A MODERN APPROACH TO IDENTIFY TRAFFIC SIGN SYMBOLS IN COLOR IMAGES

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Abstract*— Nowadays, the number of accidents is increasing rapidly which in turn resulting in huge loss of human lives. This is mainly because drivers are unaware of different road side traffic signs. In these systems reliable and robust Traffic sign detection and recognition (TSDR) technique is used which will automatically recognize the traffic signs and give an alert to the driver. Different methodologies available for TSDR like: Image sequence using color information, color based segmentation techniques. The most of the algorithms for traffic sign recognition (TSR) are suffering from performance issues like time complexity and space complexity. These papers try to analysis most of the important prior work of TSDR and Fuzzy Integral which acts as abstract classifier, attempts to find a new work which is concerned with developing an inventory system capable to accomplish a complete catalog of all traffic sign and their corresponding state information.

***Index Terms*— Traffic sign detection and recognition; Image Processing; Fuzzy Integral; Symbol Identification.**

I. INTRODUCTION

Vehicle driving plays an important role in day-to-day life. Each and every individual require vehicles for their comfort of life. Henceforth, traffic security needs to be considered. Parallel many traffic signs are increasing which is difficult for drivers to learn all the traffic sign and to pay attention to them while driving. Driver assistance system will automatically assist to the driver about road side traffic sign which in turn make driving safer and easier which will provide road safety. TSR systems consist of three different phases: detection, recognition and fuzzy integral.

TSD system detects valuable information from camera attached to the top of vehicles. Detection stage generally deals with detection of traffic signs like prohibitory, warning and information signs. As shown in the Fig.1 segmentation block is given as input to the feature extraction block and then finally the image is detected. In segmentation a digital image is partition into multiple segment (set of pixels). The goal of segmentation is to convert Image into meaningful image and easier to analyze. Feature extraction involves an initial set of measured data and builds derived values. It is mainly related to dimensionality reduction and image is detected.

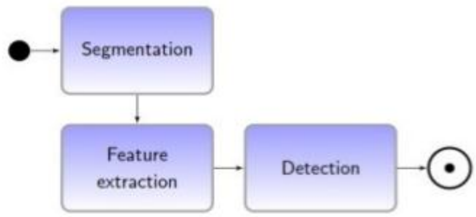

Fig1: General block diagram of Typical Sign Detection.

A general block diagram of TSD system is shown in Fig 2. In traffic sign detection there are usually three major steps: Preprocessing, Feature extraction and Traffic sign detection. Preprocessing is applied on images to increase the reliability of optimal inspection and reduces certain image details for easier evaluation, i.e. filtering techniques. In the first step input image is taken from the camera and given to detect signature block. Local features, regional features extractions are applied to the input image. The last step finally tracks sign and given to output.

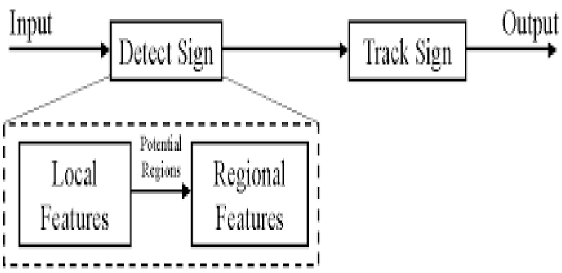

Fig2: General block diagram of TSD

Fuzzy logic can be related as a generalization of classical logic. It is an approach based on "degrees of truth" rather than the usual true or false (1or 0). Fuzzy logic can sometimes called diffuse logic, they are two alternatives, but a whole continuum of truth values for logical proposition.

In the recent past a lot of research work is carried out in the TSR system in literature. Many of them used Advanced Driver Assistance System [1] which includes inter-vehicle communication, human machine interaction and driver behavioral monitoring. The main objective of this paper is to identify current challenges and trends that are faced by many researchers. The different methods to review the strategies and concepts have been investigated and finally a conclusion is drawn. Suggestion for further research in the process of TSDR is attaining a view of robust systems. The automatic TSDR system has been classified into four major steps, namely early stage, intermediate stage, saturation period and the modern age. The different issues regarding systems such as probabilistic neural network. A genetic algorithm is used for detection purpose in RGB image segmentation for post processing.

Support vector machine is another popular approach to develop a TSDR system. SVM is used to detect and recognize the speed limit sign and images are extracted from the image database with 90% of success rate. Especially effective classification is done on detecting speed limit signs in highways. This method is invariant in partial occlusion and motion blur. An example is shown in fig.3

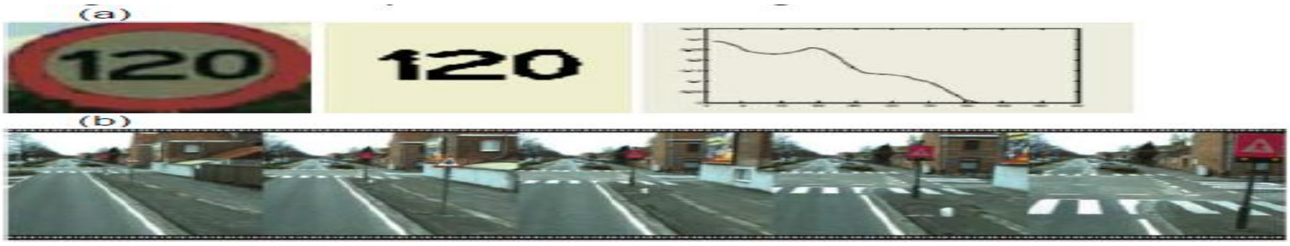

Fig3: Example of speed limit sign detection using SVM

[2] This paper proposes Advance Driver Assistance System (ADAS) with different goals like road side sign recognition, road mark detection, etc. The research paper generally includes two methods: Detection and Classification. Color or shape is generally used to detect region and Classification is used to identify the meaning of traffic signs. In detection phase, color based segmentation is applied to remove background, then in the analysis sub section, Fast Fourier Transform (FFT) is used to solve the rotation and scaling problem of traffic signs.

A digital image is given as input to Color Segmentation block, where image is segmented according to different color. In Counters Detection block, of each binary image are used for next shape analysis, which is based on the normalization FFT, then Region of interest is obtained. Discrete Fourier Transform (DFT) Block converts a finite sequence Of samples into an equivalent long sequence. A shape database which includes the common projection distortion shapes, which will remove the effects of projection distortion. Then the image filtering and morphological operation are applied for reducing the noise interferences and improving the efficiency of the algorithm.

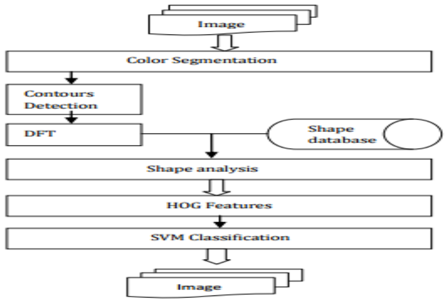

Fig4.Shows the typical flow of the system

In Recognition phase, HOG (Histogram of Oriented Gradient) features are extracted from normalized ROI. This paper proposes a method which uses a linear Support Vector machine (SVM) classifier for classification. The algorithm shows good, robust, scaling, occlusion and rotation while accuracy of recognition is more than 93%.

[3] This system has created a large traffic- sign benchmark which is more realistic for simultaneously detecting and classifying the traffic signs. The images in this benchmark are more variable, and signs in these images are much smaller. It contains more images than previous benchmarks, and the images have a higher resolution. It covers the real world conditions, with huge & large variation and weather conditions. This is annotated with a pixel mask for the traffic-sign, as well as giving its bounding box and class. Pixel-wise segmentation of signs is provided. Two convolution neural network (CNN) for detecting traffic signs and parallel detecting & classifying traffic signs. The CNN state the robustness of two networks that classify and detect the image. Both significantly outperform previous work, and can be used as a baseline for future research. The CNN network is inherently efficient when used in sliding window fashion that can determine an object bounding box together with its class label. This object bounding box speeds up the R-CNN approach. The benchmark, where the data are obtained, how it is annotated and finally contain images retrieved by search engines. Images rather than traffic sign is included in benchmark to differ that detector that can distinguish real traffic sign from other similar looking objects.

II. LITERATURE SURVEY

[4] In this paper recognition of traffic sign is for visual object detection. This method proposes performance on two large detection and classification datasets. In existing methods like pedestrian detection and face classification have reached performance measurement in the range of 95%-99%. The other techniques which are proposed were modern variants of HOG features for detection and sparse representation for classification.

Recognition of traffic is covered in two phases: Traffic sign detection (TSD), Traffic sign classification (TSC). Detection is only meant for precise location of the sign in the image space, while classification stages handle the labeling of such detections and mapping for sign types or subcategories. Evaluation has been performed on Belgian and German traffic sign benchmarks for two stages i.e. detection and classification. Three main stages are Integral channel feature classifier, Detection uses different aspect ratios, Training setup.

This system is only applicable to a minimum set of data, subsets recorded limit up to too good weather condition, adverse weather conditions such as fog, snow, night, rain was not recorded through these datasets. There are further possibilities of invention of such datasets which will identify traffic signs, even in the worst weather conditions.

[5] This paper proposed the accuracy effect of the detected traffic sign region to the traffic sign recognition (TSR) and an improved TSR method is proposed by the accurate traffic sign region extraction. The conventional HOG based traffic sign detection (TSD) gives limited localization accuracy. Inaccurate traffic sign region affect to the TSR performance directly. The ROI refinement process is required to improve the TSR performance after TSD. The TSR performance after the application of the ROI refinement showed almost consistent

results. This paper presents an enhancement method of traffic sign recognition by introducing the ROI refinement stage. The application of the proposed method for a real sequence will verify the robustness.

[6] This paper introduces a machine learning-base design recognition scheme. In the proposed scheme, detection and classification are based on learning in a coarse-to-fine manner. The important contributions of this paper are twofold:

1) Propose a whole learning-based TSR scheme for street view images, through a coarse-to-fine process.
2) Introduce a saliency feature extraction method for traffic signs, through a salient region segmentation and feature Extraction Features in each salient region are then extracted and is fed into SVMs for fine classification. The proposed scheme, that provide traffic sign recognition as a coarse-to-fine classification process, is shown to be effective. Experiments on a Chinese traffic sign dataset containing two traffic sign categories, automatically cropped from Ten cent street view, showed that the proposed method has average of 97.5% performance. Further tests will be conducted by extending to more categories of signs in the near future.

[7] The system presents integrated object detection, association and tracking approach based on a spatial-temporal data fusion. The algorithm tracks detected sign candidates in order to reduce false positives. The camera detector associated with pixel coding ensures the detection efficiency. The Region Of Interest (ROIs) are combined using the transferable belief model semantics. When the detection and recognition are processed on sign the different activities like multiple local detection, misdetection, wrong detection this type of drawbacks are lowered. The system composed of ROI detector coupled to an MRT multi-ROI racking algorithm which implement an object association method. As ROI detection contains set of traffic sign candidates, it may also contain some false positive. So the MRT tracks the detected ROIs using a TBM-based association algorithm. The filtering performs target tracking by predicting the future position of the tracked ROIs in the frames. The Kalman Filter (KF) is a straightforward solution retained for tracking applications.

The ROI detection requires 40ms to process a single frame. The MRT computational time depends on no. of detected and tracked ROIs but remains insignificant with high sampling rate by 45%. The pedestrian and dynamic object detection and tracking association will be considered. The association will also be enhanced by adding the pair wise belief functions and additional assignment primitives for the correlation coefficients between target and tracks.

[8] The paper proposed method consists of two modules: 1) extraction of the histogram of oriented gradient variant (HOGv) feature and 2) a classifier trained by extreme learning machine (ELM) algorithm. The norm of output weights is included in the cost function. ELM can balance the recognition accuracy and computational cost. To evaluate the proposed method the TSR benchmark dataset, the traffic sign classification dataset and the revised mapping and assessing the state of traffic infrastructure (MASTIF) dataset. ELM algorithm is that the input weights between input and hidden layers are randomly assigned. The TSR process does data preprocessing, feature extraction and classification. Extraction of HOGv descriptor includes image processing, gradient accumulation, normalization, dimensionality reduction and concatenated in order to evaluate performance of the descriptor. Training time and recognition time are used as evaluation measures. It presents a variety Hog descriptor with signed and unsigned gradients for building feature representation and ELM algorithm for classification. This runs with high performance GPUs.

Their computational cost during both training and recognition processes is expensive. This method achieves higher accuracy, recognition accuracy, but recognition time increases. The learning of number of hidden nodes and extending this ELM-based classifier for traffic sign detection will be done and the dependency on parameter tuning.

III. PROPOSED SYSTEM

Image Block Creation and Image Morphology Algorithm based on Fuzzy Integral are used in order to recognize traffic signs. The proposed system consists of 3 stages. These stages are Traffic Sign Detection, Traffic Sign Recognition and Fuzzy Integral. In this paper, a digital image is captured by a camera then it is given as input to the Image Block which will divide the image into a number of blocks. Then Color Identification is done on the image. After that, Blocks are labeled, Then With the help of Edge Analysis Block, the edge of an image is detected. Shape identification Block will Detect exact shape of image like circle, triangle, square, etc. In Block Correlation Pearson correlation equation is applied to image where Fuzzy Integral acts as abstract classifier which will divide the image into 5 parts and with the help of Symbol identification, sign is detected.

IV. CONCLUSION

As most of the accidents are happening due to not following of the traffic rules, and these rules are always depicted in the form traffic symbols. So observations of these traffic symbols are most of the driver. So this paper deals with the thorough understanding of the traffic symbol recognition system that uses image processing as main weapon. After analyzing most of the systems, this paper comes to a conclusion that much progression need to be achieved to attain perfection, So block revision method can be more advanced technique through which image blocks are analyzed for correlation with one another for the traffic symbol recognition.

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