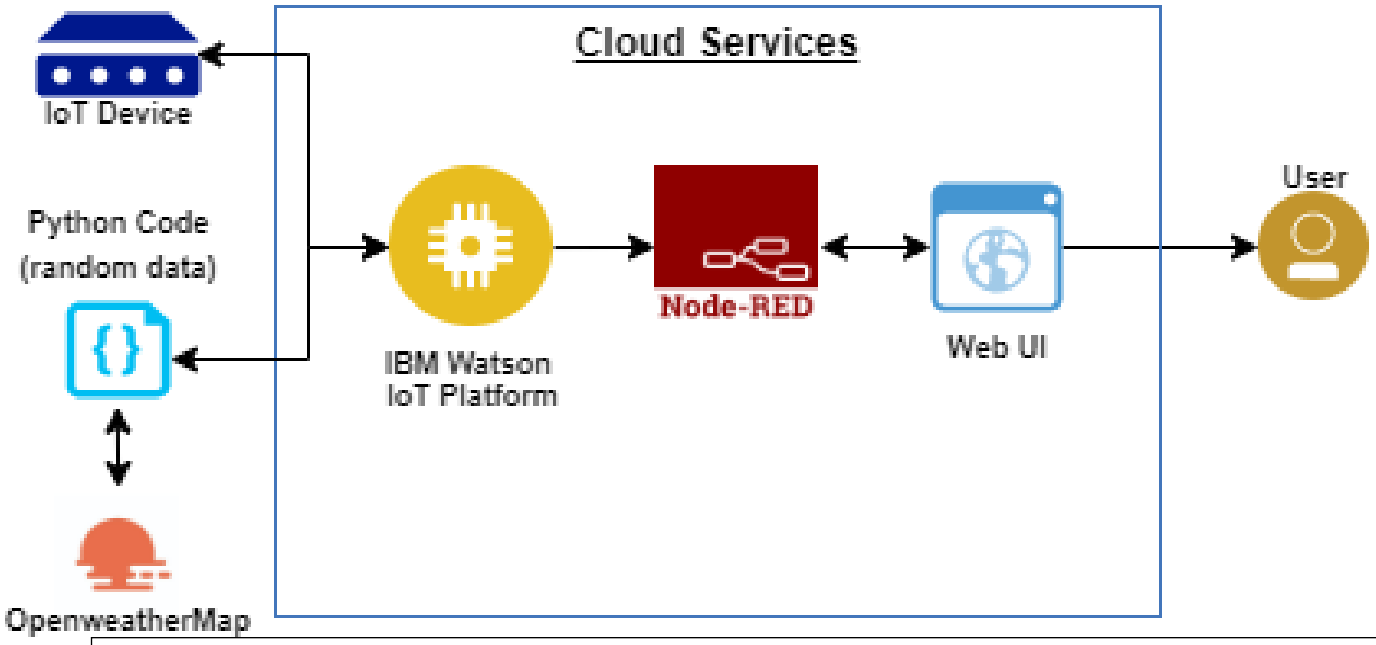
PS1

PS2

Project Design Phase-II
Technology Stack(Architecture and Stack)

Date	14 November 2022
Team ID	PNT2022TMID54421
Project Name	Signs with Smart Connectivity for Better Road Safety
Maximum Marks	4 Marks

Technical Architecture:
Reference: https://developer.ibm.com/patterns/ai-powered-backend-system-for-order-processing-during-pandemics/
Technical Architecture:



GUIDELINES:

1. ***To override the static traffic signs, use the smart sign indicator boards. These connected smart signs use the Weather API to get speed limits from the web app and update automatically Depending on the weather, the speed may increase or decrease and the signs are posted depending on traffic and life-threatening situations. Orientation (schools), warning and service (hospitals, restaurants) signs are displayed accordingly Different operating modes can be selected using buttons)***
2. ***The IBM Watson IoT Platform acts as a intermediate to connect web applications to IoT devices, hence the creation of the IBM Watson IoT Platform.***
   To connect an IoT device to the IBM cloud, create a device in the IBM Watson IoT platform and obtain device credentials
   Configure the connection security and create API keys for Node-RED services to access the IBM IoT platform.

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

S.No	Component	Description	Technology
1.	User Interface	How user interacts with application e.g. Web UI, Mobile App, Chatbot etc.	HTML, CSS, JavaScript / Angular Js / React Js etc.
2.	Application Logic-2	Logic for a process in the application	IBM Watson STT service
3.	Application Logic-3	Logic for a process in the application	IBM Watson Assistant
4.	Cloud Database	Database Service on Cloud	IBM DB2, IBM Cloudant etc.
5.	External API-1	Purpose of External API used in the application	IBM Weather API, etc.

Table-2: Application Characteristics:

S.No	Characteristics	Description	Technology
1.	Security Implementations	Strong security system that anyone without login credentials and hackers are not allowed to enter the network.	Firewall, Firebase, cyber resiliency strategy
2.	Scalable Architecture	Easy to expand the operating range by increasing the bandwidth of the network.	IoT, internet.
3.	Availability	Available anytime and everywhere 24/7 as long as the user is signed into the network.	IBM Cloud
4.	Performance	Supports a large number of users to access the technology simultaneously.	IBM cloud

References:

https://c4model.com/
https://developer.ibm.com/patterns/online-order-processing-system-during-pandemic/
https://www.ibm.com/cloud/architecture
https://aws.amazon.com/architecture
https://medium.com/the-internal-startup/how-to-draw-useful-technical-architecture-diagrams-2d20c9fda90d

5.2 Project Design Phase-I Solution Architecture

Solution Architecture Diagram:

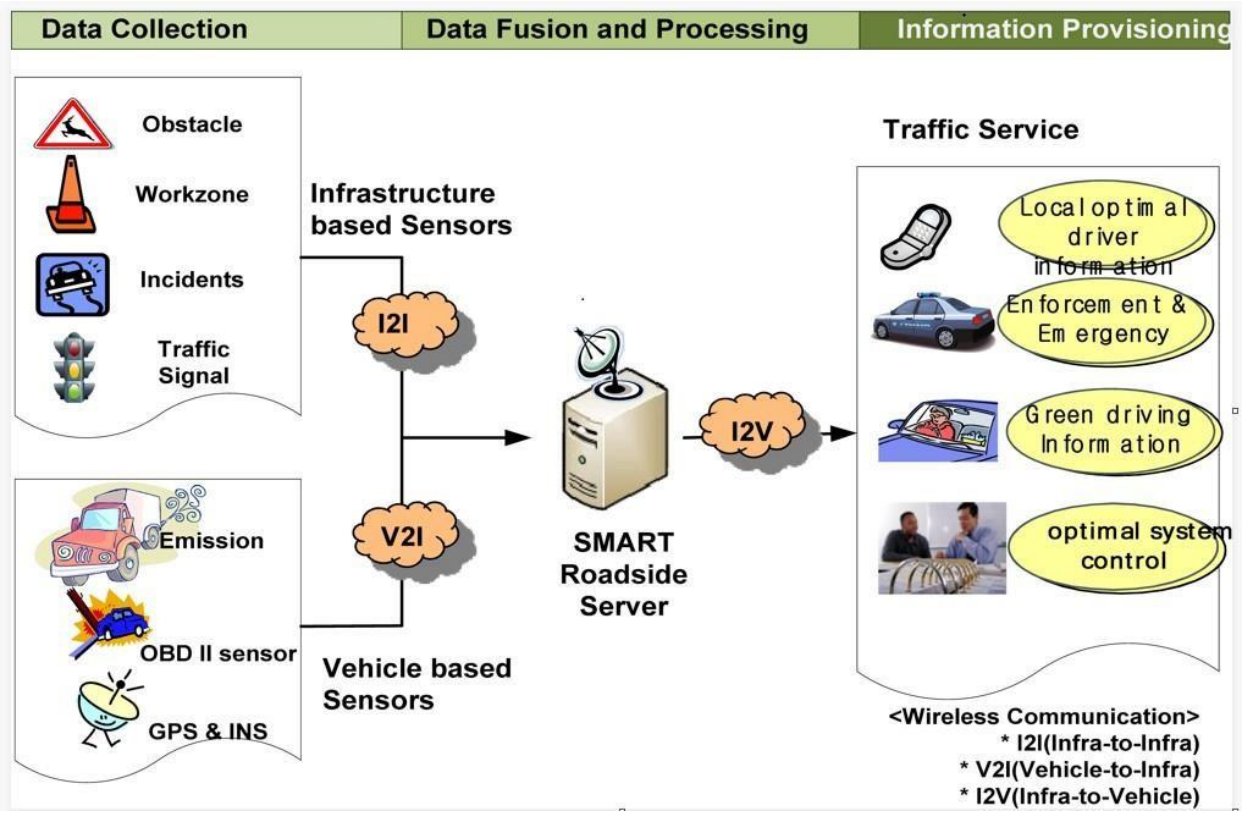


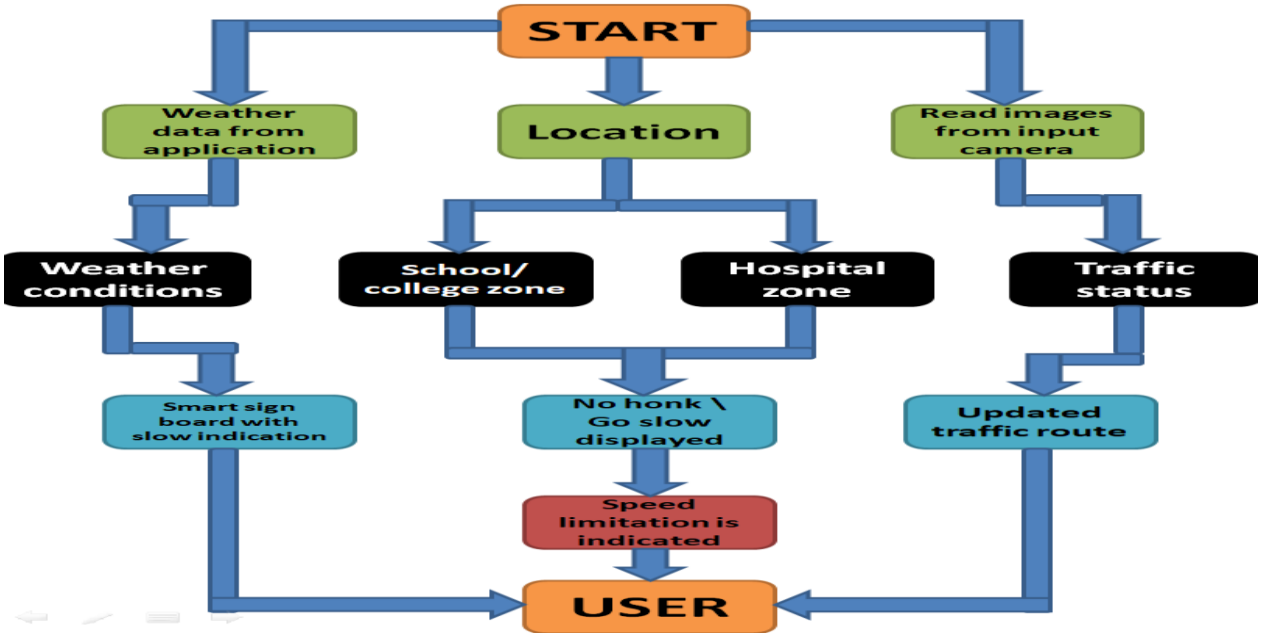
Figure: Framework of smart road server and sensor system.

5.3 Project Design Phase-II
Data Flow Diagram & User Stories

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.

Data Flow Diagram - Signs With Smart Connectivity for Better Road Safety:



User Stories

Use the below template to list all the user stories for the product.

User Type	Functional Requirement (Epic)	User Story Number	User Story / Task	Acceptance criteria	Priority	Release
Customer (Mobile user)	Registration	USN-1	I can get my speed constraint utilizing climate application	I can get speed restrictions	High	Sprint-1
		USN-2	As a client, I can enroll for the application byentering my email, secret phrase, and confirmingmy secret phrase.	I can get to my account/dashboard	Medium	Sprint-2
		USN-3	As a client, I can increment or diminishing my speed as indicated by the weather conditions change	I can increment or decline my speed	High	Sprint-1
		USN-4	As a client, I could I at any point get my traffic redirection signs relying upon the traffic and the lethal circumstances	I can get to my traffic status ahead in my movement	Medium	Sprint-1
	Login	USN-5	As a client, I can sign out from the dark climate map by entering email and secret key	I can get to the application through my Gmail login	High	Sprint-2
	Interface	USN-6	As a client the connection point ought to be straightforward and effectively open	I can access the point of interaction without any problem	High	Sprint-1
Customer (Web user)	Data generation	USN-7	As a client I utilize open climate application to access the information in regards to the weather conditions changes.	I can get to the information concerning climate through the application	High	Sprint-1
Administrator	Problem solving/ Fault clearance	USN-8	As an in authority charge for the legitimate working of the sign sheets need to keep up with it through occasional observing	Authorities can screen the sign sheets for legitimate working.	Medium	Sprint-2

Project Design Phase-II

Customer/user journey map

Template:

6. Project Planning Phase

Project Planning Template (Product Backlog, Sprint Planning, Stories, Story points)

Product Backlog, Sprint Schedule, and Estimation (4 Marks)

Use the below template to create product backlog and sprint schedule

Sprint	Functional Requirement (Epic)	User Story / Task	Story Points	Priority	Team Members
Sprint-1	Resource initialisation	Create and initialise account in OpenWeatherMap	1	low	Samyuktha Varsha Shreyas Veerasawakar
Sprint-1	Local server/software run	Write a python program to obtain the output as the weather and speed limit suggestion	1	medium	Veerasawakar Shreyas Samyuktha Varsha
Sprint-2	Push server/software to cloud	Push the code from sprint 1 to cloud so that it can be accessed from anywhere	2	high	Veerasawakar Shreyas Samyuktha Varsha
Sprint-3	Hardware initialisation	Integrate hardware to be able to access the cloud functions and provide inputs	2	High	Shreyas Veerasawakar Varsha Samyuktha
Sprint-4	UI/UX optimisation for better user experience	Optimise all shortcomings and provide better user experience	2	Medium	Varsha Samyuktha Shreyas Veerasawakar

Project Tracker, Velocity & Burndown Chart: (4 Marks)

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	6 Days	28 Oct 2022	29 Oct 2022	20	29 Oct 2022
Sprint-2	20	6 Days	3 Oct 2022	05 Nov 2022	20	31 Oct 2022
Sprint-3	20	6 Days	07 Nov 2022	12 Nov 2022	20	7 Nov 2022
Sprint-4	20	6 Days	14 Nov 2022	19 Nov 2022	20	14 Nov 2022

Velocity:

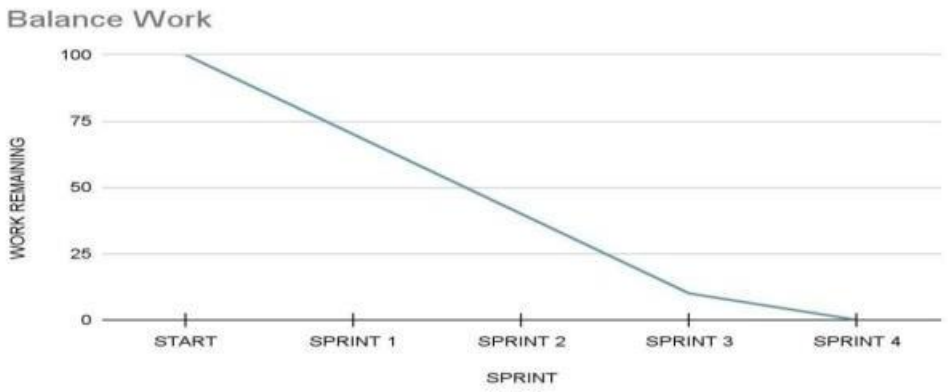
Imagine we have a 10-day sprint duration, and the velocity of the team is 20 (points per sprint). Let's calculate the team's average velocity (AV) per iteration unit (story points per day)

$$AV = \frac{sprint\ duration}{velocity} = \frac{20}{10} = 2$$

Burndown Chart:

A burn down chart is a graphical representation of work left to do versus time. It is often used in agile software development methodologies such as Scrum. However, burn down charts can be applied to any project containing measurable progress over time.

Burndown Chart:



Project Planning Phase
Project Planning Template (Milestone and Activity List)

MILESTONE AND ACTIVITY LIST (4 Marks)

Use the below template to create product backlog and sprint schedule

Sprint	Functional Requirement (Epic)	User Story Number	User Story / Task	Story Points	Priority	Team Members
Sprint-1	IDE	USN-1	Installing all the softwares which is required like python IDE	2	High	Samyuktha Shreyas Varsha Veerasawakar
Sprint-1	Checking the simulation with conditions	USN-1	Simulating the circuits and experimenting	2	High	Samyuktha Shreyas Varsha Veerasawakar
Sprint-2	Software	USN-2	IBM Watson IOT NodeRed Integration	2	High	Samyuktha Shreyas Varsha Veerasawakar
Sprint-2	Software	USN-2	Test the device and workflow	2	High	Samyuktha Shreyas Varsha Veerasawakar
Sprint-3	Application Development	USN-3	Using MIT App Inventor create an App	2	High	Samyuktha Shreyas Varsha Veerasawakar

Sprint	Functional Requirement (Epic)	User Story Number	User Story / Task	Story Points	Priority	Team Members
Sprint-3	Testing	USN-3	Testing the Application	2	High	Samyuktha Shreyas Varsha Veerasawakar
Sprint-4	WEB UI	USN-4	User Interface with the software	2	High	Samyuktha Shreyas Varsha Veerasawakar

7. DEVELOP A PYTHON SCRIPT

CODE:

```
#include <TinyGPS++.h>
#include <SoftwareSerial.h>
TinyGPSPlus gps;
SoftwareSerial ss (3,4); char
n;
int a;

void setup() {
Serial.begin(9600);
ss.begin(9600); pinMode (2,
INPUT): pinMode (6,
OUTPUT); pinMode(11,
OUTPUT); pinMode(10,
OUTPUT);  pinMode (9,
OUTPUT); pinMode (12,
OUTPUT); //apr
digitalWrite(11,HIGH);
digitalWrite(6,HIGH);
attachInterrupt (digitalPinToInterrupt (2), piezo,CHANGE);
}
void loop() { n-
Serial.read(); //
Serial.println(" ");
delay (200);
if (n=='3') {
digitalWrite(6,HIGH);
digitalWrite(11,HIGH);
digitalWrite(12,HIGH);
delay(200);
digitalWrite(12,LOW); }
else if (n=='2')
digitalWrite(6,LOW);
digitalWrite(11,LOW);
digitalWrite(10,LOW);
digitalWrite(9,LOW);
digitalWrite(12,HIGH);
```

```
delay(200);
digitalWrite(12,LOW); }
else if (n=='1')
analogWrite(11,100);
analogWrite(6,100);
digitalWrite(12,HIGH);
delay(200);
digitalWrite(12,LOW);
}
}
// while (ss.available() > 0)
// if (gps.encode(ss.read()))
// displayInfo(); void
displayInfo()
{
 // Serial.print (F("Location: ")); if
(gps.location.isValid())
Serial.print(gps.location.lat(), 6);
Serial.print (F(","));
Serial.print(gps.location. Ing(), 6); } else
// Serial.print (F ("INVALID"));
Serial.print("10.305125");
Serial.print(',');
Serial.print("76.389582");
}
/* Serial.print(F(" Date/Time: "));
if (gps.date.isValid())
{
Serial.print(gps.date.month());
Serial.print (F("/"));
Serial.print(gps.date.day());
Serial.print (F("/"));
Serial.print(gps.date.year());
}
else
{
Serial.print(F("INVALID"));
}
Serial.print (F("  "));
if (gps.time.isValid())
{
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.println();
}
void piezo()
{
while (ss.available() > 0)  if
(gps.encode(ss.read()))
displayInfo();
}
int a=0,b=0,c=0,d=0;
void setup() { pinMode
(D1, INPUT); pinMode
(D2, INPUT); pinMode
(D3, INPUT); pinMode
(D4, INPUT);
digitalWrite(D1,LOW);
digitalWrite(D2,  LOW);
digitalWrite(D3,  LOW);
digitalWrite(D4,  LOW);
Serial.begin(9600);
}
void loop()
{
a=digitalRead(D1);
if (a==1) {
Serial.print("1"); }
b=digitalRead (D2);
if (b==1) {
Serial.print("2"); }
d=digitalRead(D4);
if (d==1)
{
Serial.print("3");
}
}
```

DEVELOP A PYTHON SCRIPT

CODE:

```
#include <TinyGPS++.h>
#include <SoftwareSerial.h>
TinyGPSPlus gps;
SoftwareSerial ss (3,4); char
n;
int a;

void setup() {
Serial.begin(9600);
ss.begin(9600); pinMode (2,
INPUT): pinMode (6,
OUTPUT); pinMode(11,
OUTPUT); pinMode(10,
OUTPUT);  pinMode (9,
OUTPUT); pinMode (12,
OUTPUT); //apr
digitalWrite(11,HIGH);
digitalWrite(6,HIGH);
attachInterrupt (digitalPinToInterrupt (2), piezo,CHANGE);
}
void loop() { n-
Serial.read(); //
Serial.println(" ");
delay (200);
if (n=='3') {
digitalWrite(6,HIGH);
digitalWrite(11,HIGH);
digitalWrite(12,HIGH);
delay(200);
digitalWrite(12,LOW); }
else if (n=='2')
digitalWrite(6,LOW);
digitalWrite(11,LOW);
digitalWrite(10,LOW);
digitalWrite(9,LOW);
digitalWrite(12,HIGH);
```

```
delay(200);
digitalWrite(12,LOW); }
else if (n=='1')
analogWrite(11,100);
analogWrite(6,100);
digitalWrite(12,HIGH);
delay(200);
digitalWrite(12,LOW);
}
}
// while (ss.available() > 0)
// if (gps.encode(ss.read()))
// displayInfo(); void
displayInfo()
{
 // Serial.print (F("Location: ")); if
(gps.location.isValid())
Serial.print(gps.location.lat(), 6);
Serial.print (F(","));
Serial.print(gps.location. Ing(), 6); } else
// Serial.print (F ("INVALID"));
Serial.print("10.305125");
Serial.print(',');
Serial.print("76.389582");
}
/* Serial.print(F(" Date/Time: "));
if (gps.date.isValid())
{
Serial.print(gps.date.month());
Serial.print (F("/"));
Serial.print(gps.date.day());
Serial.print (F("/"));
Serial.print(gps.date.year());
}
else
{
Serial.print(F("INVALID"));
}
Serial.print (F("  "));
if (gps.time.isValid())
{
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.println();
}
```

DEVELOP A PYTHON SCRIPT

CODE:

```
#define BLYNK_PRINT Serial
#include <ESP8266WiFi.h>
#include
<BlynkSimpleEsp8266.h>
 char
auth[]="q6FAQIggdIxznS2kMIbxAPn8E6nnv116";
char ssid[] = "hellow";
char pass[] = "12345678";
String str; void setup() {
Serial.begin(9600);
Blynk.begin(auth, ssid,
pass);
}
void loop() { Blynk.run(); if
(Serial.available()>0)  str  =
Serial.readStringUntil('/');  //
Serial.print(str);
// Blynk.notify("location:
");Blynk.notify(str);
}
}
```

Team ID: PNT2022TMID54421

```
#Python code

import weather
from datetime import datetime as dt
  def
processConditions(myLocation,APIKEY,localityInfo):
      weatherData = weather.get(myLocation,APIKEY)

      finalSpeed = localityInfo["usualSpeedLimit"] if "rain" not in weatherData else
localityInfo["usualSpeedLimit"]/2
      finalSpeed = finalSpeed if weatherData["visibility"]>35 else finalSpeed/2

if(localityInfo["hospitalsNearby"]):
            # hospital zone                    doNotHonk = True
else:
if(localityInfo["schools"]["schoolZone"]==False):
                  # neither school nor hospital zone
doNotHonk = False                 else:
                  # school zone
                  now = [dt.now().hour,dt.now().minute]
activeTime = [list(map(int,_.split(":"))) for _ in
localityInfo["schools"]["activeTime"]]
                  doNotHonk = activeTime[0][0]<=now[0]<=activeTime[1][0] and
activeTime[0][1]<=now[1]<=activeTime[1][1]

      return({
            "speed" : finalSpeed,
            "doNotHonk" : doNotHonk
      })

[DEBUG ON]
[DEBUG OFF]
```

Advantages & Disadvantages

Significantly reduce costs by reducing the number of drivers needed in logistics. In many countries in Europe, it is estimated that around 40% of total cost for road freight operators are categorised as driver costs. Infrastructure changes, such as developing, trialling and implementing smart roads, take considerable resources and investment. Due to the link to city infrastructure and legislation, infrastructure innovations are usually backed by government funding but can lack private investment.

CONCLUSION

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. Future work involves exploring further applications, especially in the context of raising driver awareness of the road safety conditions during their trips.

The road is often overlooked when discussing the future development and digital transformation of the modern transport infrastructure. Afterall, we have all heard of connected cars, self-driving cars, gps navigation, route optimization apps and ride-hailing services. You would be forgiven for thinking how the common road fits into this digital revolution, as it turns.