Traffic sign detection and analysis

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Abstract - *Advance Driver Assistance Systems (ADASs) are being developed with many goals: communications, road mark detection, road sign recognition or pedestrian detection. This paper suggests the method to detect and analyze the traffic sign. Various methods are used for detection and recognition phase, like hough circle transform, color segmentation, conversion of RGB to HSI model. Recognition includes shape context, HOG features etc.*

Key Words: **RGB model, HSI model, hough circle transform, shape context, HOG features.**

1.INTRODUCTION

Along with the urbanization, the violently increasing of the volume of automobile brings some problems such as traffic jams and traffic accidents, etc. The driving aided system based on computer vision is one important measure to solve these problems. The traffic indication sign recognition is essential to the ITS (Intelligent Transport System). Every year 1.3 million people worldwide are killed on roads, and between 20 and 50 million are injured. A good solution to this problem would be to develop machines, which take into account the environment. That is why today, safe auto driving is becoming a popular topic in many fields, from small projects to large car factories. However this topic also raises many questions and problems. There is a need to define the width of the edges of the road, recognize road signs, traffic lights, pedestrians, and other objects which contribute the driving safely. There are many methods for solving these tasks.

Recognition of traffic signs has been addressed by a large amount of classification techniques: from simple template matching (e.g. cross-correlation similarity), to sophisticated Machine learning techniques (e.g. support vector machines, boosting , random forest, etc), are among strong candidates to assure straightforward outcome necessary for a real end-user system. Moreover, extending the traffic sign analysis from isolated frames to videos can allow to significantly reduce the number of false alarm ratio as well as to increase the precision and the accuracy of the detection and recognition process. Research groups have focused on other aspects, related more with the development of an automatic pilot to detect road borders or obstacles in the vehicle's path such as other vehicles or pedestrians. Accidents can occur, for example, because drivers do not notice a sign in time or by lack of attention at a critical moment. In bad weather conditions such as heavy rain showers, fog, or snow fall, drivers pay less attention to traffic signs and concentrate on driving. In night driving, visibility is affected by the headlights of traffic oncoming and drivers could easily be blinded.

The research on traffic signs recognition generally includes two modules, detection and classification. Color or shape are usually used to detect the region may contain the traffic sign. Classification is further to identify the meaning of traffic signs.

2.REVIEW OF LITERATURE

2.1. Real-Time Traffic Sign Detection and Recognition for Intelligent Vehicle by Min Zhang Huawei Liang and Zhiling Wang Jing Yang, China,2014,IEEE.

This paper proposes a stable system for the real time traffic sign detection and recognition, especially for the geometric distortions of traffic sign. In detection phase, color based segmentation is applied to remove the background, then in the shape analysis subsection, the Fast Fourier transform (FFT) is used to solve the rotation and scaling problems of the traffic sign. A template database which includes the common projection distortion shapes was established to overcome the effects of the projection distortions. For object occlusions, using the method of contours convex hull to weaken the influence of occlusions. Then the image filtering and the morphological operations are applied for reducing the noise interference and improving the efficiency of the algorithm.The contours of each binary image are used for next shape analysis which is based on the normalized FFT. Hence, we can obtain the candidate regions of interest (ROIs). In recognition phase, the Histogram of oriented gradient (HOG) features are extracted from normalized ROIs, we propose a method which uses linear Support Vector

Machine (SVM) classifier for classification. The system is verified on intelligent vehicle named as Intelligent Pioneer. This algorithm shows good robust against scaling, occlusion, rotation and projection distortion while the accuracy of recognition is more than 93%.

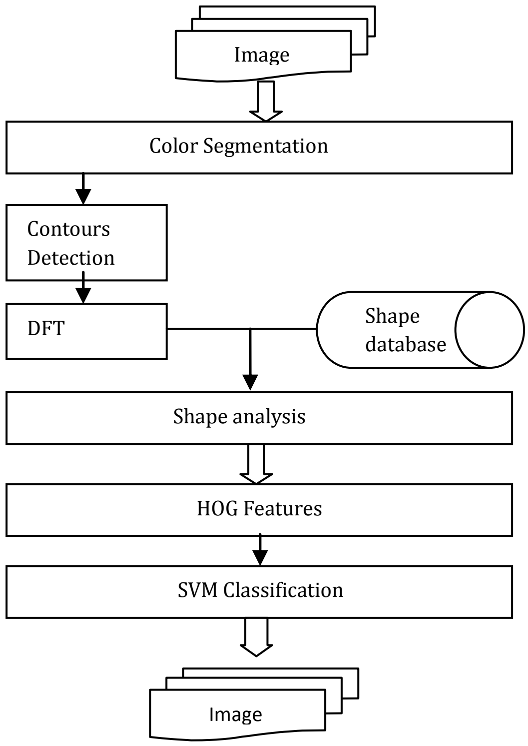

Fig-1 : Flow chart of the proposed system

2.2. Towards Real-Time Traffic Sign Detection and Classification by Yi Yang, Hengliang Luo, Huarong Xu and Fuchao Wu,2014, IEEE.

This paper aims to deal with real-time traffic sign recognition, i.e. localizing what type of traffic sign appears in which area of an input image at a fast processing time. To achieve this goal, a two-module framework (detection module and classification module) is proposed. In detection module, we firstly transform the input color image to probability maps by using color probability model. Then the traffic sign proposals are extracted by finding maximally stable extremal regions on these maps. Finally, an SVM classifier which trained with color HOG features is utilized to further filter out the false positives and classify the remaining proposals to their super classes. In classification module, we use CNN to classify the detected signs to their sub-classes within each super class. Experiments on the GTSDB benchmark show that our method achieves comparable performance to the state-of-the-art methods with significantly improved computational efficiency, which is 20 times faster than the existing best method.

2.3. Fast Traffic Sign Detection under Challenging Conditions by, Bao Trung Nguyen, Joong Kyu, Kim JaeRyong, Shim, South Korea,2014, IEEE.

In this paper, a fast and robust method for traffic sign detection with only a low dynamic range VGA camera is suggested. The system is based on a combination of a flexible segmentation and shape-based detection. In segmentation stage, two segmentation steps using HSV color model consist of a segmentation with higher criteria, and a segmentation with lower criteria. The strict segmentation allows only exclusive red pixels. In challenging cases of lighting condition, the strict segmentation can still find the traffic sign location even though it may let through only the inner part. After strict segmentation, a binary processing step is executed to remove noises. Then, since traffic signs are limited in size, a morphological dilation with a 19x19 square structuring element and the loosely segmented output as a mask can guarantee the output cover all or almost area of traffic sign, which is enough for shape detection. The segmentation stage consuming much less computation time in comparison to shape detection not only helps cut down the computation burden of shape detection, but also boosts the detection rate because the it already removes a number of false positives having similar shape to the target traffic sign. However, the final output of segmentation stage in some situations partially contains background when it has similar color information to traffic signs. Thus, a shape recognition step finalizes the detection system by localizing traffic signs.

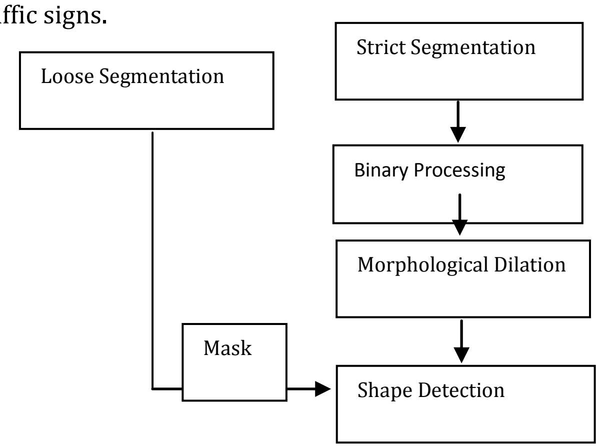

Fig-2: Work flow of detection system

2.4.Traffic sign recognition without color information by, Hasan Fleyeh, Sweden,2015,IEEE.

Color represents an important attribute in the field of traffic sign recognition. However, when the color of the traffic sign fades or the traffic scene is collected in gray as in the case of Infrared imaging, then color based recognition systems fail. Other problems related to color are simply that different countries use different colors. Even within the European Union, colors of traffic signs are not the same. This paper aims to present a new approach to detect traffic signs without color attributes.

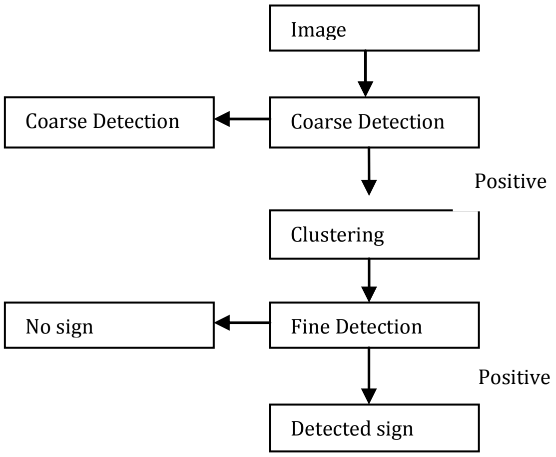

Fig-3: Step by step detection process

2.5. "Traffic indication symbols recognition with shape context" by Kai Li, Weiyao Lan, Department of Automation Xiamen University, China,2011, IEEE.

This paper aims to detect the traffic sign using HIS color model followed by circle detection. The regions detected by color detection cannot be determined to the exact sign region. The edge of interested regions is traced to get their contours after morphologic operations. Then Hough circle transform is applied to find the target region. The target have been located and extracted after the previous two steps. We next recognize the symbol in the destination area. To make it looks simple and clear, we treat the marked region separately. The image is preprocessed to remove noise. Edge detection and segmentation are used specifically to the image to obtain a clear silhouette boundary of the traffic indication symbol. Shape context is based on the contour of the object.

2.6. Driving supervision through traffic analysis by Juan Pablo Carrasco, Arturo de la Escalera, Member, José María Armingol,2008,IEEE.

The system presented in this paper fulfils the requirements of an ADAS in order to get a real time RSR system. It is able to detect, recognize and track blue plate and red border road signs. It deals with one of the major problems in detection: the change in color when the road sign is under shadows. Besides, as the most difficult scenario for a RSR is urban environment, a parallel study of the color of bricks is done in order to avoid in the enhanced image. In the case of blue background road signs, some pixels from the sky and asphalt are enhanced, but as they usually appear as noise it does not produce false detections.

3. CONCLUSION

Papers discussed provide a variety of methods both for detection and recognition phase. Detection phase including methods like color segmentation, shape analysis, conversion of color model have been used in order to have clear results. SVM classifier, edge detection provide improved results. Thus it is important to have methods providing better results so that goal of having safe traffic systems could be achieved.

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