Traffic Sign Recognition using a Multi-Task Probabilistic Neural Network

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Abstract— This paper offers a fresh data-driven system to diagnose all sets of movement cryptograms, which contain equally symbol-based and text-based cyphers, in video arrangements apprehended by a camera straddling on a flatcar. The organization comprises of three steps, transportation sign districts of curiosity (ROIs) withdrawal, ROIs development and cataloguing, and post-processing. Transportation sign ROIs from each surround are first take out using maximally stable extremely districts on gray and normalized RGB channels. Then, they are superior and gave to their comprehensive classes via the projected multi-task convolutional neural grid, which is qualified with a large volume of facts, plus synthetic traffic signs and images labeled from street views. The post dispensation lastly blocs the results in all borders to make an acknowledgment result. Investigational results have proven the success of the planned coordination.

Key words: Open Source, Computer Vision, Neural Networks, Parallel Computation, Machine Learning

I. INTRODUCTION

To recognize traffic signs in an image, most popular methods include two steps: Detection and Classification. There are a lot of researchers working on this challenging task with the already popular or specially designed vision algorithms. However, it is not easy to compare these methods since there did not exist a public available data set until the release of the German Traffic Sign Recognition Benchmark(GTSRB) and German Traffic Sign Detection. Traffic sign recognition plays an important role in Driver Assistance Systems and Automated Driving. However, this task is not easy for a computer because of the large variations in visual appearance of traffic sign images due to partial occlusion, different viewpoints, illuminations and weather conditions. Traffic sign recognition contains two parts: detection and classification. The purpose of detection is to find the locations and sizes of the existing traffic signs in an image, and the task of classification is to assign a class label to each detected traffic sign.

II. EXISTING SYSTEM

Traffic sign ROIs from each frame are first extracted using maximally stable extremely regions on gray and normalized RGB channels. They include only three categories of symbol based traffic signs with regular shape and color which are relatively easy to detect and classify, while text-based traffic signs are more challenging. The GTSDB only includes static images, but in real scenarios, continuous video captured by an in-vehicle camera is useful for detection and classification .The final task of traffic sign recognition is to know the existing signs in a scene, but the two benchmarks separate it into two independent tasks with different datasets.

A. *Disadvantages of Existing System*

1) Less accuracy.
2) Not efficient classification
3) Feature extraction process required time is more.

III. PROPOSED SYSTEM

Our traffic sign recognition system consists of three stages: traffic sign regions of interest (ROIs) extraction, ROIs refinement and classification, and post-processing. First, for each frame in the video, traffic sign ROIs are detected with Maximally Stable external Regions (MSERs) on multi-channel images. Then, to refine and classify the ROIs, a multi-task Probabilistic Neural Network (PNN) is proposed. Specifically, the ROIs are first fed to a binary classification layer, and only the positive ones are further classified with a deep multiclass classification network. The network is trained end-to-end with a large number of data, which consists of training data, synthetic signs and images labeled from street view. Finally, recognition results from each frame are fused to get the final results of the video.

A. *Advantages of Proposed System*

1) High accuracy.
2) The system is convenient and secure for the users.
3) Focused on text based traffic signs.
4) Less human interaction.

IV. SYSTEM ARCHITECTURE

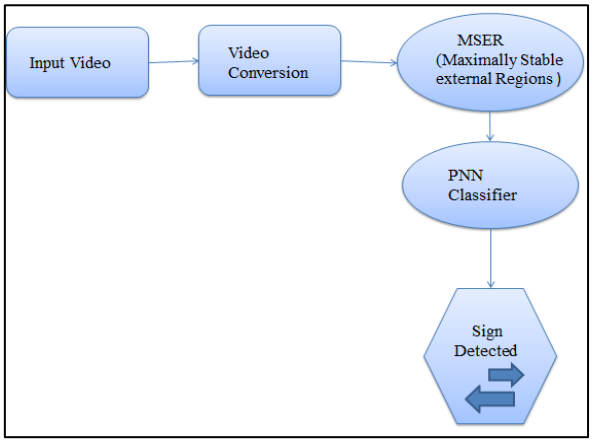

Fig. 1:

The traffic sign regions of interest (ROIs) withdrawal, ROIs alteration and arrangement, and post-processing. First, for each surround in the video, traffic sign ROIs are professed with Momentously Stable exterior Regions (MSERs) on multi-channel images. Then, to refine and classify the ROIs, a multi-task Probabilistic Neural Network (PNN) is proposed. Specifically, the ROIs are first fed to a binary classification layer, and only the positive ones are further classified with a deep multiclass classification network. The network is trained

end-to-end with a large number of data, which consists of training data, synthetic signs and images labeled from street view. Finally, recognition results from each frame are fused to get the final results of the video.

V. MOTIVATION

The classifier is trained on instances of each class of normal activities in a PNN classification of traffic sign. One favorite tool for such PNN classification. The partitions between classes of normal activities have also been learned using PNN classifier. The authors of suggested the ideals of the optimal classifier as being able to:

1) Detect dubious events with a minimal description of the view context.
2) Perform the detection without the need of a training dataset.
3) Robust to the real-time constraints of the system;
4) Learn and adjusts it to changes of object behaviors.

VI. ALGORITHM

A. Maximally Stable Extremal Region

MSER is a method for blob detection in images. The MSER algorithm extracts from an image a number of co-variant regions, called MSERs. MSER is based on the idea of taking regions which stay nearly the same through a wide range of thresholds. All the pixels below a given threshold are white and all those above or equal are black. This operation can be performed by first sorting all pixels by gray value and then incrementally adding pixels to each connected component as the threshold is changed.

B. PNN Classifier

A probabilistic neural network (PNN) is a feedforward neural network, which is extensively used in categorization and pattern credit problems. In the PNN algorithm, the parent probability distribution function (PDF) of each class is approximated by a Parson window and a non-parametric function. Then, using PDF of each class, the class likelihood of a new input data is estimated and Bayes' rule is then employed to allocate the class with highest later probability to new input data. By this method, the probability of mis-classification is minimized This type of ANN was derived from the Bayesian network[2] and a statistical algorithm called Kernel Fisher discriminate analysis.

VII. RESULTS

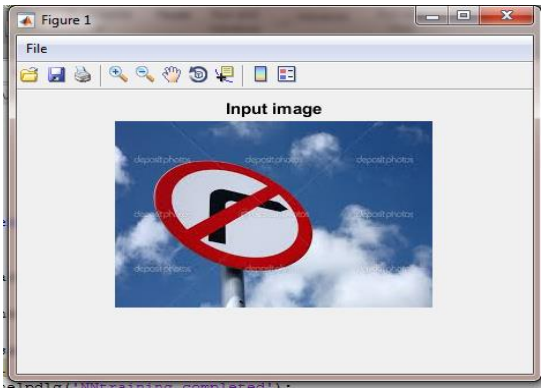

Fig. 2:

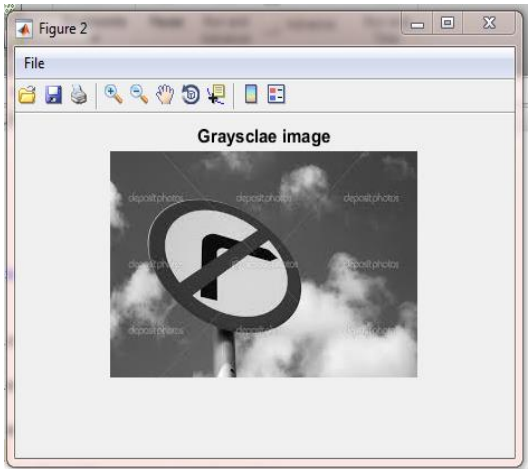

Fig. 3:

Fig. 4:

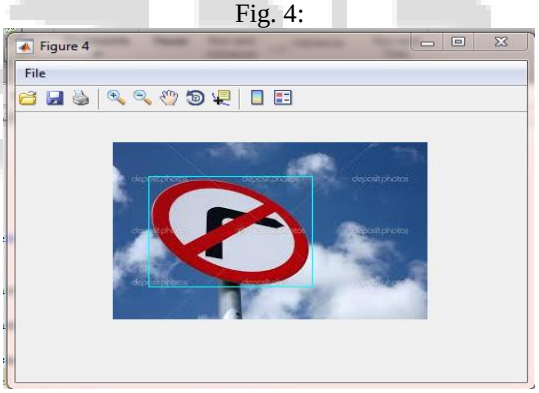

Fig. 5:

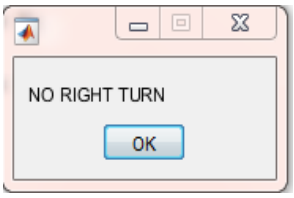

Fig. 6:

VIII. FUTURE SCOPE

1) In future, we can mount the camera in headlights of cars, this will help to recognizing the signs at night time more accurately.
2) Also, audio device will be used which tells about the signs, so that Driver doesn't need to see in display all the time.

3) We will suggest automobile companies to have inbuilt camera and display in vehicle as it has lot of advantages.

IX. CONCLUSION

We propose a new data-driven system to recognize all categories of traffic signs in low quality short videos captured by a car mounted camera. The traffic sign ROIs are first extracted using MESRs on multi-channel images. A new multi-task PNN structure is proposed to refine and classify the ROIs in a uniform framework. The recognition outputs of all frames are fused to get final result for a video. Our system gets the state-of-the-art result on a challenging new data set.

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