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Traffic Sign Detection Using Convolutional Neural Networks

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Abstract - *Driving is a mind boggling, persistent, and perform multiple tasks procedure that includes driver's insight, observation, and engine developments. The manner in which street traffic signs and vehicle data is shown impacts emphatically driver's consideration. This task focus on identification and perceiving of traffic and street signs with the goal that vehicle driver can keep up their mindfulness and guiding their focus toward expected rising dangers. Customarily, standard computer vision strategies were utilized to identify and order traffic signs, however these required impressive and tedious manual work to handcraft significant highlights in pictures, Rather, by applying profound learning and picture preparing to this issue, we make a model(CNN) that dependably characterizes traffic signs, figuring out how to distinguish the most fitting highlights for this issue without anyone else.*

Key Words: CNN, Vehicle Data, Traffic sign, street signs, computer vision

1.INTRODUCTION

Vehicles turned into an essential methods for transport in the twentieth century and their number has been progressively developing since the time they were imagined. At the present the motorways and the urban streets in many created and creating nations are loaded with vehicles, which has presented the drivers to different dangers. This, along with the innovative advancement of the post-war decades, supported the improvement of vehicle industry and the examination planned for expanding driving security and computerization of the vehicle route process.

First recognized computer vision-based driver assistance systems were developed in 1980's when adequate computing hardware and cameras could already be fitted in a standard passenger car. As road signs are an important part of the traffic infrastructure which plays a key role in regulating flow of the vehicles, it was soon found necessary to include in the Driver Support Systems (DSS), as they were often called, the visual traffic sign recognition (TSR) functionality. Nowadays, TSR is considered only a single aspect of the computer-aided driver assistance, along with obstacle detection, pedestrian detection, parking assistance or lane departure alerting, as well as a range of non-visual components like GPS-based vehicle positioning or intelligent route planning.

2. RELATED WORK

Several methods have been practiced for the detection of traffic signs .various algorithms are developed to detect traffic signs. Wang, C in 2018 has proposed a method for the traffic sign detection. Traffic sign detection methods mainly includes color and shape based methods[1]. During the detection phase, the collected imag.es are preprocessed, enhanced and segmented according to basic attributes of color and shape. It uses a VGG-16 as a front-end network structure of the SSD algorithm to detect and identify traffic signs[1]. The VGG-16 network consists mainly of five stacked convolutional layers, three fully connected layers and a SoftMax[1]. It uses a novel approach for traffic signs recognition and classification that is it uses Convolutional Neural Network and Support Vector Machine (CNN-SVM)[2]. In this video-based CNN-SVM recognition framework, by introducing the YCbCr color space, we firstly divide the color channels, secondly employ CNN deep network for deep feature extraction[2]. This paper focus on the research is to implement a vision – based traffic sign compliance analysis system that may be used in producing the first traffic sign database[3]. This paper presents a spatial measures and interpretations of some of the most commonly used traffic signs[3].It uses Alex net architecture for classification of traffic signs[3]. The pictures were cut to 1360×800 pixels as the lower part predominantly shows the front cover and is in this way not task-relevant [4]. All images in the dataset were converted to RGB color space employing an edge-adaptive, constant-hue demo sacking method and were stored in raw PPM file format. All relevant traffic sign that are visible in the images were labeled manually.It uses mathematical approach for image processing[4].

3. METHODOLOGY

As part of the intelligent transportation system, the detection of traffic sign is significant for driving assistance system, traffic sign maintenance, autonomous driving and other spaces.Our proposed system mainly consists of Dataset collection, Image segmentation, Model building,

obtaining predicted results and we also created front end using FLASK Framework.

3.1 Data Collection

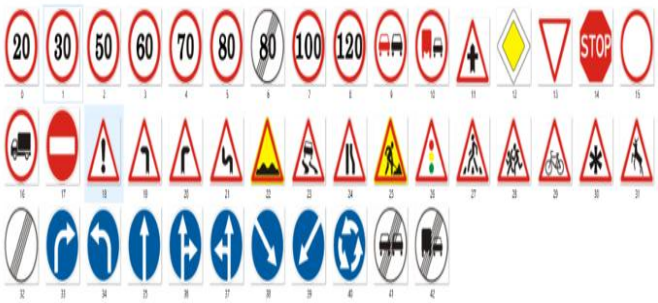

Figure -3.1: Sample Data[7]

Image Segmentation is the process of extracting the region of interest(ROI).We use Laplacian contour binding for extracting the boundaries of the image. Extracting boundaries of image from figure is given below.

Figure -3.2: Extracting boundaries of image

We used binarization to extract the informative part of the region of interest and remove the background color. Output of binarization is shown below.

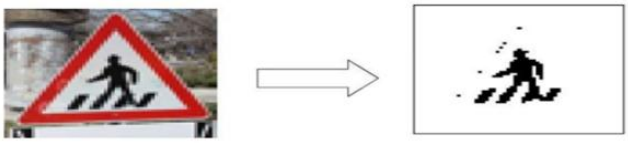

Figure -3.3: Output of Binarization

Model Building:

A Convolutional Neural Network (CNN) is a Deep Learning algorithm that accepts in an input as picture or image, designate importance for various aspects/objects in the image and be able to differentiate one from the other. The deep network is built had three convolution layers of size 64, 128 and 256 followed by two densely connected layers of size 256,60 and an output layer dense layer of size 11 .We use max-pooling layer to reduce the dimensions of the image and for faster processing. The output of the max-pooling layer is given to softmax layer which classifies the image. We use droup out algorithm as optimization technique. Relu is used as activation function and softmax as classification. This algorithm is used to predict the final class label of the system. CNN has been a popular choice in classification and pattern recognition.

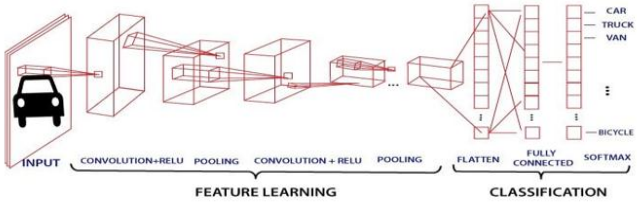

Figure -3.4: Model Structure[6]

3.2 User Interface

We created a dashboard using FLASK. Flask is a platflorm which is done in python. It connects the model with the front end. We will take the input image and give it our trained model which classifies the input image in to one of the classes and display it in the front end. The below figure shows it takes input from user and gives predicted image.

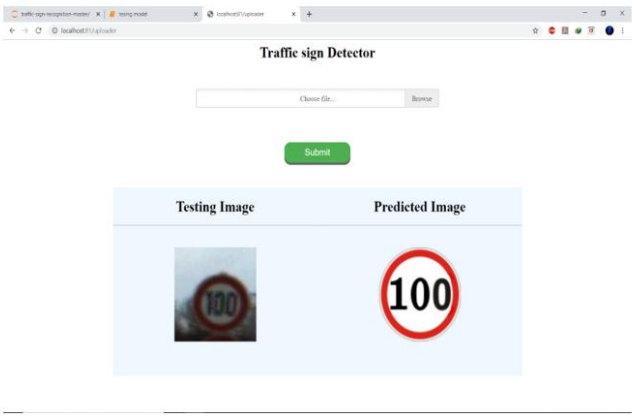

Figure -3.5: User Interface

4. EXPERIMENTAION RESULTS

The below table shows the percentage of accuracy derived when we tried with different algorithms. we used SVM, Naïve Bayes and CNN algorithms. Out of those CNN gives best results.

Algorithm used	Accuracy
SVM	83%
Naïve Bayes	85:
CNN	91%

Table-4.1: Accuracy

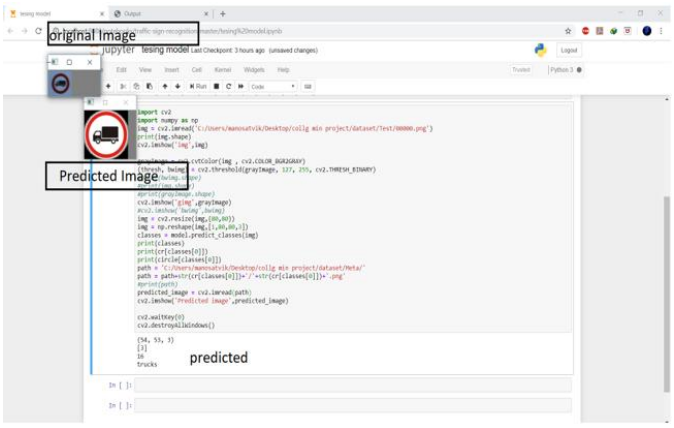

Figure-4.1: Testing an Image

5. CONCLUSION

Traffic sign recognition (TSR) is one of the critical tasks for the intelligent vehicles which are themselves a technology of the future. Solving the TSR problem will have deep implications on our safety while driving and should therefore reduce the number of road traffic fatalities. Computer-aided recognition of traffic signs has now a long record of related academic and industrial research projects and the first industry-scale applications are now emerging on the market.

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