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Traffic Sign Detection Using CNN

Sangam Prasad[1], Shankar Desai[2], Sandeep kumar[3], Adarsha M V[4], Dr. R.Guru[5]

BE Student, Department of Computer Science and Engineering, JSS Science and Technology University, Karnataka, India[1-4]

Assistant Professor, Department of Computer Science and Engineering, JSS Science and Technology University, Karnataka, India[5]

Abstract: Traffic sign detection and recognition plays an important role in expert systems, such as traffic assistance driving systems and automatic driving systems. It instantly assists drivers or automatic driving systems in detecting and recognizing traffic signs effectively. In this paper, a novel approach for real-time traffic sign detection and recognition in a real traffic situation was proposed. First, the images of the road scene were converted to grayscale images, and then we filtered the grayscale images with simplified Gabor wavelets (SGW), where the parameters were optimized. The edges of the traffic signs were strengthened, which was helpful for the next stage of the process. Second, we extracted the region of interest using the maximally stable extremal regions algorithm and classified the superclass of traffic signs using the support vector machine (SVM). Finally, we used convolution neural networks with input by simplified Gabor feature maps, where the parameters were the same as the detection stage, to classify the traffic signs into their subclasses. The experimental results based on Chinese and German traffic sign databases showed that the proposed method obtained a comparable performance with the state-of-the-art method, and furthermore, the processing efficiency of the whole process of detection and classification was improved and met the real-time processing demands.

I.INTRODUCTION

In order to solve the concerns over road and transportation safety, automatic traffic sign detection and recognition (TSDR) systems have been introduced. An automatic TSDR system can detect and recognise traffic signs from and within images captured by cameras or imaging sensors. In adverse traffic conditions, the driver may not notice traffic signs, which may cause accidents. In such scenarios, the TSDR system comes into action. The main objective of the research on TSDR is to improve the robustness and efficiency of the TSDR system. To develop an automatic TSDR system is a tedious job given the continuous changes in the environment and lighting conditions. Among the other issues that also need to be addressed are partial obscuring, multiple traffic signs appearing at a single time, and blurring and fading of traffic signs, which can also create problems for the detection purpose. For applying the TSDR system in a real-time environment, a fast algorithm is needed. As well as dealing with these issues, a recognition system should also avoid erroneous recognition of nonsigns. The aim of this research is to develop an efficient TSDR system which can detect and classify traffic signs into different classes in a real-time environment. For detecting the red traffic signs, a combination of colour and shape based algorithm is presented which will up the procedure of the detection stage and for recognition SVMs with bagged kernels are introduced. Traffic sign recognition has high industrial potential in intelligent autonomous vehicle and driver assistance system.improvement in traffic quality and safety cannot be achieved without correctly applying and maintaining road traffic signs, traffic signals and road markings. Traffic sign recognition plays a very important role in the driver assistant system to dis-burden drivers as well as in intelligent autonomous vehicles

II. LITERATURE SURVEY

D. Kellmeyer and H. Zwahlen [1] published ”Detection of highway warning signs in natural video images using color image processing and neural networks,” presented at 1994 IEEE World Congress on Computational Intelligence, Orlando, Florida, USA, 1994.used back propagation neural network to recognise warning signs. The input to the network which was a 10x10 boundary square representing the yellow region inside the warning sign, is fed to a 100 neuron input layer. The output-layer contains two outputs either “sign” or “non-sign”. A hidden layer of 30 nodes was used. The system could detect 55 percent of warning signs in 55 images. For large signs, 86 percent of the signs could be detected. D. Ghica, S. Lu, and X. Yuan [2] published ”Recognition of traffic signs by artificial neural network,” presented at IEEE Inter. Conf. Neural Networks, Perth, W.A., 1995. carried out recognition by a neural network which consisted of three sub-networks, a classification sub-network, winner-takes-all sub-network (Hopfield network), and a validation sub-network.J. Stallkamp, M. Schlipsing, J. Salmen, and C. Igel [3] published “The German traffic sign recognition benchmark: a multi-class classification competition,” in Proc. IEEE IJCNN, 2011, pp. 1453–1460. This paper proposes the design and analysis of the “German Traffic Sign Recognition Benchmark” data-set and competition. The results of

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the competition show that state-of-the-art machine learning algorithms perform very good in the challenging task of traffic sign recognition. The participants achieved a very high performance of up to 98.98% correct recognition rate which is similar to human performance on this dataset.S. Houben, J. Stallkamp, J. Salmen,M. Schlipsing, and C. Igel [4] published "Detection of traffic signs in real-world images: The German traffic sign detection benchmark," in Proc. IEEE IJCNN, 2013, pp. 1–8. This paper proposes a real-world benchmark data set for traffic sign detection together with carefully chosen evaluation metrics, baseline results, and a web-interface for comparing approaches. In their evaluation, they separate sign detection from classification, and also measured the performance on relevant categories of signs to al-low for bench-marking specialized solutions. The considered baseline algorithms represent some of the most well liked detection approaches such as the Viola-Jones detector based on Haar features and a linear classifier relying on HOG descriptors. Further, a recently proposed problem-specific algorithm utilizing shape and color in a model-based Hough like voting scheme is evaluated.

III. METHODOLOGY

Traffic Sign Detection model can be summarized into 4 steps. They are
• Explore the datasets
• Build CNN model
• Train the model and validate
• Test the model with test datasets

1) Explore the datasets

Our dataset folder contains subfolders each representing a different class. Dataset consists of around 50000 images which are classified into 43 classes. With the help of the OS module, we iterate over all the classes and append images and their respective labels in the data and labels list.

2) Build CNN model

To classify the images into their respective categories, we will build a CNN model (Convolutional Neural Network). CNN is best for image classification purposes

We are using Keras' Sequential API to build our Model. It undergoes several layers such as Conv2D, MaxPooling2D, ReLu, Flatten, Dropout, Dense. Two sets of Convolution, RELU, Convolution, ReLu followed by MaxPooling layer.These sets of layers deepen the network by stacking two sets of Convolution, RELU, Batch Normalization layers before applying max-pooling to reduce volume dimensionality. The head of our network consists of two sets of fully connected layers and a soft-max classifier. Dropout is applied as a form of regularization which aims to prevent over-fitting. The result is often a more generalized model.

3) Train the model and validate

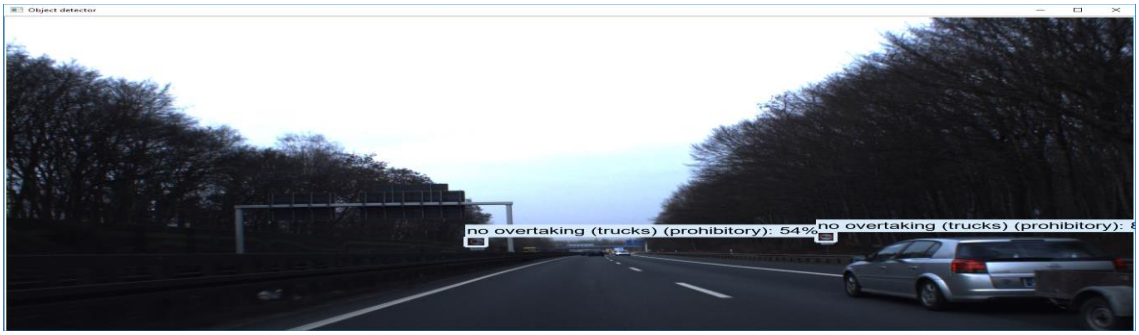
After building the model architecture, we then train the model using the model.fit(). This process can be summarised as follows. Loading our training and testing split from the dataset, Preprocessing of the images, Training our model, Evaluating accuracy of our model, Serializing the model to disk so we make predictions on new traffic sign data

4) Test the model

This process can be summarised as Load the model from disk where we stored after training the model, Detect traffic signs from webcam, Alert with voice assistance(build using pyttsx python library)

IV. RESULT AND CONCLUSION

GUI Interface



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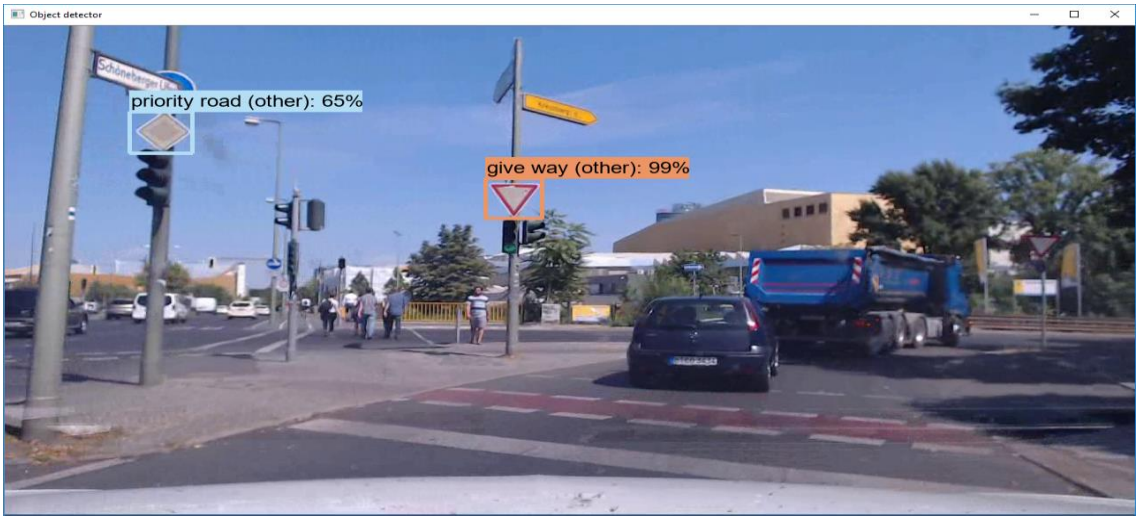

V. CONCLUSION

This system is used to save valuable life by preventing accidents due to the negligence of traffic signs boards. The project is mainly focused on the majority of the society who used to travel especially the night travelers and it also helps traffic police to reduce the traffic issues. The main idea for this project is from the road accidents that take place due to driver's ignorance of traffic signs. People die in these road accidents which is a great loss for the family. It provides maximum efficiency and is user friendly. At present 40% percentage of deaths that take place in a day are mainly due to road accidents. By our project we expected that we can able to reduce it up to 20%.

VI. ACKNOWLEDGEMENT

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