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Traffic Object Detection and Recognition Systems

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ABSTRACT

You are already known about automatic vehicles in which the car can control itself. Cars must clearly understand and recognize all traffic signals. Many organizations named Uber, Google, Tesla, Toyota, Mercedes-Benz, Ford, Audi and others are getting involved on this technology to enhance their experience by adding features like autonomous driving and putting efforts in maximum innovation in this field. As a result, if we want to work with this technology accurately it depends on how the vehicle can distinguish between different signs such as no entry, height limit, turning signs, school signs, hospital signs, and many others. Traffic sign recognition is the process of differentiating the traffic signals into similar classes. Here we created a deep-neural-network system that can differentiate traffic signs.

Using this system, we can analyze and process different traffic signals which plays a major role in all automatic vehicles. By using CNN, we propose an automated system for traffic sign detection, firstly conversion of original image to grey scale image takes place with the help of some vector machines used there, after that the convolutional-neural network is applied with limited and learnable layer for analyzing. Here it tries to crop the image boundary as per the original have.

Keywords : Convolutional Neural Networks, Traffic Sign Recognition, Image Processing, Automatic Vehicle

I. INTRODUCTION

Traffic signals are used as marker can be found on each roads stating different signals to various vehicle drivers, climbers, cyclists and many more [4]. Traffic signal recognition (TSR) has become leading research topics result in improvement in road safety. This can have control on vehicle by itself. While operating vehicle input is generated by visuals the activity of motor driving is performed by considering all these factors at present. None system has developed that can take visual input as same as human. The attempts of motor operator can be improved by focusing on this category also some well-known mortally related problems such

as wakefulness frazzle and many more can be resolved conquering the field of driving safety [6]. The main aim of TSR systems was to deal with the similar looking signals in an accurate manner improving the more road safety measures. As we know it is not as simpler as it looks. Like the human brain and computer processing are way different from each other. It is totally dependent on color and design recognition, based on this data it gives the result. Even this data can't also make simpler, it still remains that much inadequate [3]. While it can be improvised by adding some knowledge and intelligence to the system. It is important to input full data for processing. A proper and complete data is required for processing. Taking an example of night time if camera isn't good to take clear image due to bad lighting condition or very dark condition then the further process will not occur as per the expectation. Using data sets of different countries can help in improving the functionality of the system.

II. Literature Survey

This paper brings you a step forward in field of traffic sign recognition. I know a lot of work is to done but a step at the beginning is needed a lot. This can be a great move towards the field of automatic vehicle. As it can be beneficial in terms of safety [2]. Automatic vehicle operation is going to be a great revolution in field on automobile industry. As we know, whenever we go out on road on each step, we can see different markers placed on the sides of roads stating different actions. It has capacity to process a lot of images with high accuracy. Here we used dataset from Kaggle which already contains. tons of images containing different signs mentioned in different lightning conditions [5]. Having dataset containing signs for different countries is much beneficial as we can use a single system in different countries with only several modifications.

Automatic vehicle is going to be a great innovation in field of automobiles. Many companies have already started working on it as it can be a great work in terms of safety as well. It was started in early 1984 only in Japan. We are so many years forward now so with the help of new techniques and innovations we can implement this system in an efficient way [7]. Giving vehicles their own brain for classifying different symbols already present on roads as a marker can result in lower on road accident as well as can introduce much more safety for pedestrian as well. Because sometimes we can't make attention on some points in a journey, in this situation it can be a beneficial as it has automatic central system which will beep or make aware the driver by visuals on making some faults.

III. Existing Model

There are many questions regarding traffic signal recognition (TSR). The initial work on autonomous traffic signal recognition was presented in 1984 in Japan. For innovation in this field an effective traffic-signal-recognition technique and to overcome all of the possible exceptions different developer presented their unalike models. Later on, the pre-processing categorizing analyzing and output processes of an efficient TSDR-system were categorized into different functionality [1]. The only aim of pre-processing is to intensify the image quality of signs photographs. Separate functions are proposed to overcome the effect of landscape processing on the unit test images, basically based on double key processing shape and color. The main aim of traffic signal discovery is to single out regions of interest (ROIS). After a large-scale survey on day- to-day life traffic sign in not more than the input sample. Various techniques for identification of these regions of interest have been already implemented. HIS/HSV metamorphosis color indexing YCbCr[8]. Color space classification and region growing are some of most leading color-based techniques. Color data can be affected by many factors including weather and light so to overcome this shape-based algorithm are included in the identification phase.

IV. Proposed Model

In actual world it is not possible to move forward without stating CNN when it comes to recognizing techniques and algorithms when it was got to known that CNN can be used in image bracketing a huge revolution took place and a sudden interest in CNN reignited and began using it in field of object recognition CNN are quite efficient when utilized in an automatic form [5]. According to Sermanet-et-al, many calculations can be reutilized in looping zones. They proposed an efficient network system that can be used to recognize items with its bounding as well. Taking reference from existing model we proposed our model in which we used CNN for the classification process. As mentioned, it is quite efficient system, as per the expectation it performed as well. It can process 100 tenders in nearly 3 seconds. Previously it uses a deep network process which is unnatural and usually a time-consuming process. Whereas our system uses a CNN which is 100 faster as well as much more efficient and also gives a higher accuracy nearly about 95.87%.

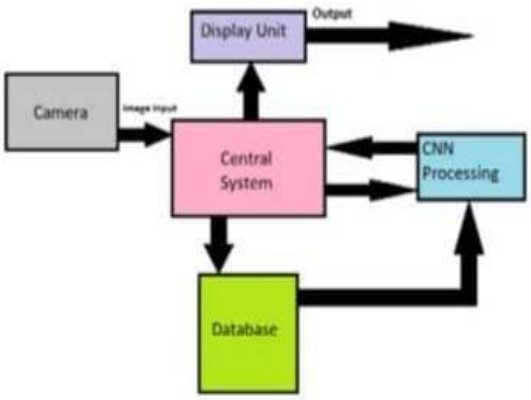

Fig. 1. System Architecture

A. System Architecture

Here it introduces a technique which improves the identification system by adding both primary and some external signals. The system is divided into different stages as capturing, processing and classification (which is a supervised machine learning algorithm where model have to be trained by the programmer) [9]. Additional data processing is needed in this model as many forms of traffic signs is there, some of them are height of vehicles is mentioned on some of the signs as well as speed limit. The limitation can be seen as mentioned 40,50,60,80.

B. Procedures

As we can see in fig 1 the traffic sign recognition follows:

1. At First the input is taken through the camera present in the vehicle.
2. After that the image is transferred to the automatic central system proposed in the vehicle.
3. Samples of images are already stored in the database of the system.
4. Image taken and from database are finally transferred for CNN procedures.
5. After several processing it respond back to the central system of the vehicle.
6. Central System give response to the display/audio unit present in the vehicle.
7. After receiving signal from the central system the output unit finally gives the output.

V. Results and discussion

Now let's talk about the functionality of the model. Here we can process a large number of images captured in different lightning conditions. Basically, the system asks for a sign's image [4]. We can enter manually or it can either get it by the camera module present in the system/vehicle. The dataset used here contains a lot of images having different signs mentioned. For testing we entered an image present in the data set only. Firstly, it has a neat Ul which only asks for the image. After that an option is present to upload an image. Here we enter the sign we want to know or needed by the vehicle for operating [10]. After choosing the image an option is present there for classification. We just need to click on that option.

Finally, the system gives the output as per the symbol entered.

Fig. 2 User Interface

Fig 2 represents the GUI implementation of traffic sign recognition model where model provides user with the option to upload an image by clicking on button provided in the interface namely 'Upload an Image' as seen in fig 2 for its classification.

Fig. 3 Classification of Face

After user uploads an image (which can be sourced from a real time image capturing system or can also be uploaded from a static database, as per user requirements) for its classification the model provides a button to user namely 'Classify Image as shown in fig 3 and after when user clicks on this button the model processes the uploaded image and classifies it based on convolutional neural network (CNN) technology and presents the results of classification of image on the top center part of GUI as shown in fig. 4. As we have used traffic dataset, so for this model we have to enter the image manually to the system.

Fig. 4. Output

As we can see in above fig. 4 the model gives an output for the uploaded image taken from the used dataset manually. This model can classify thousands of images in different lighting conditions as well as different categories. It gives a higher accuracy on image processing.

Fig. 5. Loss Chart

We get this graph as an output stating the accuracy and loss after execution of model. Fig. 5 represents epoch on the x axis and loss on the y axis and training loss is represented by a blue line and val loss is represented by an orange line.

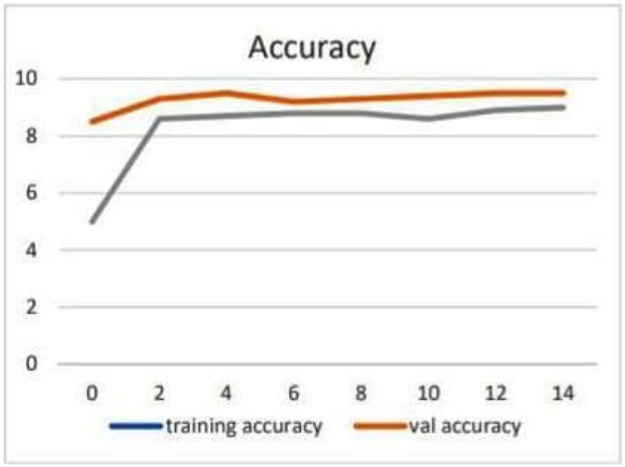

Fig. 6 Accuracy Chart

Fig. 6 represents epoch on the x axis and accuracy on the y axis training accuracy is represented by a blue line whereas val accuracy is represented by an orange line, which is 95.87 on its highest level.

VI. CONCLUSION

The system developed in this study make it one step more forward infield of automatic driving system. But there still a progression is needed. In this model the colors and patterns are used for categorization. Reflection of light from the sign panel can be a big problem in day time and night time both also if the sign is torn or broken can also affect in recognition. Another important factor to be seen is night-time recognition, the signs can't be recognized if there is too much darkness as camera need optimum lighting condition. Using more datasets of various countries can be helpful in improvement of the system. It can be integrated in driver's assistance software system as well as a component part in automated driving software system. It can also be enhanced to ensure more safety while driving.

VII. FUTURE SCOPE

GTRSBS latest dataset in our system. As per a testing appraisal on used dataset our system intensifies result's accuracy when contrasted with nearly similar methods. Here TSR system gives an accuracy of 95.87% as output when CNN is utilized.

VIII. Limitations

The recognition system is device dependent. It means that the high end device we have the higher accuracy we get. Hence it is recommended to implement this system in high end devices.

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