AUTOMATIC SPEED CONTROLLING OF VEHICLE BASED ON SIGNBOARD DETECTION USING IMAGE PROCESSING

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Abstract - *The aim of this project is to reduce accidents and follow traffic rules by identifying and recognizing traffic sign boards in various backgrounds and lighting conditions from static digital images.These identification is done by using image processing technology. A major reason for accidents is not considering the signboards and not following the rules consequently. So to avoid this problem, introduce an automatic speed controlling vehicle using an image processing system in the vehicle which will detect the signboard. It will reduce the speed of the vehicle according to the signboard speed limit with the help of image processing algorithm and if head counts more than 10, speed of the vehicle automatically limited to 35kms/hr. Traffic sign recognition is important to the transport system on the highway road. Major approach is to detect road signs and use the data to reduce the speed of the vehicle.Proposed system will play a vital part in saving numerous lives.*

Key Words: Traffic sign recognition, Deep learning, Speed control, Image Processing

1.INTRODUCTION

Most of the traffic accidents are the result of neglectfulness, ignorance of the traffic rules and disobeying traffic sign boards, by the drivers and also people in the society at large. Due to inflated vehicle density and over speed driving causes a lot of accidents. The applied mathematics reports of happened accidents shows that, there area unit inflated rate of auto density, the Indian roads area unit drastically inflated quite up to the expecting level excluding the national road, multiple performing at the time of driving the vehicle that's like use of mobile, drink whereas driving, refuse of traffic rules and regulation, crossing speed limits that is dangerous for your own safety which of others. This is apparent from the fact that every hour 56 accidents occurring due to carelessness, disobeying of traffic rules and overspeed. Similarly, every hour nearly 14 people die in road accidents. When someone fails to obey traffic signs, they are making themselves at risk as well as the life of pedestrians, and other drivers. Speed limit sign boards and traffic signals helps to reduce traffic in roads and they also are fabricate to reduce the number of traffic accidents. Image processing technology plays an important role in the speed limit sign board capturing. In this journal we have introduced a system that can help the driver, significantly increasing passenger's safety. Road sign detection and recognition systems have also been implemented lately by many companies. In earlier days the road signs were detected manually by the drivers. But now the Automatic speed controlling of vehicles based on signboard detection using image processing can easily recognize the signs using the raspberry pi camera module.

1.1 METHODOLOGY

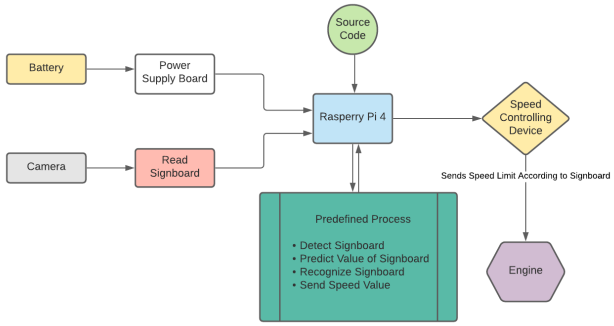

Figure 1.1 Overall architecture of proposed system

The automatic recognition of those signs, however, isn't simple due to weather's conditions, the blur ensuing from moving vehicles and also the lighting conditions. To handle these challenges, researchers suggested the use of image processing and machine learning techniques. Automatic speed controlling of vehicles using image processing includes mainly, the traffic sign detection and also the traffic sign classification. Traffic signs have many distinctive options like colors, shapes and symbols. Within the detection stage, the input pictures are preprocessed increased so metameric in step with their color or pure mathematics

Proposed speed controlling system has two modules, which is an image processing module and a speed controlling unit module. The image processing module acknowledges the regulation signs before extracting from them a speed of the vehicle data that may be sent to the speed controlling unit module. A summary of those units is shown in Figure 1.1.

1.2 IMAGE PROCESSING MODULE

This Image processing module intends to recognize the speed limit of traffic signs whatever the weather conditions are. Figure 1.2 presents the proposed model of the sign board speed-limit recognition system.

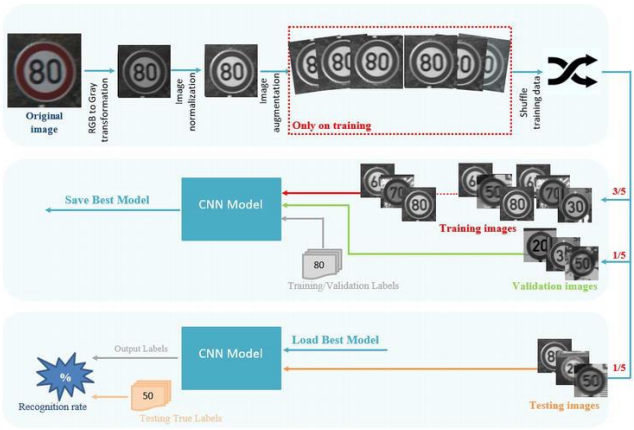

Figure 1.3 Image processing module representation

This system will perform two important tasks: capturing the sign board image and then identifying the speed. As it is shown in Figure 1.3, this unit receives an input image, executes grayscale transformation before normalization process and noise removal. Lastly, each preprocessed image will be given as an input to a CNN unit for a classification process

2. PREPROCESSING STAGE

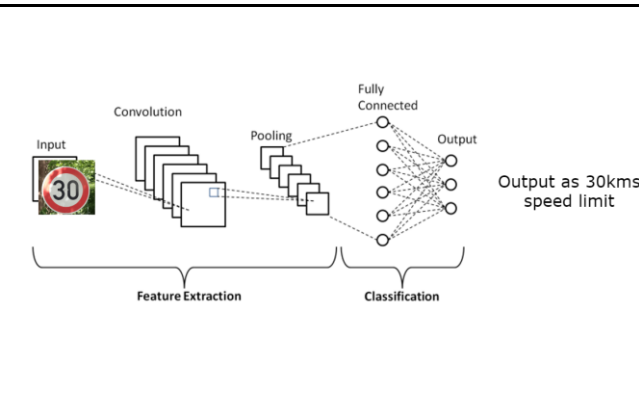

Figure 1.4 CNN architecture of image preprocessing stage

In order to organize the deep neural network to be told relevant options from speed-limit images, extra process is required.Initially, we have a tendency to expand the coaching images, then, we have a tendency to normalize the increased pictures, and at last, we have a tendency to filter them with a median filter.

2.2 COLOR THRESHOLDING OF DATA

The most intuitive color area is the RGB system. The color of each component are red, green, and blue.Due to this, the colour threshold has the following expression:

$$g(x,y)=k1 \begin{cases} Ra \le fr(x,y) \le Gb \\ Ga \le fg(x,y) \le Gb \\ Ba \le fb(x,y) \le Gb \end{cases}$$

$$g(x,y)=k2 \text{ in any other case}$$

where *fr(x,y), fg(x,y)* and *fb(x,y)* are, respectively, the functions that give the red, green, and blue levels of each point of the image

2.3 NORMALIZATION OF DATA

In this step, we tend to normalize the grey scale image so as to scale back poor lighting variations ascertained within the database. Let Im(i,j) denotes the grayscale value of pixel (i,j) Me and Std denote the estimated mean and standard deviation of Im, respectively, and Norm(i,j) denotes the normalized grayscale value of pixel (i,j).The image which is normalized is defined using Equation 1

$$Norm(i,j)= \frac{(Im-Me)}{Std} * K1 + K2 \quad \text{----------} \quad \text{——>} \quad \textbf{(Eq 1)}$$

K1 and K2 are two constants set variously from 50 to 100 respectively. Figure 1.5 shows the images obtained by 1. Atlast, a median filter is applied to the input image to obtain an emphasized speed limit sign board image.

a) Original images *b) After Grayscale transformation*

c) After normalization by Equation (1)

d) After median filtering

Figure 1.5

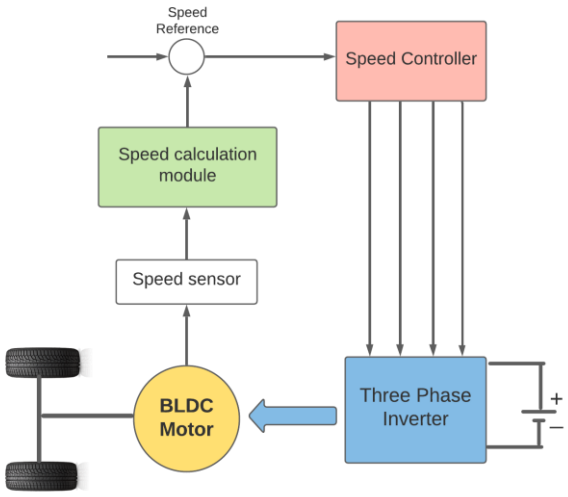

Figure 1.6 Block diagram of the vehicle using BLDC motor.

2.4 AUGMENTATION OF DATA

Deep neural networks need a large amount of learning info to perform the speed limit recognition task. However, most publicly offered databases suffer from lack of information. Increasing these databases is, therefore, an important step for correct sign recognition. Moreover, augmentation of the coaching information makes the projected model a lot more sturdy to geometric changes. Figure 1.6 is AN example of regulation sign board image with totally different augmentation techniques applied thereto vertical flipping, rotation with little angle ∈[−8°,8°] and horizontal translation of one unit to either side (right and left)

3. SPEED CONTROLLER MODULE

The goal of the speed controller module is to scale back the speed of the electronic vehicle victimization the knowledge resulted from the image process module as speed-limit reference so, input it to the speed controller unit.The studied system of BLDC motor Brushless DC motor has solely two basic parts: rotor and also the mechanical device. The rotor is the rotating half and has rotor magnets whereas the mechanical device is the stationary half and contains mechanical device windings(see Figure 1.6). In BLDC permanent magnets area unit connected within the rotor and move the electromagnets to the mechanical device stator

Speed controller phase uses the result obtained from the image processing module as an input to reduce the speed of the vehicle. In this module speed reference identified from CNN classification sent to speed controller controls the three phase inverter to send respective power supply to BLDC motor to run within the range speed limit rules in roads

4. CONCLUSION

Main objective of the system is to reduce accidents because of neglecting traffic rules and not considering speed limit sign boards. Performance of the system is purely based on input image and accuracy of speed limit sign board detects by the image processing algorithm. In future, to overcome the issue we can improve CNN Classification method and image processing algorithm in order to identify the sign board more accurately and quickly. By using this proposed system in every vehicle can reduce 30% of accidents happens because of overspeed and neglecting traffic speed limit sign boards.

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