Traffic Sign Detection and Recognition using Image Processing

[1]Karthikeyan D, [2]Enitha C, [3]Bharathi S, [4]Durkadevi K
[1] Assistant Professor, [2,3,4] UG Scholar
Department of Electronics and Communication Engineering
Kongunadu College of Engineering and Technology
(Autonomous)
Thottiyam, Trichy, Tamilnadu, India

Abstract:- In 21st century, automobiles have become the most convenient mode of transports for every household. This makes the road traffic environment more and more complicated, and people expect to have an intelligent Vision-assisted application that provide drivers with traffic sign information, regulate driver operations or assist in vehicle control to ensure road safety. As one of the more important functions traffic sign detection and recognition has become a hot research direction of researchers at home and abroad. It is mainly the use of vehicle cameras to capture real time road images and then to detect and identify the traffic signs encountered on the road, thus providing accurate information to the driving system. With the development and progress of science and technology, more and more scholars use deep learning technology to reduce time consumption in traditional process. This model can learn the deep features inside the autonomously from the training samples. This article focuses on the correctness and high efficiency of detection and recognition. Through Caffe[3] which is the open-source frame work, a deep convolution neural network algorithm is proposed to train traffic sign training sets to get a model that can classify traffic signs and to learn and identify the most critical of these traffic signs features, so as to achieve the purpose of identifying traffic signs in the real scene.

Keywords – Traffic sign, Segmentation, Gabor filter, YCBCR conversion.

I. INTRODUCTION

Traffic signs occupy an important position in the road traffic systems. The main function of the traffic signs is to display the contents that need to be noticed in the current road sections, to prompt the drivers in front of the road the danger and difficulty in the environment, to warn the driver to drive at the prescribed speed, to provide a favorable guarantee for safe driving. Therefore, the detection and identification of traffic signs is a very important research direction, which is of great significance to prevent road traffic accidents and protect the personal safety of drivers.

Road traffic signs are divided in to two major categories of main signs and auxiliary signs. The main sign is divided into warning signs, prohibition signs, mandatory signs, guide signs, tourist signs and road construction and safety signs. Among them, prohibition signs mainly played a role in banning certain kinds of behavior, a total of 43 categories. Mandatory signs indicate the role of vehicles which is placed in the need to indicate vehicles, near the intersection. Warnings are mainly to alert drivers, vehicles pedestrians to beware of dangerous targets, a total of 45 categories. They all play an important role in traffic signs. Among them, the most common speed limit signs and the prohibition of left and right turning signs are of great significance for safe driving of drivers and therefore are the focus of the current research on traffic sign recognition.

The aim of this paper is to develop a better system for the automatic detection and recognition of traffic signs with high accuracy and robustness under various complicated situations and disturbances.

II. METHODOLOGY

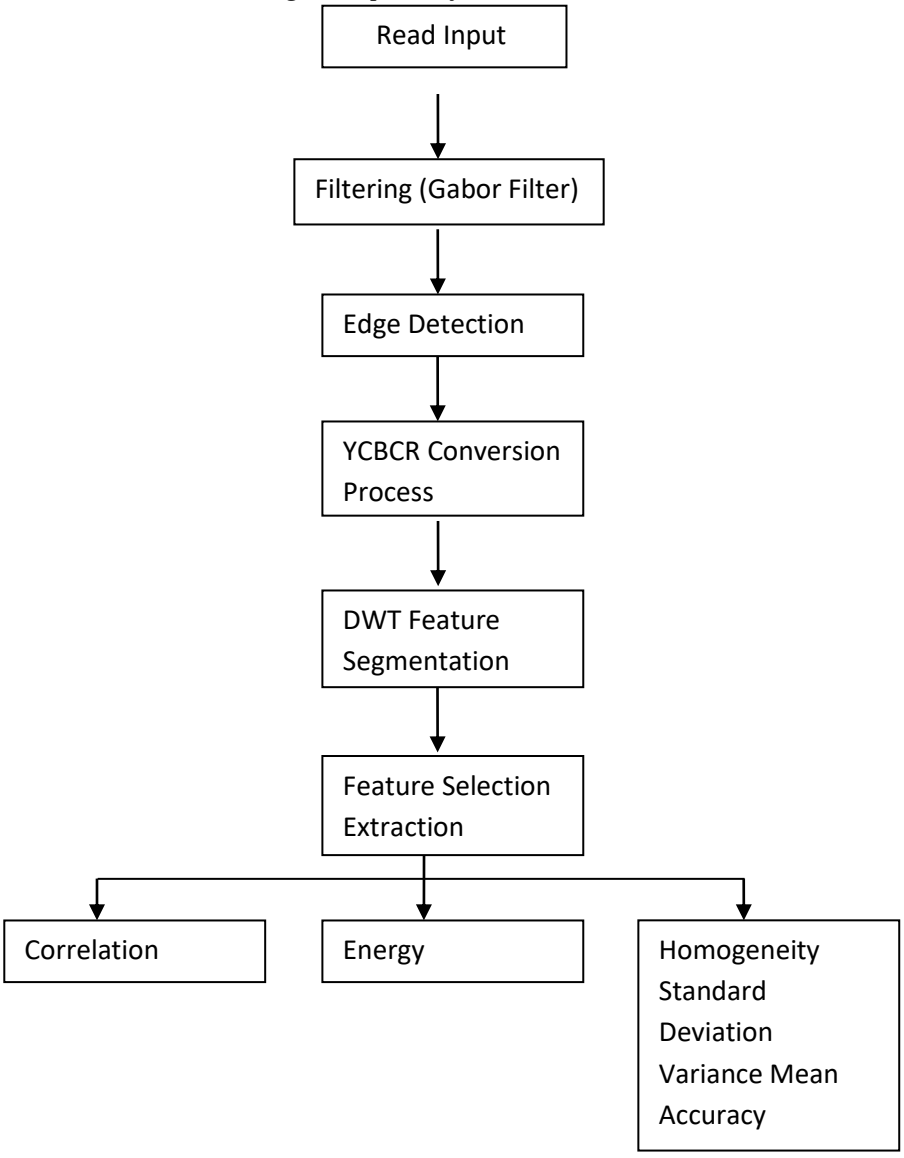
DATASET :

Although the convolution neural network has made remarkable achievements, the current applications in the field of traffic sign detection and recognition are still not much. The reason for this is largely due to the lack of traffic sign data sets. Training and verifying a deep convolution neural network traffic sign recognition model requires a large amount of traffic sign data as a basis. However, the open traffic sign datasets in India is relatively scarce compared with developing countries. More well-known traffic sign datasets now include GTSRB in Germany, GTSDB in Germany and KUL in Belgium.In this paper, GTSRB, GTSDB traffic sign datasets is used to traffic sign detection and recognition. These two datasets include many types of complex traffic signs such as sign tilt, uneven lighting, traffic sign with distraction, occlusion and similar background colors, as well as actual scene maps. Through a variety of complex and difficult to distinguish traffic signs to verify the ability of the algorithm.

B.PROPOSED METHOD:

The objective of this work is to develop a method to segment the traffic sign from the background image by applying various techniques like filtering, edge detection. The YCBCR conversion process used to compare the detected image with the datasets and Feature selection extraction is used to get the accurate symbol from the compared images.The Feature extraction is classified in to three phases as shown in Figure1.

Fig 1: Proposed system Architecture.



III. FILTERING (GABOR FILTER):

Gabor filter is a linear filter used for texture analysis, which means that it basically analyzes whether there are any specific frequency content in the image in specific directions in a localized region around the point or region of analysis. Frequency and orientation representations of Gabor filters are claimed by many contemporary vision scientists to be similar to those of the human visual system. They have been found to be particularly appropriate for texture representation and discrimination. In the spatial domain, a 2D Gabor filter is a Gaussian kernel function modulated by a sinusoidal.

a) These filters have been shown to possess optimal localization properties in both spatial and frequency domain and thus are well suited for texture segmentation problems. A Gabor filter can be viewed as a sinusoidal signal of particular frequency and orientation, modulated by a Gaussian wave.

b) When a Gabor filter is applied to an image, it gives the highest response at edges and at points where texture changes. When we say that a filter responds to a particular feature, we mean that the filter has a distinguishing value at the spatial location of that feature.

c) To analyze texture or obtain feature from image, a bank of Gabor filter with number of different orientation are used.

IV.EDGE DETECTION:

The result of applying an edge detector to an image may lead to a set of connected curves that indicate the boundaries of objects, the boundaries of surface markings as well as curves that correspond to discontinuities in surface orientation. Thus, applying an edge detection algorithm to an image may significantly reduce the amount of data to be processed and may therefore filter out information that may be regarded as less relevant, while preserving the important structural properties of an image. If the edge detection step is successful, the subsequent task of interpreting the information contents in the original image may therefore be substantially simplified.

V. DWT FEATURE SEGMENTATION:

This segmentation uses Discrete Wavelet Transformation. Image Segmentation is the process of partitioning a digital image multiple segments (sets of pixels also known as image objects). The goal of segmentation is to simplify and change the representation of an image into something that is more meaningful and easier to analyze. Image segmentation is the process of assigning a label to every pixel in an image such that pixels with the same label share certain characteristics of the image.

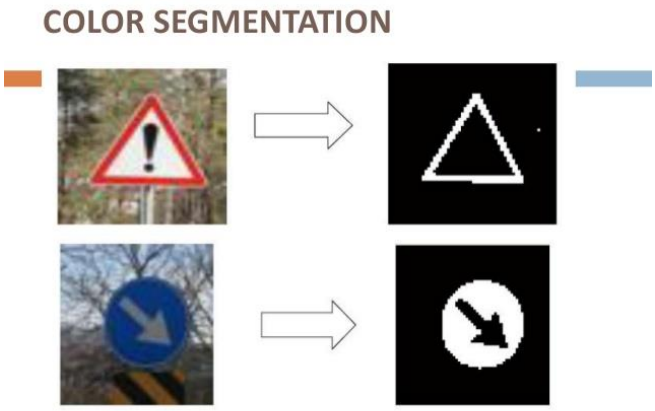


Fig: Traffic sign and Red/Blue segmented image

VI. FEATURE EXTRACTION :

The exact feature of the system is to detect the traffic sign from the background image by using the colour, size and the direction of segmented image. Then this sign is compared with the datasets and it uses correlation, quality of the segmented image, homogeneity, variance, standard deviation and accuracy and then mean.

RESULT:

The output is Showed in every step of the process like Edge detection and segmentation in matlab function. Then the final output is showed in the notification pop up in the screen to denote the changes that have to be made by the vehicle for safe driving. This notification will be like instructions to take another route or something like that for fine driving without any accidents or delay.

CONCLUSION

In this paper, we reported a traffic sign detection and recognition system for detecting the sign in a given image taken from the vehicle camera. The image analysis generally consists of three steps: detection, segmentation and classification. The sign is edge detected and segmentation applied to segregate the sign from background. We propose a simple feature selection extraction in which we have two data sets of GTSRB and GTSDB used for traffic sign detection and recognition. This datasets include many types of complex traffic signs such as sign tilt, uneven lighting, traffic sign with distraction, occlusion and similar background colors, as well as actual scene maps. Through a variety of complex and difficult to distinguish traffic signs to verify the ability of the algorithm.

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