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TRAFFIC SIGN RECOGNITION SYSTEM

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ABSTRACT

Traffic Sign plays an important role in our day to day life. In this modern era each and every one of us own vehicles, which leads to the advent of heavy traffic. Due to heavy traffic and improper traffic monitoring , there is a high probability of road accidents. According to a recent survey taken all over the world, majority of deaths are caused due to road accidents. Also the occurence of accidents may be due to several reasons like carelessness of drivers in noticing the traffic signs ,may be due to the varying lightning conditions or weather calamities there by leading to blurry vision of traffic signs in the roadside. So we are in need of a Traffic Sign Recognition System (TSRS) which could warn the drivers about the upcoming traffic hurdles in their way.

Keywords: *Convolutional Neural Network, Driverless vehicles assistance, Feature extraction, Traffic sign recognition, Support vetor machine.*

I INTRODUCTION

Traffic Sign Recognition System is a vital system inorder to assist in driverless cars and automated vehicles. It could actually guide the drivers in warning them about the upcoming hurdles in their path. This could actually save human lives and thereby prevent the uncessary deaths and incidents.This system works by capturing the imges via camera and the captured image is analysed internally by the model. After analysing , the model will detetct and classify the given input and it will be warning the drivers about the traffic signs on theeir way.

II PROPOSED SYSTEM

The proposed methodology makes use of a camera placed infront of the vehicles. The camera captures the images on the road side and collected input is given as trainind data for CNN.The Convoultional Neural Network has three main parts: Input layer, Hidden layer and Output layer. The input image is passed via the input layer. Then the fed input is processed by the hidden layers inside CNN. As the number of hidden layers increases , the accuracy and performance is also increased. Then finally output is given out via output layer.Here CNN with SVM offers good performance than CNN with ADAM optimizer.

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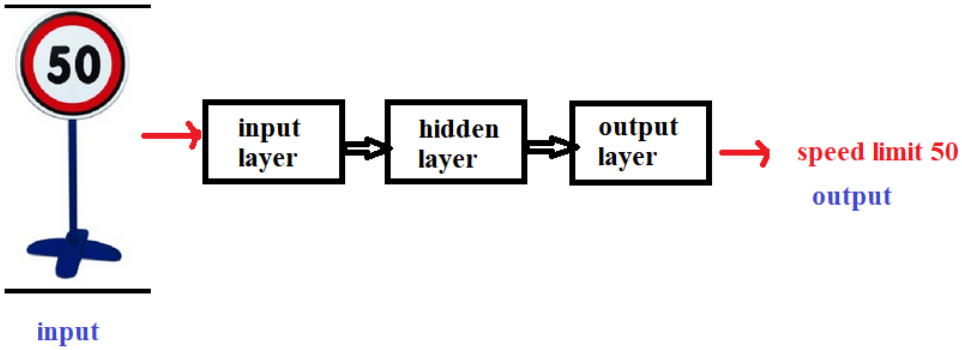


Fig 1: Overall working of Traffic Sign Recognition inside CNN layers

III DATASET PREPROCESSING AND COLLECTION

The data set which we have used is German Traffic Sign Recognition Benchmark(GTSRB). It has nearly 43 classes of traffic signs.It has both the training and testing folder.The training folder has more than 34,799 images. The tesing folder has more than 12,630 images. The validation part has 4410 images. The dataset which we have collected many contain null values , inappropriate values or even missing values. So we are in need to clean those dataset and make it suitable for predicting purposes. This process of cleaning the dataset is called Data Preprocessing. All the images are in the form of 32 x 32 x 3 format(width x height x RGB). If the dataset is unbalanced, we have to make it as balanced by using a technique called image augmentation. After this gray scaling and image normalisation takes place .

IV TRAINING , TESTING AND SPLIT

After preprocesing the dataset, we have to split the given dataset into testing, training and validation set. The training dataset is used for training the model . The learning rate, epochs and batch size are the main factors to be considered in training part. Epoch is nothing but how many times the dataset is read by the model. The batch size depicts how our dataset is splitted into different batches for loading purpose. Then the dataset is also allocated for testing purpose too. The training data occupies 75% and testing data occupies 25% . The testing data is utilised for testing the accuracy and output verification.If the expected result and obtained result is matched, then the model is successful.

V ALGORITHM IMPLEMENTATION

In the study, we have chosen two different varieties of algorithm- CNN with SVM and CNN with Adam Optimiser.Convolutional Neural Networks has input , hidden and output layer. The hidden layer contains multiple Convolutional layers and pooling layers inside it. CNN has neurons within them just like the neurons present inside the human brain. These neurons plays an important role in passing and receiving stimuli. Support Vector Machine is a kind of supervised learning that is mostly used for classification

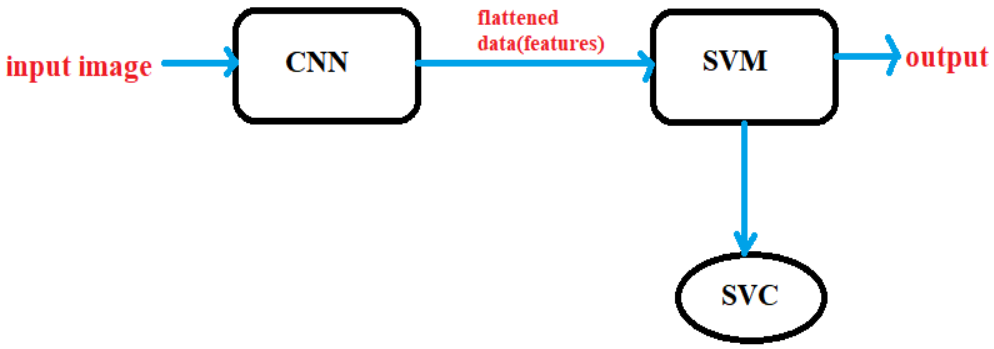
purpose rather than Regression .Here we have developed a new hybrid combination algorithm by mixing CNN with SVM. Initially the input is fed to the CNN. After this the input image is processed ,predicted and finally the output is obtained. The obtained output is fed as training data for the SVM. The SVM in turn process the solution again and finally produces the enhanced and more accurate results . This combination offers much more performance and accuarcy.

VI CODING

We have made use of varieties of library packages like Numpy, Pandas, Matplotlib, Keras and Tensorflow. After installing the required libraries we have trained and tested the model. We have first implemented the existing solution (i.e) CNN. After this we have implemented our own new combination of CNN with SVM. CNN layers include:

1. **Convolutional Layer:** This layer is responsible for feature extraction with mathematical operation of convolution (i.e) the dot product.
2. **Pooling Layer:** This layer gives the maximum pool value by reducing the dimensions of the image and thereby reduces the overfitting problem.
3. **Fully Connected(FC) Layer:** This layer ensures the connectivity of neurons between two different layers.
4. **Dropout Layer:** This layer drops the unwanted neural connectivity inorder to avoid overfitting issues.
5. **Dense(output) Layer:** Dense layer is the final output layer where we obtain the processed result. It is where the classification activity takes place.

Adam Optimiser is used here inorder to minimise the data loss . The flattened output from CNN (i.e) the features are given as inout for the SVM inoreder to increase the performance and thereby increasing the accuracy. SVC(Support Vector Classifier) is considered to be the most robust and highly preferred algorithm for classification of linear data. So the flattened data from CNN is given to SVM (i.e SVC) and output is obtained.



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VII RESULTS

The Traffic Sign Recognition System can be implemented by using different algorithms like CNN, SVM, hybrid combination of CNN with SVM and also with CNN with Adam Optimiser. Here by increasing the epochs , the test accuracy can be increased. If the batch size is increased , the test accuracyy is decreased.

epochs↑ = accuracy ↑

batchsize↑ = accuracy↓

Here we have designed the GUI by which the user can interact with the model and thereby visualise the output (i.e) the predicted traffic sign . The accuracy obtained with CNN and SVM is much more when compared to other algorithms. So the below table depicts the overall comparison of all the algorithms used:

Algorithm Name	Accuracy obtained
SVM	72%
CNN with Adam optimiser	92.23%
CNN with SVM	99%

The below screenshot shows the sample output obtained :

VIII ADVANTAGE AND DISADVANTAGE:

Advantages:

- ✓ Traffic could be regulated Unnecessary accidents could be prevented
- ✓ Accuracy is more when compared to existing ones

Disadvantage:

- ✓ Training of data model is quite time consuming
- ✓ Requires huge dataset inordr to improve the accuracy

IX CONCLUSION

Already existing system have made use of CNN algorithm.Thus we have developed traffic sign recognition system by using CNN with Adam optimiser and also with CNN with SVM . The accuracy obtained by using CNN with Adam optimiser is 92.23%. Then by using CNN with SVM combination we have obtained 99% accuracy nearly.With the development of this TSRS , unnecessary road accidents and traffic congestion can be reduced. In future, with the advent of heavy data we have the train our model with the huge dataset and thereby increase the epoch value , so that the accuracy and performance could be enhanced.

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