SIGNS WITH SMART CONNECTIVITY FOR BETTER ROAD SAFETY

CHAPTER-1

INTRODUCTION

In present systems the road signs and the speed limits are statics. 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 can you enter the data of the road diversion.

1.1PROJECT OVERVIEW

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

1.2 PURPOSE

Hence, road safety education is as essential as any otherbasic skills of survival. Our aim is to provide road safety information for road users to encourage safer road user behaviour among current and prospective road users and reduce the number of people killed and injured on our roads every year.

The purpose of this document is to provide a debriefed view of requirements and specifications of the project called IOT Road Safety. The goal of this project is to operate the vehicles in a safe speed at critical zones minimizing the possible risk of unwitting accidents

CHAPTER-2

LITERATURE SURVEY

ZarulazamEusofe et al. Assessment of Road Safety Management at Institutional Level in Malaysia, IATSS Research. This paper had examined the current institutional arrangements for the management of road safety in Malaysia in a systematic manner. It focused on road safety funding and seemed to provide an insight into how funding factors may affect both the effectiveness and the efficiency or road safety management.

Francis John Gichaga, The Impact of Road Improvements on Road Safety and Related Characteristics. IATSS Research (2016), University of Nairobi, Kenya. This paper presented the historical and cultural background relating to road improvement and road safety characteristics in Kenya. It discussed two case studies: one on the socio-economic impact following improvements to a 50-km, high-class, high-traffic-volume road and the other on the monitoring and evaluation of road safety aspects along the Northern Corridor in Kenya also following major road improvements. The results of monitoring and evaluation exercises on the Northern Corridor have shown that drivers are the major contributors in causing accidents, with a component ratio of 49.4%; pedestrians are next at 21.7%.

Francis John Gichaga etal. Road Safety and Road Safety Audit in India: A Review. ISSN: 2347 - 4718 This paper had reviewed the concept of the road safety audit and its stages. Objective of the RSA is to evaluate ventures for potential mishaps end/lessening on the premise of road client learning, characteristics and aptitudes, day/night, wet/dry road conditions.

2.1 EXISTING PROBLEM

Driving at speed significantly increases both the likelihood of a crash occurring, and the severity of its consequences.

For every 1% increase in mean speed there is a 4% increase in fatal crash risk. The risk of death for pedestrians hit by motorized vehicles also rises rapidly as speed increases.

Road traffic injury is a major global public health problem. Rapid motorisation in low and middle-income countries (LMICs) along with the poor safety quality of road traffic systems and the lack of institutional capacity to manage outcomes contribute to a growing crisis.

More than 1.24 million people die each year on the world's roads. Many more suffer permanent disability, and between 20 and 50 million suffer non-fatal injuries. These are mainly in LMICs, amongst vulnerable road users and involve the most socio-economically active citizens.

2.2 REFERENCES

https://doi.org/10.1080/15389588.2014.936407

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http://safetyknowsys.swov.nl/Safety_issues/pdf/Road%20Safety%20Management.pdf

https://www.gov.uk/government/statistical-data-sets/ras30-reported-casualties-in-road-accidents

http://www.who.int/roadsafety/decade_of_action/en/

https://www.who.int/violence_injury_prevention/road_safety_status/2015/en/

https://theconversation.com/driverless-cars- will-change-the-way-we-thinkof-car-ownership-50125

https://www.onlinepublications.austroads.com.au/items/AP-R420-13

2.3 PROBLEM STATEMENT DEFINITION

This project will replace the static boards to smart signed boards that will change the speed limits according to the weather climate and show diversion messages if there is accidents in the road and alert messages if there is hospital, schools or any road works.

CHAPTER-3

IDEATION & PROPOSED SOLUTION

3.1 EMPATHY MAP CANVAS

An empathy map is a collaborative tool teams can use to gain a deeper insight into their customers. This tool helps to understand the reason behind some actions a user takes deeply. This tool helps build Empathy towards users and helps design teams shift focus from the product to the users who are going to use the product.

3.2 IDEATION & BRAINSTORMING

Ideation is often closely related to the practice of brainstorming, a specific technique that is utilized to generate new ideas. A principal difference between ideation and brainstorming is that ideation is commonly more thought of as being an individual pursuit, while brainstorming is almost always a group activity.

We can digitalize the boards that can even more clearly visible to drivers.

The sign boards have button mode and that button is used when there is no network connectivity

Using IOT device ,the accidents happened in the road can be alerted to the other drivers Using IOT device, the accidents happened in the road can be alerted to the other drivers

Traffic signals will change automatically by detecting the moving using PIR sensor on the crosswalks

Using cloud communications the data can be shared through network and the functions of the signs of the board can be controlled.

2. Idea description

The weather and temperature details are obtained from the Open Weather Map API.

Using these details, the speed limit will be updated automatically in accordance with the weather conditions.

Also, the details regarding any accidents and traffic congestion faced on the particular road are obtained

Based on this, the traffic is diverted followed by a change in map path and the traffic is cleared. So in the traffic sign board, some buttons will be placed which will be used to make it generic;

Where each button will be given a functionality such as changing the warning signs, which are predefined and separate signs will be present for both school and hospital zones.

By activating this button, either through the web application or the physical buttons, sign of the board can be changed accordingly, and the speed limit will also be set depending upon the zones.

3.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

4. Business Model

Since APIs are used to actively monitor the customer's environment, this project employs a business strategy in which revenue will be generated on the basis of the length of time in which the customers actively interact with the product.

This product is aimed to be free of cost to the public, but the revenue will be generated by selling this product to the government at a low cost.

So there will be less accidents and the public will be aware of the discrepancies or accidents in the particular road.

The public will also gain all the information about the road, even if they are checking for an alternate path because of some mishaps that happen on the roads.

These functionalities will increase the value of the product in the global market.

5. Scalability of the Solution

In the future, if any update is required either on the hardware or software side, it can be easily implemented.

The hardware components can be directly interfaced with the microcontroller and small modifications can be made in the programming of the existing Product.

In case of the software, the website application has to be updated with the additional functionality by creating a new section for the updated hardware.

So this will not affect the existing functionality of the product and new functionality can be easily integrated.

3.3 PROBLEM SOLUTION FIT

1. JOBS-TO-BE-DONE / PROBLEMS

Which jobs-to-be-done (or problems) do you address for yours customer?

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

2. TRIGGERS

What triggers customers to act?

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

3. EMOTIONS: BEFORE / AFTER

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

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

4.AVAILABLE SOLUTIONS

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

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

5.CUSTOMER

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

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

6. BEHAVIOUR

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

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

7.CHANNELS OF BEHAVIOUR

What kind of actions do customers take online?

The departments can receive direct emails or messages from customers.

8.PROBLEM ROOT CAUSE

What is the real reason that this problem exists ? What is the back story behind the need to do this job?

No Sensor readings from the Weather ion if there was no internet connection.

Unnecessary pressing of the accident indicator button by some people could lead to problems

9.YOUR SOLUTION

We employ smart linked sign boards as an alternative to static signboards. With the help of a web app and weather API, these intelligent connected sign boards automatically update with the current speed limits.

The speed may rise oí fall in response to variations in the weather.

The display of diversion signs are determined by traffic and potentially fatal situations

CHAPTER-4

REQUIREMENT ANALYSIS

4.1Functional Requirement

FR No.	Functional Requirement (Epic)	Sub Requirement (Story / Sub-Task)
FR-I	User Visibility	Sign Boards should be made of bright coloured LEDs capable of attracting driver's attention Not too distracting to cause accidents
FR-2	User Understanding	Should display information through means like images/illustrations with text so that the user can understand the signs correctly

Non-functional Requirements

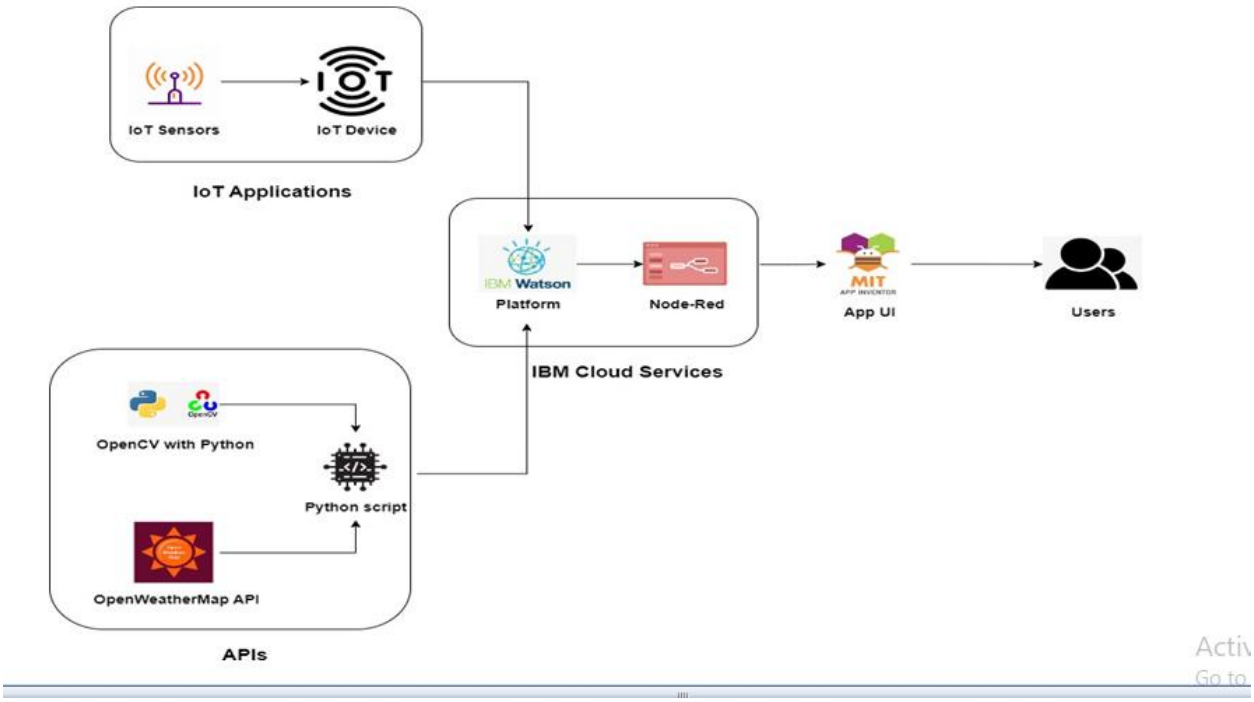
NFR-I	Usability	Should be able to dynamically update with respect to time.
NFR-2	Security	Should be secure enough that only the intended messages are displayed in the display.
NFR-3	Reliability	Should convey the traffic information correctly.
NFR-4	Performance	Display should update dynamically whenever the weather or traffic values are updated
NFR-5	Availability	Should be on service 24/7
NFR-6	Scalability	Should be modular and hence able to scale on servers horizontally.

CHAPTER-5

PROJECT DESIGN

5.1 TECHNICAL ARCHITECTURE

Solution architecture is a complex process with many sub processes that bridges the gap between business problems and technology solutions.



5.2 DATA FLOW DIAGRAMS

CHAPTER 6

PROJECT PLANNING & SCHEDULING

6.1 SPRINT PLANNING &ESTIMATION

Sprint	Functional Requirement (Epic)	User Story / Task	Story Points	Priority	Team Members
Sprint-1	Resources Initialization	Create and initialize accounts in various public APIs like OpenWeatherMap API.	1	LOW	MEKANA, AKILA, VARTHINI, KEERTHIKA
Sprint-1	Local Server/Software Run	Write a Python program that outputs results given the inputs like weather and location.	1	MEDIUM	MEKANA, AKILA, VARTHINI, KEERTHIKA
Sprint-2	Push the server/software to cloud	Push the code from Sprint 1 to cloud so it can be accessed from anywhere	2	MEDIUM	MEKANA, AKILA, VARTHINI, KEERTHIKA
Sprint-3	Hardware initialization	Integrate the hardware to be able to access the cloud functions and provide inputs to the same.	2	HIGH	MEKANA, AKILA, VARTHINI, KEERTHIKA
Sprint-4	UI/UX Optimization & Debugging	Optimize all the shortcomings and provide better user experience.	2	LOW	MEKANA, AKILA, VARTHINI, KEERTHIKA

6.2 SPRINT DELIVERY SCHEDULE

Sprint	Total Story Points	Duration	Sprint Start Date	Sprint End Date (Planned)	Story Points Completed (as on Planned End Date)	Sprint Release Date (Actual)
Sprint-1	20	6 Days	24 Oct 2022	29 Oct 2022	20	29 Oct 2022
Sprint-2	20	6 Days	31 Oct 2022	05 Nov 2022	20	31 Oct 2022
Sprint-3	20	6 Days	07 Nov 2022	12 Nov 2022	20	07 Nov 2022
Sprint-4	20	6 Days	14 Nov 2022	19 Nov 2022	20	14 Nov 2022

CHAPTER 7

CODING

7.2 FEATURE 2

```
# Python code
# IMPORT SECTION STARTS
Import brain
#IMPORT SECTION ENDS
#----------------------------------------
# USER INPUT SECTION STARTS
myLocation = “ Chennai ,IN”
APIKEY =”9cd610e5fd400c74212074c7ace0d62c”
localityInfo = {
    “ schools” : {
        “schoolsZone” : True,
         “activeTime” : [“7.00”,”17.30”]#
Schools active from 7 AM till 5.30 PM
        },
“hospitalsNearby” : False,
“usualSpeedlimit” : 40 # in km/hr
}
```

```
# USER INPUT SECTION ENDS

#-----------------------------------------------

#MICRO-CONTROLLER CODE STARTS

Print(brain.processConditions(myLocation, APIKEY,localityInfo))

“

MICRO CONTROLLER CODE WILL BE ADDED IN SPRINT 2
AS PER OUR PLANNED SPRINT SCHEDULE

“

# MICRO-CONTROLLER CODE ENDS
```

7.2 FEATURE 1

```
# Python code

# IMPORT SECTION STARTS

import brain

# IMPORT SECTION ENDS
# -----------------------------------------------
# USER INPUT SECTION STARTS

myLocation = "Chennai,IN"
APIKEY = "9cd610e5fd400c74212074c7ace0d62c"
```

```
localityInfo = {
    "schools" : {
        "schoolZone" : True,
        "activeTime" : ["7:00","17:30"] # schools active from 7 AM
till 5:30 PM
        },
    "hospitalsNearby" : False,
    "usualSpeedLimit" : 40 # in km/hr
}

# USER INPUT SECTION ENDS
# ----------------------------------------
# MICRO-CONTROLLER CODE STARTS

print(brain.processConditions(myLocation,APIKEY,localityInfo))

'''
MICRO CONTROLLER CODE WILL BE ADDED IN SPRINT
2 AS PER OUR PLANNED SPRINT SCHEDULE
'''

# MICRO-CONTROLLER CODE ENDS
```

CHAPTER 8

TESTING

8.1 TEST CASES

A **Test Case** is a set of actions executed to verify a particular feature or functionality of your software application. A Test

Case contains test steps, test data, precondition, postcondition developed for specific test scenario to verify any requirement. The test case includes specific variables or conditions, using which a testing engineer can compare expected and actual results to determine whether a software product is functioning as per the requirements of the customer.

Testing is the final verification and validation activitywithin the organization itself.

White Box Testing

White Box Testing is a testing in which in which the software tester hasknowledge of the inner workings, structure and language of the software.

Usingwhite box testingwe can derive test cases that:-

- Guarantee that all independent paths within a module have been exercised at

least once.

- Exercise all logical decisions on their true and false sides.
- Execute all loops at their boundaries and within their operational bounds.
- Execute internal data structure to assure their validity.

Black Box Testing

Black Box Testing is testing the software without any knowledge of theinner workings, structure or language of the module being tested. It

is a testing inwhich the software under test is treated, as a black box . The test provides inputsand responds to outputs without considering how the software works.

It uncovers adifferent class of errors in the following categories:

- Incorrect or missing function.
- Performance errors.
- Initialization and termination errors.
- Errors in objects.

Unit Testing

Unit testing is usually conducted as part of a combined code and unit testphase of the software lifecycle, although it is not uncommon for coding and unittesting to be conducted as two distinct phases: Test strategy and approach.Field testing will be performed manually and functional tests will be written indetail.

Test objectives:

- All Components must work properly.
- Proper coordinates should be sent by the Android app to the Arduino
- The entry screen, messages and responses must not be delayed in the Android

8.2 USER ACCEPTANCE ANALYSIS

PURPOSE OF THE DOCUMENT

The purpose of this document is to briefly explained the test coverage and open issue of the project at the time of the release to User Accptance Testing (UAT)

DEFECT ANALYSIS

The report shows the number of resolved or closed bugs at each severity level and how they were solved

Resolution	Severity 1	Severity 2	Severity 3	Severity 4	Subtotal
ByDesign	10	4	2	3	20
Duplicate	1	0	3	0	4
External	2	3	0	1	6
Fixed	11	2	4	20	37
NotReproduced	0	0	1	0	1
Skipped	0	0	1	1	2
Won'tFix	0	5	2	1	8
Totals	24	14	13	26	77

TEST CASE ANALYSIS

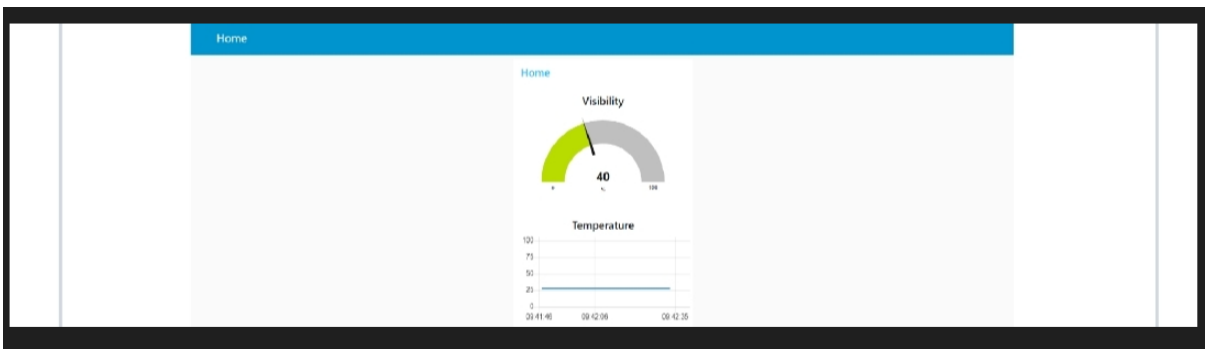
This report shows the number of test cases that have passed ,failed and untested

Section	Total Cases	Not Tested	Fail	Pass
Print Engine	7	0	0	7
Client Application	51	0	0	51
Security	2	0	0	2
Outsource Shipping	3	0	0	3
Exception Reporting	9	0	0	9
Final Report Output	4	0	0	4
Version Control	2	0	0	2

CHAPTER 9

RESULT

Hence ,road safety eduction is an essential as any other basic skills of survival.Our aim is tio provide road safety information for road users to encourage safer road user behaviour among current and prospectve road users and reduce the numbe of people killed and injured on our roads every year.



CHAPTER 10

ADVANTAGES AND DISADVANTAGES

ADVANTAGES

Multimodal sensors and edge computing help speed up the low of traffic with real time processing reducing congestion and emissions.

Smart road technology can assist in optimizing traffic flow and managing road conditions.

Creating a more sustainable environment within cities

DISADVANTAGES

Increased trafffic can incease carbon emissions and other pollution

Land use for roads can damage built and natural environment.

Impose morality on wildlife if habitats ae severed

Constructed has associated environmental costs

CONCLUSION

Professionalism in driver training and advanced licensing system and some strict law will help to decreasethe accidents.There is a need to undertake experimenta studies on drunk and driving for corect assessment of traffic safety situation on indian roads.Vehicles GPS and GIS facilities with unique user id will help to improve the identificaton of vehicles involved in road accidents.Do not drive at excessive speed and try to enhance the general awareness so isks of traffic accidents can be reduced.One must also check the vehicle health regularly and its maintenance parts to eliminate any potential risks.This points will be us to imrove the current situation of road safety and management in India.

FUTURE SCOPE

With the help of software ad device based ITS technology,he movement of vehicles on the can be monitored remotely. Drivers will be able to know whether their vehicles are running within the speed limit and receive warnings when they approach it.Some transportation not only provides detailed data points fo every aspect of the transportation system,but allows administrators to better monitor operations,track maintenance needs,and identity key sources of problems that need to be fixed.