A PROJECT REPORT ON

RTO SIGN RECOGNITION FOR DRIVER ALERT

SUBMITTED TO THE SAVITRIBAI PHULE PUNE UNIVERSITY, PUNE
IN THE PARTIAL FULFILLMENT FOR THE AWARD OF THE DEGREE

OF

BACHELOR OF ENGINEERING
IN
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BY

Shubham Tadas	**Exam Seat No:B150134339**
Aditya Mundhe	**Exam Seat No:B150134281**
Suraj Dongare	**Exam Seat No:B150134237**
Hitesh Sonawane	**Exam Seat No:B150134335**

UNDER THE GUIDANCE OF
Prof. R.H JADHAV

DEPARTMENT OF COMPUTER ENGINEERING
K.K.WAGH INSTITUTE OF ENGINEERING EDUCATION AND RESEARCH, HIRABAI HARIDAS VIDYANAGARI, PANCHAVATI, NASHIK 422003

2021-22

CERTIFICATE

This is to certify that the project report entitled

RTO SIGN RECOGNITION FOR DRIVER ALERT

Submitted by

Shubham Tadas	**Exam Seat No:B150134339**
Aditya Mundhe	**Exam Seat No:B150134281**
Suraj Dongare	**Exam Seat No:B150134237**
Hitesh Sonawane	**Exam Seat No:B150134335**

is a bonafide work carried out by them under the supervision of Prof. R.H Jadhav and it is approved for the partial fulfillment of the requirement of Savitribai Phule Pune University for the award of the Degree of Bachelor of Engineering (Computer Engineering)

This project report has not been earlier submitted to any other Institute or University for the award of any degree or diploma.

Prof. R.H Jadhav
Internal Guide
Dept. of Comp. Engg.

Prof. Dr. S. S. Sane
Head of Department
Dept. of Comp. Engg.

External Examiner

Date:
Place: Nashik

Abstract

Traffic sign detection and recognition are vital in the improvement of clever vehicles. detection and recognition of traffic signs have for quite some time been at the focal point of interest for significantly affecting the wellbeing of the driver. Programmed street signs recognition is turning into a piece of Driver Assisting Systems whose job is to increment wellbeing and driving solace.

Considering different datasets of various RTO/Traffic Signs, the location module will distinguish the particular sign and show Alerts for drivers.

Traffic sign recognition is generally founded on the shape and variety credits of traffic signs, and traffic sign recognition is frequently utilized with classifiers, for example, convolutional neural network (CNNs). The response time of the relative multitude of above tasks will be determined and contrasted with demonstrate that the CNN executes quicker (25ms/outline).

Keywords : Algorithms, Conventional neural networks, Database, Deep learning, Recognition System.

Acknowledgment

It gives us extraordinary joy in introducing the primer venture report on **'RTO Sign Recognition for Driver Alert'**.

We might want to make a move to thank our internal guide **Prof. R. H. Jadhav** for giving us all the assistance and direction we really wanted. We are truly thankful to her for her caring help. Her significant ideas were exceptionally useful.

We are likewise thankful to **Prof. Dr. S. S. Sane**, Head of Computer Engineering Department, K. K. Wagh Institute of Engineering Education and Research for his fundamental help, suggestions.

Shubham Tadas
Aditya Mundhe
Suraj Dongare
Hitesh Sonwane
(B.E. Computer Engg.)

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CHAPTER 1

INTRODUCTION

1.1 PROJECT IDEA

The fundamental thought of the proposed framework is to give awareness of the driver about the presence of traffic signs at a specific distance separated. This framework will actually want to identify, perceive and deduce the road traffic signs would be a tremendous assistance to the driver. This cautioning then permits the driver to take fitting remedial choices all together to relieve or totally stay away from the occasion.

Road and traffic sign recognition in the field of study can be utilized to help the turn of events of a stock framework (for which constant acknowledgment isn't needed) or on the other hand help the advancement of an in-vehicle warning framework (when continuous acknowledgment is essential). Both road sign stock and road sign recognition are worried about traffic signs, face comparative difficulties and utilize programmed location and acknowledgment. In this way, the framework furnishes the driver with ongoing data from road signs, which comprise of the most significant and testing assignments. Then, produce an admonition message to the driver ahead of any risk.

1.2 MOTIVATION OF THE PROJECT

Traffic sign detection and recognition have gotten expanding interest in the last not many years. This is because of the wide scope of uses that a framework with this capacity gives sign stock. It is fundamentally a similar application yet in towns and urban areas climate is more troublesome than roadways. The signs are not put 100opposite to the development of the vehicles, delivering a disfigured image of the signs; also, there are impediments and different objects of a similar variety.

Acknowledgment of billboards accurately with impeccable timing and at the ideal locations is vital for drivers to guarantee themselves and their travelers' protected excursion. In any case, once in a while, because of the adjustment of weather patterns or review points, signs are troublesome to be seen until it is past the point of no return. These days expansions in registering power have carried PC vision to

applications. Then again, the expansion in rush hour gridlock mishaps going with the rising measure of traffic has turned into a major issue for society. Road mishaps are especially high under extraordinary road conditions, for example, at the entry to a single direction road, sharp bends, and convergences. Consequently, The inspiration for this undertaking lays both individual interests in a superior comprehension of item recognition and scholarly examination. The objective is to foster an establishment for a road sign-recognition (RSD) with the choice to add further articles or capacities to it. A definitive objective is to have a useable item recognition for the auto area.

CHAPTER 2

LITERATURE SURVEY

Sr. No.	Paper Title	Authors	Methodology	Limitations
1	”An improved convolutional neural network algorithm and its application in multilabel image labeling” , 2019.	Cao, Jianfang, etal.	• Forming the dataset and Training the Data. • Model Training and Optimization. • Advances in Intelligent Systems and Computing (CNN).	CNN Used.
2	Traffic Sign Detection and Recognition using a CNN Ensemble, 2019.	Aashrith, V., Smriti, S	• Images were provided through labelled dataset. • Training was done taking all of the dataset. • Two files were generated as the output; Testing model was created tested on random images and accuracy of the model was calculated • Files were imported on raspberry pi camera. Final accuracy was calculated using the results.	Use of camera.
3	- Traffic sign recognition using convolutional neural networks”, 2017	K. S. Boujemaa, I. Berrada, A. Bouhoutee and K. BouBouh.	• Link :- https://ieeexplore.ieee.org /abstract/document /8238205/authors authors	

Sr. No.	Paper Title	Authors	Methodology	Limitations
4	Traffic sign detection based on cascaded convolutional neural networks. [2016]	Di, Z., Junqi, Z., Dongdong, Z.	Networking and Parallel/ Distributed Computing	
5	Traffic Sign Classification Using Convolutional Neural Networks and Computer Vision, 2021.	Anuraag Velamati , Gopichand G	this research requires manipulation as well as visualization of the data being used, there was extensive use of libraries	• Tensorflow • Keras • Numpy • Tkinter

Table 2.1: Literature Survey

1. An improved convolutional neural network algorithm and its application in multilabel image labeling :

The blend of deep learning and multilabel image annotation settles the issues of the complicated annotation process, bad annotation efficiency, the lack in deciding attributes, and the ”semantic gap” that influences traditional annotation techniques.

A framework plan a CNN model that wires two unique convolutional neural networks. In light of comprehension of the convolutional neural networks themselves too as the experimental outcomes, the parameters are changed, and a combination proportion is set between the two subnetworks that outcome in a satisfactory performance. The planned model is pointed toward tackling the bad annotation impact issue that happens on underrepresented image types in datasets because of deficient training. Contrasted and other techniques to resolve such issues, the strategy proposed in this study is both advantageous what's more, quick, and its application isn't confined to datasets.

In light of comprehension of the general course of multilabel image annotation, this study proposes a multilabel image annotation algorithm that utilizes CNN. This algorithm contains preparing and annotation stages and the data sources and results vary as indicated by the various stages. During the preparation stage, the two branch

models are prepared freely. Then, in the testing stage, these branch models are intertwined so they apply joint commitments to decision-production as to the last comment results.

2. Traffic Sign Detection and Recognition using a CNN Ensemble :

Traffic Sign Detection and Recognition (TSDR) assumes a significant part here by distinguishing and perceiving a sign, in this manner telling the driver of any impending signs. This guarantees road wellbeing, yet in addition permits the driver to be at minimal simplicity while driving on precarious or new roads. Another generally dealt with issue isn't being ready to figure out the importance of the sign. With the assistance of this Advanced Driver Help Systems (ADAS) application, drivers will never again deal with the issue of understanding what is according to the sign. The technique proposes for Traffic Sign Detection furthermore, Recognition utilizes image handling for the location of a sign and a gathering of Convolutional Neural Networks (CNN) for the acknowledgment of the sign. CNN's have a high acknowledgment rate, in this way making it alluring to use for executing different PC vision undertakings. TensorFlow is utilized for the execution of the CNN. Framework accomplished higher than 99 % for each. acknowledgment exactnesses for roundabout signs on the Belgium and German databases.

3. Traffic sign recognition using convolutional neural networks :

This framework introduced an insightful investigation of two powerful and effective road sign locations furthermore, acknowledgment draws near. The trial results accomplished in the wake of testing both of the techniques on the German Traffic Sign Detection Recognition datasets, infer that the Fast R-CNN is such a great deal quicker than the C-CNN strategy, likewise it is invariant to light changes (as long as this sort of images is accessible in the preparing dataset). Then again, despite the fact that the C-CNN approach is slow and delicate to weather patterns, it is invariant to scale and review points.

4. Traffic sign detection based on cascaded convolutional neural networks

The GTSDB dataset contains a training dataset with 10000 images and a test dataset with 40000 images. The quantities of prohibitory, compulsory, and risk signs in the test dataset are 162, 47, and 60 separately. The spans of traffic signs in the scene

image shift from 32x32 px.

This framework proposes a productive methodology for identifying traffic signs. To start with, LBP includes descriptor, and AdaBoost classifiers are coupled to extricate ROIs for coarse target determination. Second, cascaded CNNs are utilized to eliminate negative examples for fine traffic sign detection. Likewise, a reformative CNN structure is introduced to upgrade acknowledgment precision. Analyzing results in light of the GTSDB benchmark data set demonstrate that the proposed technique can accomplish serious outcomes when contrasted and the connected work.

5. Traffic Sign Classification Using Convolutional Neural Networks and Computer Vision :

In this, utilizing TensorFlow, CNN and OpenCV, the framework has effectively evolved a traffic sign classifier which achieved a precision of 96 %, which is working better than numerous different models that have been created from other explorers. The the framework likewise developed a python GUI which looks intelligent and instinctive to utilize, which accepts a image as input and presents the anticipated traffic sign to the client.

CHAPTER 3

PROBLEM DEFINITION AND SCOPE

3.1 PROBLEM STATEMENT

To design and execute a framework that would be helpful to recognize the RTO Traffic Signs for Driver alert.

3.1.1 Goals and objectives

- To develop a framework that recognizes and groups at least one road sign from inside a live variety of images caught by the camera.
- To do similar concentrate on Machine learning algorithms to work on more exactness.
- To prevent accidents using a programmed sign board recognition framework to give traffic data to the driver.
- These frameworks help drivers to securely drive.

3.1.2 Assumption and Scope

3.1.2.1 Assumption

- The framework must have the option to identify traffic signs autonomously of their appearance in the image. Thus, it must be invariant to :
  - Viewpoint contortion
  - Lighting changes
  - Incomplete impediments
- Moreover, it needs to give data about the presence of potential issues:
  - Absence of permeability
  - Terrible condition
  - Terrible placement

3.1.2.2 **Scope**

- Transferred image should be with .jpg, .jpeg, .png extension.
- Voice-ready message through the speaker to driver.
- The traffic signs center around the decrease of the traffic load on an existing road organization through different travel requests the board measures.
- Traffic signs ought to eliminate the infringements and clog and work on the traffic light, road condition, and geometrics highlights at convergences.

3.2 METHODOLOGY

Traffic sign detection is generally founded on the shape and variety ascribed to traffic signs and traffic sign recognition are frequently utilized with classifiers, for example, convolutional neural networks (CNNs) with discriminative features.

A. Database description

The database chosen to use for the framework was the Traffic Sign Detection Benchmark database which is taken from Kaggle. This database has in excess of 40 classes of images also, 50000 images for training, approval, and testing purposes. The database is partitioned into training, approval, and testing set, which further aided us in figuring out how well this engineering was working.

B. CNN(Convolutional Neural Network)

To group the images into their individual classes, the framework will build a CNN model (Convolutional Neural Network). CNN is best for image order purposes. A CNN utilizes a framework similar to a multi-facet discernment that has been planned for decreased handling prerequisites. The layers of a CNN comprise an input layer, an output layer, and a hidden layer that incorporates numerous convolutional layers, pooling layers, fully connected layers, and normalization layers. The evacuation of constraints and expansion in efficiency for image handling brings about a framework that is undeniably more effective, and simpler to trains restricted for image handling and normal language handling.

- Feature Extraction

In feature extraction, 1,000 elements were removed for each image from 50000 images utilizing convolutional neural networks from deep learning models. This module contains algorithms that are utilized to remove features from either the training images in the training data set or images straightforwardly from the shape examination unit. It permits the classifier to be prepared by either twofold images or by features.

3.3 OUTCOME

- The result of the framework is to arrange and perceived the different traffic signs from the marked database of 43 unique sorts of traffic signs what's more, show the type and percentage of every one of the given images with high exactness.
- The driver will get a voice caution message over the speaker with the goal that he gets he will all consider on road.

3.4 TYPE OF PROJECT

- Project Type : Application oriented
- Domain : Machine Learning

CHAPTER 4

PROJECT PLAN

4.1 PROJECT TIMELINE

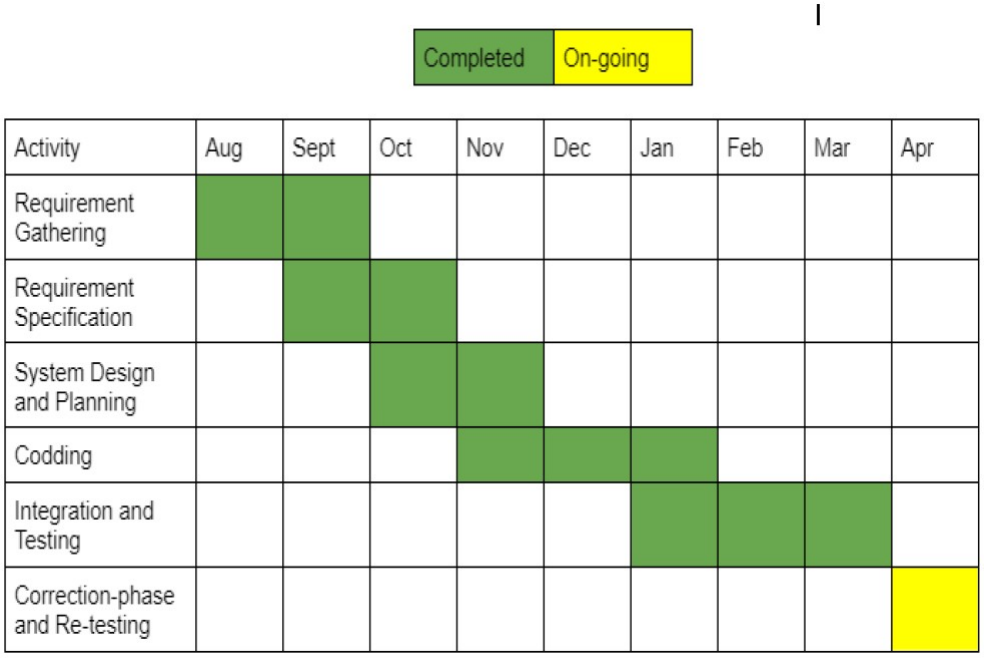

Figure 4.1: Planning

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4.2 TEAM ORGANIZATION

Project Guide : Prof. R. H. Jadhav

Multiple Meetings conducted over the course of entire semester in the allotted span as well as whenever we required guidance in both online and in-person format.

Project Coordinator : Prof. I. Priyadarshini

Guidance regarding scheduling of Project Review as well sorting out our technical difficulties.

4.2.1 Team structure

The team is consist of 4 members.

The roles of each member are given below :

Name	Role
Shubham Tadas	Coding, Presentation
Aditya Mundhe	Documentation, Testing
Suraj Dongare	Coding, Testing
Hitesh Sonwane	Coding, Presentation

Figure 4.2: Team Organization

CHAPTER 5

SOFTWARE REQUIREMENT SPECIFICATION

5.1 FUNCTIONAL REQUIREMENTS

- Input: Get the image as contribution at a decent distance and in a proper region.
- Extensions: Image extension ought to be .png, .jpg, .jpeg.
- Output: The traffic signs is grouped and afterward the image will be distinguished. Their sorts and rate exactness will be shown.

5.2 NON FUNCTIONAL REQUIREMENTS

- Availability: Laptop Or Mobile Phone with a Stable web association should be there.
- Compatibility: Compatible with practically all pc's/notebooks/Cell phones.
- Portability: Portable gadgets like Laptops or Mobile Phones.
- Usability: System should be easy to use.

5.3 CONSTRAINTS

- Hardware : Camera must be available.
- Operational : One image file to be uploaded at a time.

5.4 HARDWARE REQUIREMENTS

- Device / Mobile with good camera.

5.5 SOFTWARE REQUIREMENTS

- OS : Windows 8, 8.1 ,10 ,11 , Linux , IOS.

5.6 INTERFACES

- User Interface : Desktop Application.

- Software Interface : Jupyter Notebook .
- Hardware Interface : Camera.

CHAPTER 6

DETAILED DESIGN

6.1 ARCHITECTURAL DESIGN(BLOCK DIAGRAM)

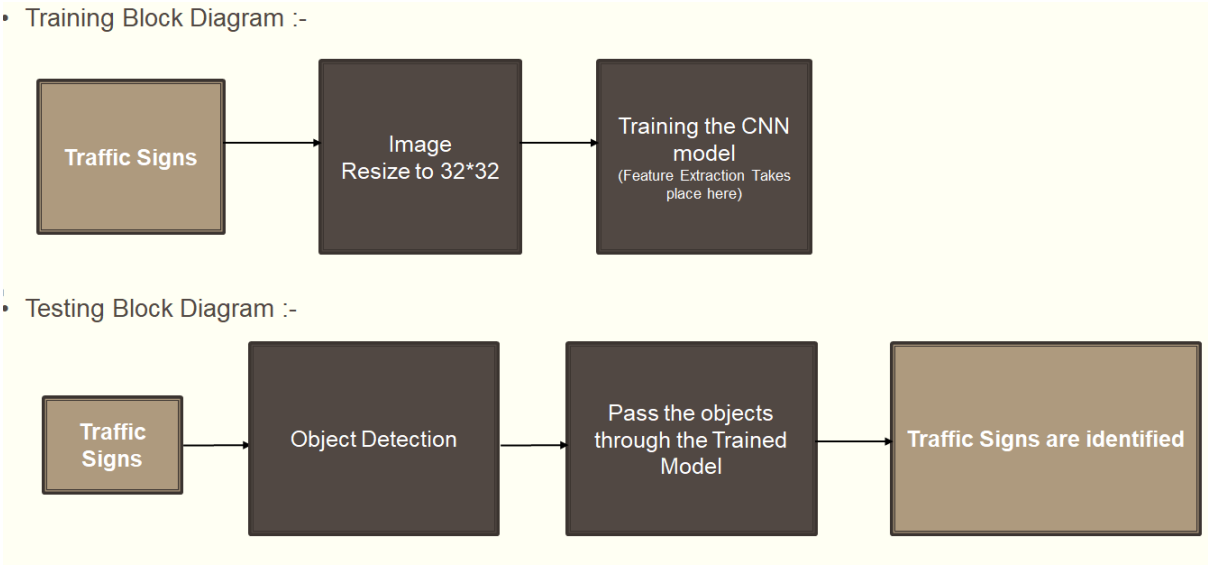

Figure 6.1: Block Diagram

A framework to distinguish and recognise road and traffic signs ought to have the option to work in two modes; the training mode wherein a data set can be worked by gathering a set of traffic signs paperwork for training and approval, and an expectation mode where the the framework can recognise a traffic sign which has not been seen previously.

A decent computerized camera that gives clear sharp actually images of various sizes is important. No extraordinary hardware is required for this reason. Images gathered by this camera are utilized in later stages to create and approve the color division algorithm,, the acknowledgment stage, and to construct the arrangement framework.

The training CNN model comprises of binary images of a standardized size, for example, 32x32 pixels. The data set is made and refreshed in the preparation mode in such a way that binary images of the ideal traffic signs are chosen from a bunch of images. This data base is utilized either straightforwardly or by separating a few features to train and approve the classifier. In the prediction mode, the data set is conjured to train the classifier before any arrangement task happens.

Feature Extraction: This module contains algorithms that are utilized to separate elements from either the training images in the training data set or images straight-

forwardly from the shape examination unit. It permits the classifier to be prepared by either binary images or on the other hand by features.

6.2 USER INTERFACE SCREENS

Figure 6.2: User Interface

6.3 DATA DESIGN

6.3.1 Data structure

- List :-

  Data will be split into three groups i.e training data, validation data, and test data. so for this list will be used to store images in all three different types.

6.3.2 Database description

The data set chose to use for the framework was the Traffic Sign Detection Benchmark data set index which is taken from Kaggle. This data set has in excess of 40 classes of images also, 50000 images for training,, approval, and testing purposes. The data set is separated into training, approval, and testing sets, which further aided us in figuring out how well this design was working.

CHAPTER 7

PROJECT IMPLEMENTATION

7.1 OVERVIEW OF PROJECT MODULES

1) Camera Module : Python gives different libraries to image and video processing. One of them is OpenCV. OpenCV is a huge library that aides in giving different capacities for image and video tasks. OpenCV, catch a video from the camera. That allows you to make a video catch object which is useful to catch recordings through a webcam and afterward the framework might perform wanted procedure on that video.

2) Feature Extracting Module: Feature Extraction means to diminish the quantity of features in a dataset by making new elements from the current ones. As the dataset contains traffic sign images record necessities to extricate valuable elements from that. The separating features are : HSV Color ,Contour Detection ,and so on.

3) Graph Plotting Module: Different plots like spectogram and Amplitude plots are utilized. Matplotlib is utilized for this reason.

4) Model Saving Module: After building model effectively, HDF5 is utilized to save that model and that assistance to utilize the model at whatever point required.

7.2 TOOLS AND TECHNOLOGY USED

Tools :- Jupyter Notebook,

Technologies :- Machine Learning , Python , Tkinter.

7.3 ALGORITHM DETAILS

Step 1 : Start

Step 2 : The camera detect the objects to be identified.

Step 3 : The images are analyzed with the trained data.

Step 4 : The objects are then detected and localized by TensorFlow object detection API.

Step 5 : Object identification takes place.

Step 6 : A prediction is made based on the identification and a probability index studied.

Step 7 : The prediction with highest probability is regarded as the output.

Step 8 : The object is then classified and Traffic Sign will be detected.

Step 9 : End

CHAPTER 8

RESULTS AND DISCUSSION

8.1 EXPERIMENTAL SETUP

8.1.1 Data set

Traffic Sign Recognition Benchmark Data set from Kaggle :

The data set chose to use for the framework was the Traffic Sign Detection Benchmark data set index which is taken from Kaggle. This data set has in excess of 40 classes of images also, 50000 images for training,, approval, and testing purposes. The data set is separated into training, approval, and testing sets, which further aided us in figuring out how well this design was working.

8.1.2 Performance Parameters

1. Accuracy:- Accuracy is any score or metric the algorithm is involving that is used to figure the presentation of the arrangement. for example how well it works and its prescient power. Each occurrence of the data gets its own grouping score upheld algorithm and metric utilized.
   Accuracy= True Negative + True Positive / (True Positive + False Positive + True Negative + False Negative)

2. Precision:- Precision is a sign of an AI model's presentation and the nature of a positive forecast made by the model. Precision alludes to the quantity of genuine up-sides partitioned by the whole sure forecasts.
   Precision= True Positive/ (True Positive + False Positive)

3. Recall:- Recall is one more significant measurement, which is characterized as the part of tests from a class that are accurately anticipated by the model. More officially:
   Recall= True Positive/ (True Positive + False Negative)

4. F1-Score:- One famous metric which joins precision and recall is called F1-score, which is the symphonious mean of precision and recall characterized as:
   F1-score= 2*Precision*Recall/(Precision+Recall)

8.1.3 Efficiency Issues

1. In the event that the Data set prepared with less number of test images, it might impact efficiency.
2. Sporadic Sign board might impact effectiveness.
3. Harmed Sign board might impact proficiency.
4. Weather patterns like Dense haze, Heavy precipitation might cause the effectiveness.

8.2 SOFTWARE TESTING

8.2.1 Test Cases and Test Results

Test Cases :-

1) Test Case 1 : Pass the image that contains STOP traffic sign.

2) Test Case 2 : Pass the image that contains ahead only traffic sign.

3) Test Case 3 : Pass the image that contains multiple traffic sign i.e.(20 Speed Limit 30 Speed Limit).

Test Results :-

Test Case 1 :

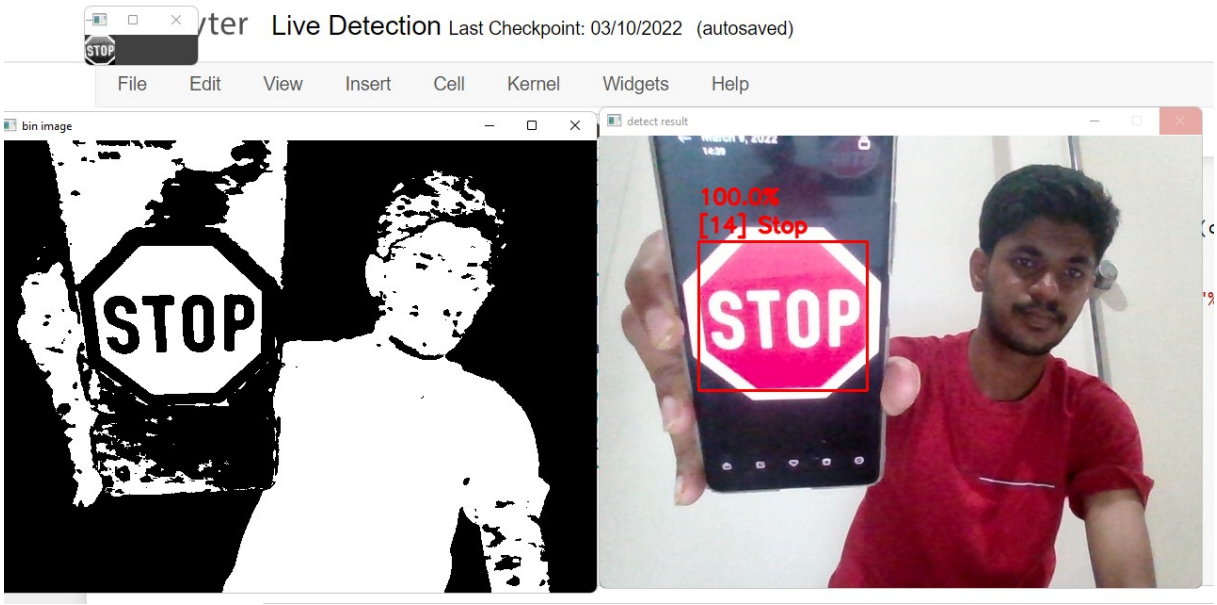

Figure 8.1: Test Case 1

Test Case 2 :

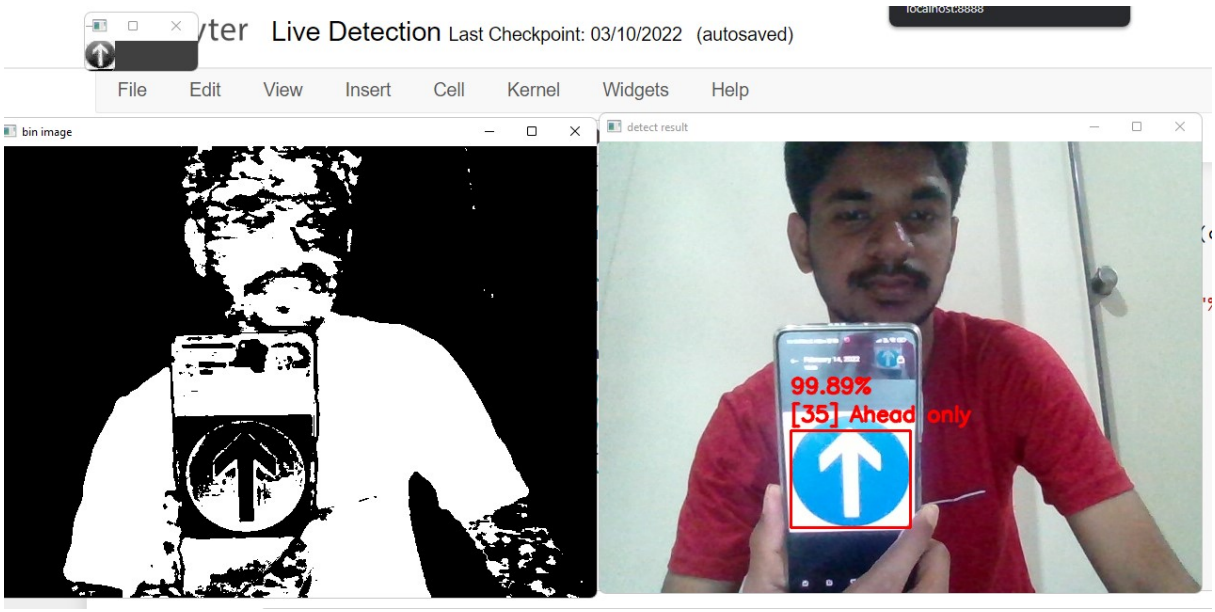

Figure 8.2: Test Case 2

Test Case 3 :

Figure 8.3: Test Case 3

8.3 RESULTS

8.3.1 Result Analysis and Discussion

The framework effectively executed a Convolutional Neural Network to the Traffic Sign Recognition task with more prominent than 95% exactness overall. Framework take care of how deep learning can be utilized to characterize traffic signs with high accuracy, utilizing an assortment of pre-handling and visualization strategies and attempting different model structures. This framework is worked with a basic straightforward CNN model to recognize road traffic signs precisely. The model arrived at near 96 % exactness on the test set which is great thinking about the limit of computational power and with a genuinely basic design. There is still a lot of work to be done, interface including present day Deep Learning frameworks which utilize later also, more convoluted designs like Google Net or Resnet. Be that as it may, clearly, this comes in more computational expense, then again.

8.3.2 Graphical Interface

Figure 8.4: Graphical Interface

CHAPTER 9

CONCLUSION AND FUTURE WORK

9.1 CONCLUSION

In the proposed framework, fundamental concept is to utilize neural network and execute the task of Traffic Sign Recognition from different traffic signs. Fundamental undertaking is to utilize CNN classifier to perform classification of various traffic signs. Traffic Sign Recognition Benchmark Data set is to be utilized in execution of the framework. In framework extraction of various features of traffic signs happens. Those are Color, Contrast, Shapes, Frequency, Chroma.

In the proposed System input image, first and foremost, record is stacked. Then,filters are applied to eliminate noise. In the future preparation of neural network and recreation happens to get the last result.

According to explore , CNN classifier technique is exceptionally exact as well as effective and practical when contrasted with different techniques like SVM ,MLP ,Binary Classification,etc. The framework shows how Machine learning can be utilized to get the basic traffic signs from images information and acquire different experiences about RTO signs. This framework can be utilized in an assortment of arrangements like Automotive.

9.2 FUTURE WORK

- Exactness of the framework will turn out to be better.
- The model will perceive more traffic signs.
- Road signs tell road clients of guidelines and give cautioning and direction required for protected, uniform and proficient activity.
- Traffic sign lessen the gridlock along the road and furthermore give facilities for the road clients.

9.3 APPLICATION

- Traffic Sign Recognition framework is one of the vital elements of Advanced Driver Assistance Systems (ADAS) in a car.

- In autonomous (Driverless) vehicles Traffic Sign Recognition framework is mandatory.
- Traffic Sign Recognition framework advances road safety and efficiency by accommodating the systematic development of all road clients on all roads in both metropolitan and non-metropolitan regions.

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ANNEXURE A

PLAGIARISM REPORT

Sr. No.	Title Name	Plagiarism	Uniqueness
1	Abstract	9%	91%
2	Introduction	6%	94%
3	Problem Definition and scope	0%	100%
4	Project Plan	0%	100%
5	Software requirement specification	0%	100%
6	Detailed Design	0%	100%
7	Experimental setup	0%	100%
8	Summary and Conclusion	0%	100%
9	Total Report	8%	93%

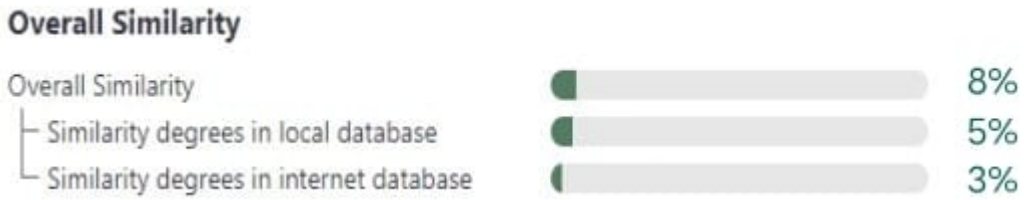

Figure A.1: Plagiarism Report

ANNEXURE B

PAPER PUBLISHED (IF ANY)

ANNEXURE C

SPONSORSHIP DETAIL (IF ANY)