International Journal on Recent and Innovation Trends in Computing and Communication ISSN: 2321-8169
Volume: 4 Issue: 10 65 - 67

An Automatic Traffic Sign Recognition for Autonomous Driving Robot

Ms. Shalaka Satish Manore
(P.G. Student of Electronics and Telecommunication Engineering, SES-GOIFOE, DIKSAL Mumbai University)

Prof. Dimple Chaudhari
(Assi. Prof. Electronics and Telecommunication Engineering YTIET, Bhivpuri Road, Karjat, Mumbai University)

***Abstract*—** This paper presents an automatic traffic sign detection system based on three stages like detection, pictogram extraction and classification. In detection stage we detect the type of symbol like triangle or circle. In pictogram extraction we localize signs from a whole image, and classification stage that classifies the detected sign into one of the reference signs. The detection stage includes segmentaion of image through RGB analysis, morphological filtering and connected component analysis. The classification modules includes the local region features extractions and KNN classification.

Keywords *: traffic sign recognition, Morphological filtering, KNN classification*

*****

I. Introduction

Traffic signs detection and recognition is a subsystem of the intelligent transportation system .

It can be applied in driver assistance systems and unmanned vehicles. It enhance safety by informing the drivers about the current state of traffic signs on the road and giving valuable information about precaution. Road signs are typically placed either by the road side or above roads. They provide important information for guiding, warning, or regulating the drivers in order to make driving safer and easier. Road signs carry much useful information that is required for piloting, such as to drive the vehicle in the correct lane and at the right speed; to avoid obstacles and potential risks. Similar to advanced driver assistance systems, an assistance system can be developed to help blind pedestrians. Sign detection and recognition can also be useful for highway maintenance so that a human operator does not have to check the presence and condition of the signs; rather, gathering of the traffic-sign position will be done automatically.

It is becoming a part of Driver Assisting Systems which role is to increase safety and driving comfort and it is to explore the possibility of developing a computer vision system which is able to perform automated recognition that could be used to notify a human driver to the presence and nature of road signs. There liability demonstrated by the proposed method suggests that this system could be a part of an integrated driver warning and assistance system based on computer vision technology.

Section II describes Methodology, which includes Color based segmentation, Morphological filtering , CC analysis and K-Nearest neighbour classifier. The block diagram is given in Section III. Section IV presents experimental results showing results of images tested. Finally, Section V presents conclusion

II. Methodology

Methodology includes Color based segmentation, Morphological filtering , CC analysis and K-Nearest neighbour classifier

COLOR BASED SEGMENTATION:

Threshold based segmentation

Threshold is one of the widely methods used for image segmentation. It is useful in discriminating foreground from the background. By selecting an adequate threshold value T, the gray level image can be converted to binary image. The binary image should contain all of the Essential information about the position and shape of the objects of interest (foreground). The advantage of obtaining first a binary image is that it reduces the complexity of the data and simplifies the process of recognition and classification. The most common way to convert a gray-level image to a binary image is to select a single threshold value (T). Then all the gray level values below this T will be classified as black (0), and those above T will be white (1). The segmentation problem becomes one of selecting the proper value for the threshold T. A frequent method used to select T is by analyzing the histograms of the type of images that want to be segmented. The ideal case is when the histogram presents only two dominant modes and a clear valley (bimodal). The Thresholding operation is a grey value remapping operation *g* defined by:

$$g(v) = \begin{cases} 255 \text{ if } y > t \\ 0 \text{ if } y < t \end{cases}$$

Where *y* represents a grey value and *t* is the threshold value. Thresholding maps a grey-valued image to a binary image.

After the Thresholding operation, the image has been segmented into two segments, identified by the pixel values 0 and 1 respectively

Morphological Filtering

Morphology is a broad set of image processing operations that process images based on shapes. Morphological operations apply a structuring element to an input image, creating an output image of the same size. The most basic morphological operations are dilation and erosion. In a morphological operation, the value of each pixel in the output image is based on a comparison of the corresponding pixel in the input image with its neighbours. By choosing the size and shape of the neighborhood .Using Morphological function we track the object. Morphological operations are used to either remove noise from an image or recover some details lost in Thersholding or background subtraction.

Dilation: adds to the foreground areas in an image, but can also add to the noise.

Erosion: removes stray foreground pixels from it, but also reduces genuine foreground areas.

Usually, a combination of morphological operators is used to improve the output.

CC ANALYSIS: Connected Component Analysis

The output of the change detection module is the binary image that contains only two labels, i.e., '0' and '255', representing as 'background' and 'foreground' pixels respectively, with some noise. The goal of the connected component analysis is to detect the large sized connected foreground region or object. This is one of the important operations in motion detection. The pixels that are collectively connected can be clustered into changing or moving objects by analyzing their connectivity. In binary image analysis, the object is extracted using the connected component labelling operation, which consist of assigning a unique label to each maximally connected Foreground region of pixels. One of the important labelling approaches is "classical sequential labelling algorithm" . It is based on two raster scan of binary image. The first scan performs the temporary labelling to each foreground region pixels by checking their connectivity of the scanned image. The Labelled objects within a sign are applied to measure its characteristics which are useful to recognize a sign with stored templates. The following features are extracted, Area, Orientation, Height, width, Eccentricity, Major axis Length, Minor axis length, perimeter and Equivalent diameter

K-NEAREST NEIGHBOUR CLASSIFIER

The k-nearest neighbor algorithm (k-NN) is a method for classifying objects based on closest training examples in the feature space. k-NN is a type of instance-based learning, or lazy learning where the function is only approximated locally and all computation is deferred until classification. The k-nearest neighbor algorithm is amongst the simplest of all machine learning algorithms: an object is classified by a majority vote of its neighbors, with the object being assigned to the class most common amongst its k nearest neighbors (k is a positive integer, typically small). If k = 1, then the object is simply assigned to the class of its nearest neighbor. The neighbors are taken from a set of objects for which the correct classification (or, in the case of regression, the value of the property) is known. This can be thought of as the training set for the algorithm, though no explicit training step is required. The k-nearest neighbor algorithm is sensitive to the local structure of the data.

III. Block diagram

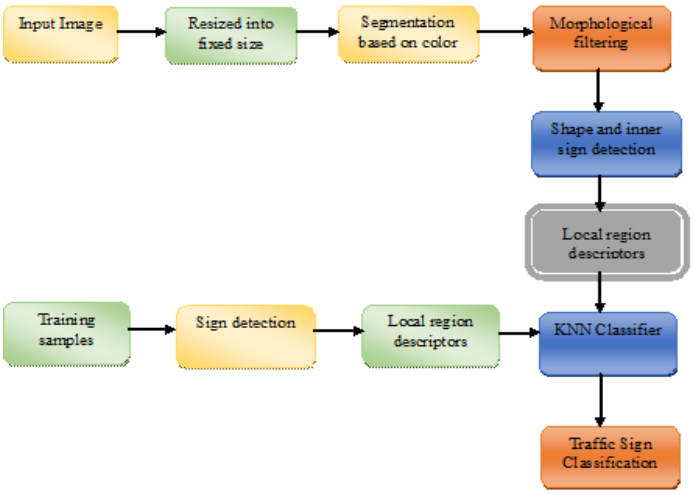
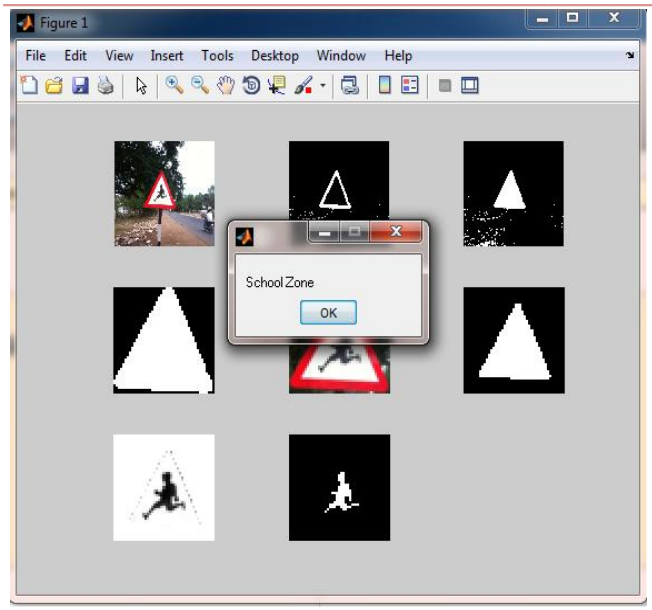


Fig.1 block diagram

IV. Experimental Results



V. Conclusion

We have implemented the An automatic traffic sign recognition for autonomous driving robot. This approach has been studied using image database. It is concluded that the proposed method is performing better in comparison to other methods as well as capable of alleviating the problems associated with other spatial domain methods. In this project we have successfully implemented An automatic traffic sign recognition for autonomous driving robot.

References

[1] "Traffic Sign Recognition for Autonomous Driving Robot" Tiago Moura, António Valente, António Sousa, Vítor Filipe. May 2014.

[2] F. Larsson and M. Felsberg, "Using Fourier descriptors and spatial models for traffic sign recognition", in Proc. Image Anal., pp. 238–249, 2011.

[3] D. Pei, F. Sun and H. Liu, "Supervised Low-Rank Matrix recovery for Traffic Sign Recognition in Image Sequences", IEEE Signal Processing Letters, vol. 20, no. 3, March 2013.

[4] J. Stallkamp, M. Schlipsing, J. Salmen and C. Igel, "Man vs. computer: Benchmarking machine learning algorithms for traffic sign recognition", Neural Networks, vol. 32, pp. 323-332, 2012.

[5] J. Park, J. Kwon, J. Oh, S. Lee, J-Y. Kim and H-j. Yoo, "A 92-mW Real-Time Traffic Sign Recognition System With Robust Illumination Adaptation and Support Vector Machine", IEEE Journal of Solid-State Circuits, vol. 47, no. 11, November 2012.

[6] "A Road Traffic Signal Recognition System based on Template matching employing Tree classifier" Varun S, Surendra Singh, Sanjeev Kunte R, Sudhaker Samuel R D and Bindu Philip 2007.

[7] "Robust Traffic Signs Detection by means of Vision and V2I Communications" M. A. Garc´ıa-Garrido, M. Oca˜na, D. F. Llorca, M. A. Sotelo, E. Arroyo and A. Llamazares 2011

[8] "Automatic Road Sign Recognition Using Neural Networks" Yok-Yen Nguwi, and Abbas Z. Kouzani, *Member, IEEE 2006.*

[9] "Real-Time Traffic Sign Detection and Recognition for In-Car Driver Assistance Systems" Erdal Oruklu, Damien Pesty, Joana Neveux, and Jean-Emmanuel Guebey IEEE 2012.

[10] "A Method Of Detecting And Recognizing Speed-Limit Signs" Yea-Shuan Huang, Yun-Shin Le, Fang-Hsuan Cheng IEEE 2012