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TRAFFIC SIGN DESCRIPTION SYSTEM

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ABSTRACT:

Traffic Sign Recognition is used to give an audio description to a image sign traffic signs and thus warn a driver, and command or prohibit certain actions. A fast real-time and robust automatic traffic sign detection and recognition can support and disburden the driver and significantly increase driving safety and comfort. Automatic recognition of traffic signs is also important for automated intelligent driving vehicle or driver assistance systems. This paper presents a study recognize traffic sign patterns using Neural Networks technique. The images are pre-processed with several image processing techniques, such as, threshold techniques, Gaussian filter, Canny edge detection, Contour and Fit Ellipse. Then, the Neural Networks stages are performed to recognize the traffic sign patterns. The system is trained and validated to find the best network architecture. The experimental results show the highly accurate classifications of traffic sign patterns with complex background images and the computational cost of the proposed method.mental results
KEYWORDS: Automatic, Neural network, Traffic signs, Recognition.

1. INTRODUCTION

The data base has been divided into: train, validation and test set. The first one is used to train the MLP. The second one is used as validation set during the MLP training to improve generalization. The last one is used to evaluate the performance of the trained MLP. To select network architecture for both generalization and approximation ability of a feedforward neural network, the number of layer and the number of hidden neurons per layer should be identification. Basically, using a single hidden layer tends to interact with global problems, therefore, in this paper, the single layer perceptron is employed with the verification of the number of hidden nodes. To find the hidden neurons for an appropriate network architecture, the use of a cross- validation approaches to cite. The method is to divide data set into a training set called training and a test set test. Then subdivide learning into two subsets: one to train the network learning, and one to validate the network validation. Train different network architectures on learning and evaluate their performance on validation. The best network has been selected and finally retrains this network architecture on training. The test set is utilized to test for generation ability of network the above figure shows the training set . The training set consists of two main data which are signs without problem and the signs with some distortion problems. The distortions are the stain color, noise, pixilated distortion, blur, and color distortion. These two set are fed to train the network simultaneously. shows the validation data which are different from the training set

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2. RELATED WORK

This section for highlights some recent related research works. Autonomas car is a recent research topic. We found many researches on this field and the working progress is too high.In 2019, Wei-Jong Yang et al. proposed an approach to recognize traffic sign. They worked with shaped based detection algorithms and for classification purpose they choose convolutional neural network. After simulation they got 97% sign recognition accuracy. In this paper author proposed SVM based classification algorithm to recognize traffic sign. Here, they considered 8 types of road signs. For training purpose they used 600 different images for each signs and for test purpose 120 images was considered. In this paper, they tested individual signs with real data and their accuracy level was 66.6% to 100%. in 2017 proposed a Traffic Sign Recognition (TSR) system. Here, they were
used HSV color model and deep CNN for automatic features extraction as a classifier. After this study, they achieved 97% accuracy. used Convolutional Neural Networks for recognizing traffic sign. Here, they found 99.18% accuracy on using Belgium Data and German Traffic Sign Benchmark (GTSDB). Where as they got 99.50% accuracy almost 0.32% improvement at accuracy. In 2016 at paper , Di Zang et al. classified their dataset using Support Vector Machine then detection part is done by CNN. Their accuracy was almost 96.50%, and they used GTSDB dataset. In 2017 at paper ,Ardianto et al. used SVM to classified object and got 91.5% accuracy in detection purpose and they also used GTSDB dataset. They improved it to add a feature called Histogram of Oriented Gradients (HOG) that help to increase its accuracy up to 98%. In 2017 Shi et al., applied SVM to detect which region of image contain a traffic sign.

The GTSDB holds complete 900 images, where 800 for training and 100 for propose a Single Shot Detector algorithm combine with multi feature fusion and they called it MF-SSD. However, in this time they divided total 900 images into 600 training and 300 as a test data to detect traffic sign .Their main goal was to find out traffic sign detection methods to locate the regions-of-interest that contain traffic sign. They divided the methods into 3 steps- focused color, shape, and finally considered learning based methods . In 2016, for detecting and classifying the traffic signs they proposed an approach. It has 2 main steps: road sign detection, after that classification with recognition. To classify the traffic sign they used neural network and to complete this work they picked four types of traffic signs: Stop, No Entry, Give Way, and Speed Limit Sign. Considered total 3 hundreds sets images, and they got 90% and 88% accuracy for detection and recognition purpose . So, detection and recognition of traffic sign is necessary to build an autonomas car driving system.

3. PROPOSED SOLUTION

The purpose of this thesis is to explore different methods for helping
computers interpret the real world visually, investigate solutions to those methods offered by the open-sourced computer vision library, OpenCV, and implement some of these in a Raspberry Pi base application for detecting and keeping track of objects. The main focus rests on the practical side of the project. The result of this thesis is a GNU/Linux based C/C++ application that is able to detect and keep track of objects by reading the pixel values of frames captured by the Raspberry Pi camera module. The application also transmits some useful information, such as coordinates and size, to other

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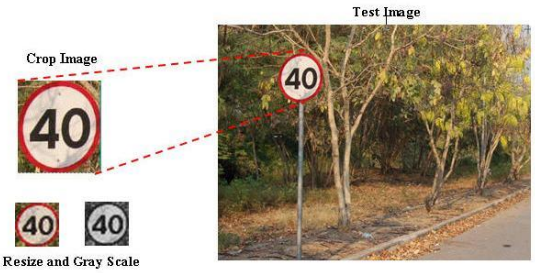
computers on the network that send an appropriate query. The source code of the program is documented and can be developed further.



Example image of traffic sign processing

4. **METHODOLOGY**-convolutional neural network

Convolutional neural network is a part of deep learning approch. Convolutiona neural network represents a vast breakthrough in image recognition. Many research fields focused on CNN to achieve the highest accurate result. A CNN model constracts with following four layers:

- Convolutional layers
- Relu function
- Polling layers
- Fully connected layer

Convolution is the first step to create complete network. Here, Convolutioal
operates on two images in 2D format. One as a input image, and another output image. It helps to understand the features from images by making relation between pixels. A convolution of two funcation f and g is defined with following the equation

$$(f * g)(i) = \sum_{j=i}^{m} g(j) * f(i - j + \mathrm{m}/2)$$

Next, relu is placed after convolution operation. This “relu” fuction considered for executing non-linear operation. It performs on pixel wise operation and sets 0 insted of all negative values. There are other non-linear functions such as tanh or sigmoid also used in CNN but “relu” performs best amon them in different situations. On the other hand, Polling progressively decrese the size of the input images. Polling helps to decrese the number of dimentions and the number of claculation required. Polling also helps to control overfitting. There are many types of polling. But in this paper we used max polling.

Fully connected layer, combines our features into output stage. It predicts the class level with better accuracy. The error is computed and then occured back propagation. This process is continue layer by layer. A sample flowchart for our proposed model on CNN and SVM is given in figure

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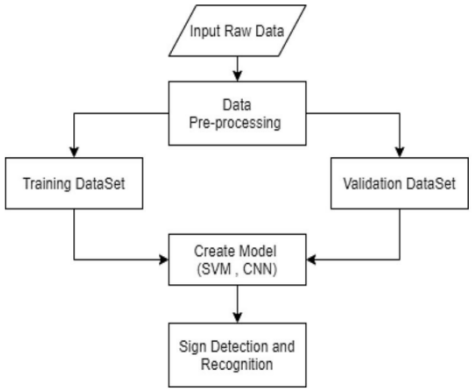

Fig. 4.1. Flowchart of our CNN model

5. DATA COLLECTION AND PREPARATION

To complete this study a dataset was built from cropping video frame. We also collect some random video and crop traffic sign area to build a real dataset. Then, we categorized its own classes and split the whole data into training and validation dataset. We have total 1200 images to propose SVM and CNN model.We have considered 12 different classes and each class completed with 100images. Split the whole dataset as training and validation purpose. To generate a model with SVM, 80% data for trining and 20% data for testing purpose is considered. Meanwhile, for CNN classification we have divided dataset into two classes train and validation. For training purpose data volume was 1080 images and 120 images for testing purpose, where total 12 different traffic signs was contained. Table 1 to represnt the selected 12 traffic signs. Here, we illstrated evey traffic sign with sample an image.In the next section, we are attending to elaborate the work procedure of our proposed approach to detect and recognize traffic sign.

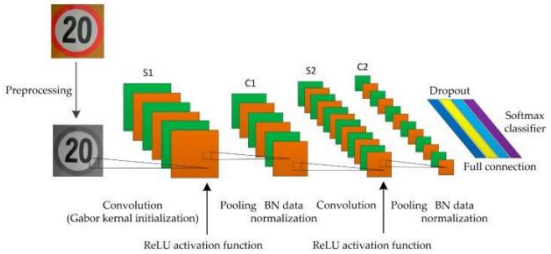

Image extraction process

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Description	Traffic Sign	Description	Traffic Sign
Turn Left		Danger	
Stop		40km/h	
Only Left		30km/h	
Only Right		Turn Right	
Road Merges Ahead		Pedestrian	
Speed Breaker		Bike	

Sign description table

5. CONCLUSION

This study discussed Traffic Sign Recognition (TSR) using Neural Networks technique. The images were pre-processed in stages with image processing techniques, such as, threshold technique, Gaussian filter, Canny edge detection, Contour and Fit Ellipse. Then, the Neural Networks stages were performed to recognize the traffic sign patterns. The main reason to select this method is to reduce the computational cost in to facilitate the real time implementation. The first strategy is to reduce the number of MLP inputs by pre-processing the traffic sign image, and the second strategy is to search for the best network architecture which reduced complexity by selecting a suitable error criterion for training. The system were trained with training data set, and validated with validating data set to find the best network architecture. The cross-validation technique was implemented with training data set, validating data set, and test set. The experiments show consistency results with accurate classifications of traffic sign pattems with complex background images. The processing time in each frame of image is provided which is satisfied to apply in the real applicationall of the above described algorithms OpenCV {RGB, HSV (color segmentation), Region of Interest, Speeded-Up Robust Features}, Convolutional Neural Networks, Normal Bayes Classifier contribute to the research done in development of this software: a highly accurate with fast response and robust Road Signs Detection and Recognition. The application was designed in android studio with the help of OpenCV library programmed by Java language. We have used the Region of Interest (ROI) with Speed Up Robust Feature (SURF) for object recognition. And Red Green Blue model, Hue Saturation Value 44model for color segmentation during day light and dark respectively. The results achieved from the experimentation cited above prove that our system is a real-time video/image processing software when exposed to a video sequence rather than to a standard approach of traffic sign detection in static images. The results of the test run also prove the convenience of the system. Examining the publicly available data set in real time shows that this system has fast processing speed and robust traffic sign recognition. This application has numerous applications like it will come in great aid to drivers with dis- abilities. In addition to this, it can help the drivers detect in advance the signs in critical weather conditions like fog, rain, thunderstorm, snowfall and so on. This application's programming interface can be integrated with Maps and Navigation software which in turn can give seamless detection of the traffic signs with speech notification during navigation. Not only this, it can

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tell at what speed the driver is going on currently and at what speed he/she needs to turn and that too in which direction. This is a very smooth application with precise and accurate predictions because of its design (coded in Java making the application faster compared to applications coded in Python) and the usage of OpenCV with neural networks

6.RESULT & VALIDATION

These are the outputs which are observed for our project while under working. Fig 5.1 sign recognition by sign board detectionn this Deep Learning project, we will build a model for the classification of traffic signs available in the image into many categories using a convolutional neural network(CNN)

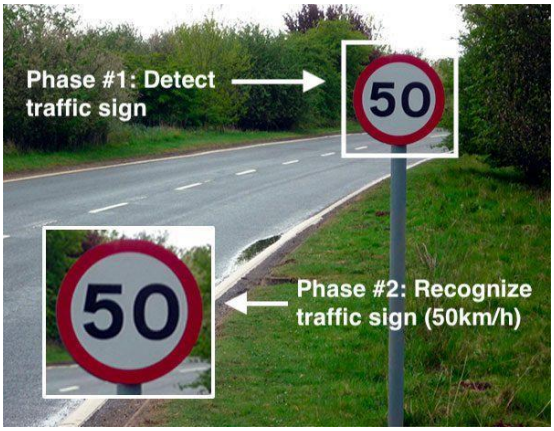

Fig 5.1 sign recognition by sign board detection

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