PROJECT REPORT

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Team ID	PNT2022TMID17477
Project Name	Signs with smart connectivity for better road safety

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INTRODUCTION

1.1 Project Overview

To change the manual sign board into digital sign board with smart connectivity for better road safety.

1.2 Purpose

1.3 million people die each year as a result of road crashes. Not following the sign boards in the free roads can lead to many accidents. The goal of cautionary traffic signs is to warn drivers of any potential threat on the road ahead, like road work, holes, and speed bumps. While these things are not inherent, accidents could occur if one doesn't slow down their vehicle. Hence, you must take cautionary road traffic signs as seriously as the mandatory ones. The road signs are static ,if the have to be changed in some cases like: The man under progress board has to be changed when they complete the progress, so a person has to go and take away the board manually. To change this automatically using digital sign board is the main aim of this project.

2. LITERATURE SURVEY

2.1 Existing Solution and Problem

[1] This proposed method uses detection and identification method on account of the image processing is proposed which is combined with convolutional neural network (CNN) to sort traffic signs. On account of its high recognition rate, CNN can be used to realize various computer vision tasks. Tensor Flow is used to implement CNN which is able to identify the circular symbol with more than 98.2% accuracy.

ADVANTAGES:

This method has Hough Transform is used to detect and pre-process the road traffic signs before recognized, which greatly helps to improve the accuracy and timeliness.

DISADVANTAGES:

This method is used to convert certain sign board with the shape only, and the main drawback of this method , it cannot convert sign board like when road is on construction. It can only convert into shape only.

[2] Real time traffic sign detection and recognition on FPGA, it is one of the most important parts of the Advanced Driver Assistance System. For improved safety of ride they used real time traffic detection system on ML507 Evaluation Board.

ADVANTAGE:

This system is a real time traffic detection system by recognizing the traffic sign and it is also reliable.

DISADVANTAGE:

System only able to detect the direction sign board in the road and then convert those directional sign board into shape only.

[3] Automatic traffic sign detection and recognition using Set U-Net and a modified Tversky Loss Function with LI-Constrain.

ADVANTAGES:

Traffic sign detection as an image segmentation problem and propose a deep convolutional neural network-based approach to solve it.To this end, we propose a new network, the Seg U-Net, which we form by merging the state-of-the-art segmentation architectures–Seg Net and U-Net to detect traffic signs from video sequences. For training the network, use the Tversky loss function constrained by an L1 term instead of the intersection over union loss traditionally used to train segmentation networks. Separate network, inspired by the VGG-16 architecture, to classify the detected signs. The networks are trained on the challenge free sequences of the CURE- TSD dataset. The proposed network outperforms the state-of-the-art object detection as the Faster R-CNN inception Resnet V2 and R-FCN Resnet 101,by a large margin and obtains a precision and recall of 94.60%and 80.21%, respectively, which is the current state of the art on this part of the dataset. In addition, the network is tested. on the German Traffic Sign Detection Benchmark (GTSDB)dataset, where it achieves a precision and recall of 95.29% and89.01%, respectively. This is on a par with the performance of the afore mentioned object detection networks. These results prove the generalizability of the proposed architecture and its suitability for robust traffic sign detection in autonomous vehicles. Index Terms— Traffic sign detection, traffic sign recognition, convolutional neural network, Tversky index, L1 constraint Traffic signs recognition with deep learning

DISADVANTAGES:

The network is tested on the German Traffic Sign Detection Benchmark (GTSDB) dataset, where it achieves a precision and recall of 95.29% and 89.01%, respectively. The accuracy may changes and didn't remains constant and proposed method with this accuracy only.

[4] Traffic Signs recognition with deep learning with artificial neural network ,convolutional neural network, multilayer perceptron, deep learning, artificial intelligence signs, autonomous vehicles.

ADVANTAGES:

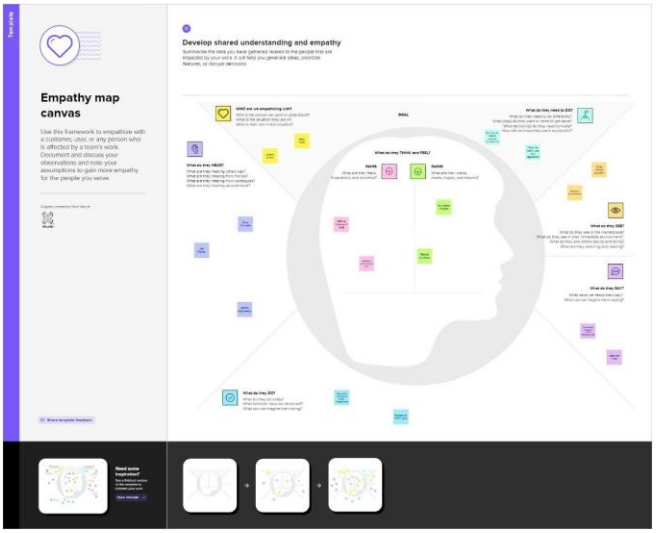
Extract main features from images of traffic signs to classify them under different categories. The presented method uses a modified LeNet-5 network to extract a deep representation of traffic signs To perform the recognition. It is constituted of a Convolutional Neural Network (CNN) modified by connecting the output of all Convolutional layers to the Multilayer Perceptron (MLP). The Training is conducted using the German Traffic Sign Dataset and Achieves good results on recognizing traffic signs. Keywords—Classification, Recognition, Artificial Neural Network (ANN),Convolutional Neural Network (CNN), Multilayer Perceptron (MLP), Deep learning, Artificial Intelligence, Road Signs, Autonomous vehicles.

DISADVANTAGES:

In this proposed method , traffic sign recognition with proper way only that recognition of image only not digital in way

3. IDEATION & PROPOSED SOLUTION

3.1 Empathy Map Canvas



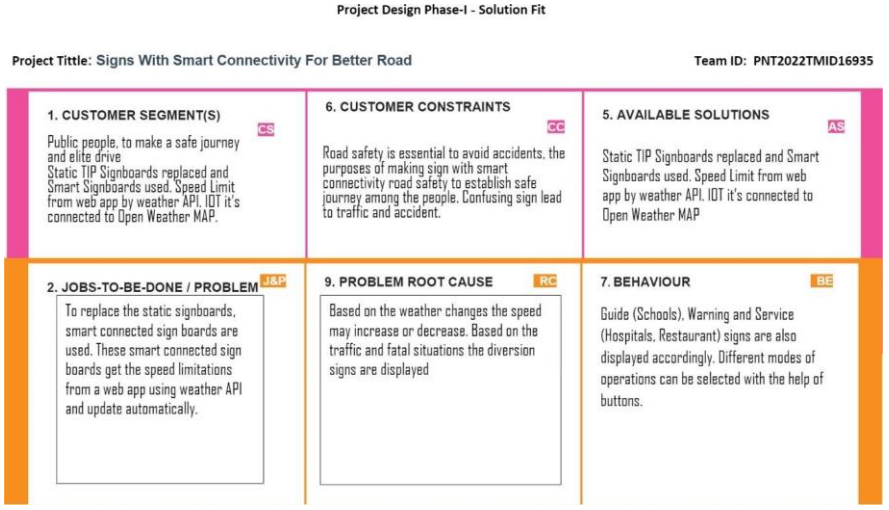
3.2 Proposed Solution

S.No.	Parameter	Description
1.	Problem Statement (Problem tobe solved)	ü It helps to reduce the accidents by our smart sign board which monitor speed of the vehicles and weather changes and fatal situations passengers convenience.

2.	Idea/Solution description	ü It is IOT based applications , replacing the man made painted signs into digital and also more visible compared to current signs and also indicating weather in same sign boards for drivers.
3.	Novelty/Uniqueness	ü Collects data about different vehicles and also speed of the vehicles and weather changes and fatal situations and any kind of warning in the road and night time visibility , daylight readable real time information .
4.	Social Impact/ Customer Satisfaction	ü Customers can get information about construction works or any kind of warning in the road through sign board at certain distance before the site
5.	Business Model(Revenue Model)	ü This project can make revenue by selling many equipments to the government sector and also private sector(educational & medical institutions).Maintain services re also taken by the company.

6.	Scalability of the Solution	ü Decrease the road accidents majorly ü Traffic jams will get reduced ü Time consumptions ü Running on sunshine ü Energy optimization ü Cost saving

3.3 Problem Solution fit



4. REQUIREMENT ANALYSIS

4.1 Functional requirement

The functional requirements of the proposed solution are :-

1. Requirements	Static sign boards will be replaced with digitalized sign board using IoT
2. Operating Environment	Operating System: Windows 8 , Processor: Intel I3 or Higher , Memory: 4GB or more
3. Design and Implementation Constraints	Control Side and Vehicle side units , Bluetooth transmitter and receiver , GPS
4. System feature : Alerts	This system will 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.

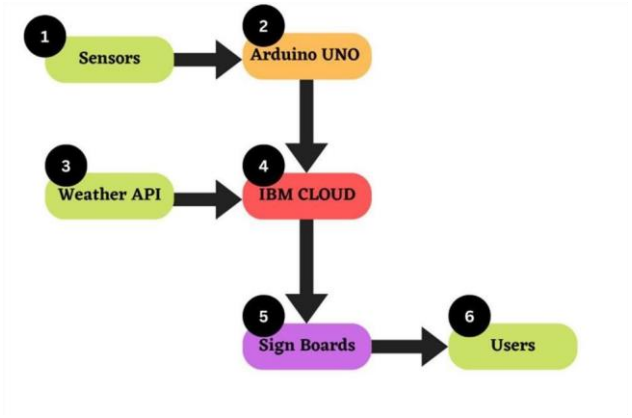
4.2 Non-Functional requirements

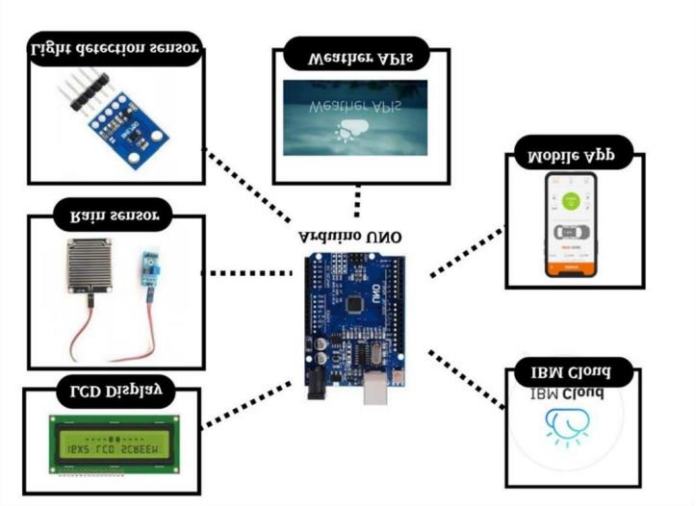
The Non-functional requirements are :-

1. Quickness	System should be fast enough for getting alerts
2. Failure Handling	In case of failures due to unavoidable reasons, the system should be able to recover quickly
3 Detection and Response Time	Must be high
4. Throughput	Model has to be updated periodically

5. PROJECT DESIGN

5.1 Data Flow Diagrams





5.2 Solution & Technical Architecture

Solution Architecture

6. PROJECT PLANNING & SCHEDULING

Sprint Planning & Estimation

Use the below template to create product backlog and sprint schedule

Sprint	Functional Requirement (Epic)	User Story / Task
Sprint-1	Registration	As a user, I can register for the application byentering my email, password, and confirmingmy password.
Sprint-1		As a user, I will receive confirmation email onceI have registered for the application
Sprint-1		As a user, I can register for the applicationthrough Facebook
Sprint-1		As a user, I can register for the application through Gmail
Sprint-1	Login	As a user, I can log into the application byentering email & password
Sprint-1	Dashboard	As a user, I can log into the application by entering email & password and access all the resources and services available

Sprint	Functional Requirement (Epic)	User Story / Task	Story Points
Sprint-2	Login	As a weather data controller, I log into my profile and start monitoring the weather updates	3
Sprint-2	Dashboard	I receive all the information about weather fromweb from weather API. Whenever there is change in weather, corresponding updates are made on sign boards.	2
Sprint-3	Login	As a image controller, I keep note of all the images received from various areas and detect traffic in that particular area.	3
Sprint-3	Dashboard	With the traffic, updates I change the status ofsign board as "take diversion".	2
Sprint-4	Login	As a zonal officer, I ensure that boards near school display "slow down" and near hospitals display "no horn".	3
Sprint-4	Login	As an administrator, I ensure that all departments work co-ordinated and ensure the accuracy and efficiency.	2

Project Tracker, Velocity

	Total Points	Duration	Sprint Start Date	Sprint End Date
Sprint-1	20	6 Days	14 Nov 2022	19 Nov 2022
Sprint-2	20	6 Days	14 Nov 2022	19 Nov 2022
Sprint-3	20	6 Days	14 Nov 2022	19 Nov 2022
Sprint-4	20	6 Days	14 Nov 2022	19 Nov 2022

7. CODING & SOLUTIONING

```
# Enter your API key here
api_key = "Your_API_Key"
# base_url variable to store url
base_url = "http://api.openweathermap.org/data/2.5/weather?"
# Give city name
city_name = input("Enter city name : ")
# complete_url variable to store
# complete url address
complete_url = base_url + "appid=" + api_key + "&q=" + city_name
# get method of requests module
# return response object
response = requests.get(complete_url)
# json method of response object
# convert json format data into
# python format data
x = response.json()
# Now x contains list of nested dictionaries
# Check the value of "cod" key is equal to
# "404", means city is found otherwise,
# city is not found
if x["cod"] != "404":
 # store the value of "main"
 # key in variable y
 y = x["main"]
 # store the value corresponding
 # to the "temp" key of y
 current_temperature = y["temp"]
 # store the value corresponding
 # to the "pressure" key of y
 current_pressure = y["pressure"]
 # store the value corresponding
 # to the "humidity" key of y
 current_humidity = y["humidity"]
 # store the value of "weather"
 # key in variable z
 z = x["weather"]
 # store the value corresponding
 # to the "description" key at
 # the 0th index of z
 weather_description = z[0]["description"]
 # print following values
 print(" Temperature (in kelvin unit) = " +
 str(current_temperature) +
 "\n atmospheric pressure (in hPa unit) = " +
 str(current_pressure) +
 "\n humidity (in percentage) = " +
```

```
 str(current_humidity) +
 "\n description = " +
str(weather_description))
else:
 print(" City Not Found ")
```

7 RESULT:

Enter city name : chennai
Temperature (in kelvin unit) = 312.15
atmospheric pressure (in hPa unit) = 996
humidity (in percentage) = 40

8 CONCLUSION

Using IBM cloud and node red smart connectivity was made easier and the signs in the digital board changes automatically and this help us to avoid accident and predict weather and at the same time does not need manual working in this.

9 APPENDIX

https://github.com/IBM-EPBL/IBM-Project-36154-1660293258