

Traffic Sign Detection and Recognition Using Colour Features towards Intelligent Vehicle/Driver Assistance System

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Abstract : To give sheltered and symphonies stream of movement , particular standards are given by each administration . There are certain rules laid down by the government of most of the countries for the safe, systematic and orderly movement of vehicles and traffic. Many of these rules are displayed through traffic signs to help the driver to follow while driving. The Traffic Sign Detection and Recognition (TSDR) perceives the activity signs by dissecting pictures /recordings taken from a camera system and helps in detecting and recognizing the traffic signs by analyzing images / videos captured by the camera planted on the car. This framework has many elements which help the driver in enhancing the well being and solace; today it is broadly utilized as a part of discovery and acknowledgement of our perceived signs. The framework of system can be developed using two algorithms, first is the detection of the image followed by its recognition. In wake of getting the best possible information for recognition we utilize the diverse morphological handling procedures. Colour Image processing play an vital role in the detection of the traffic sign. In this paper we chiefly accentuation on the color/shade of the activity sign for its recognition on the grounds that in many spots a standard arrangement of hues are utilized as a part of movement sign like red is used in prohibition signs. In the directional signs blue is the foundation shading in the directional signs and yellow is chosen for warning signs.

Keywords - Detection, Recognition, Segmentation, RGB, HSV, Morphological image processing

I. INTRODUCTION

Programmed movement sign location and acknowledgement is a critical piece of Advanced Driving Assistance System (ADAS). Activity images have a few recognizing highlights that can be utilised for there discovery and distinguishing proof . The distinguishable features are hues(colour), shapes, text or symbol in contrast to the background, and acts as the basis of its recognition. Beside the traffic symbols roads (scene) can also contain many other geometric shapes like advertisement boards, hoardings, windows etc that could be misinterpreted along with the traffic signs.

The identification of the road signs is achieved by two principal stages: detection (discovery) and recognition (acknowledgement). In the detection phase, the image is pre-processed or pre – handled (which includes mainly the various noise removal techniques), enhanced, and portioned according to the sign properties such as shading or geometric shape. The output is a segmented image containing our Region of interests (ROI) could be recognized as possible road symbol. Each of the symbols has certain features (shapes and/or colour) which classify them. For example, in Figure 1. (a) and (c) can be easily classified both on the basis of either shape or colour or both (for better results), whereas for classification of (a) and (b) which are of same shape i.e circular, so only shape is not enough(or will not give us the result) but as the colours are different , so the „colour“ feature classifies them. These features are chosen so as to emphasize the differences among the classes. The state of the sign assumes a focal part in this stage and the signs are ordered into various classes such as triangles, circles, octagons, and so forth. Street signs are outlined , made and introduced by tight controls. They are planned in settled 2-D shapes like triangles, circles, octagons, or rectangles. The shades of these signs are far been from the earth , which makes them effortlessly conspicuous by drivers . The tint of paint that covers the sign ought to relate to a particular wavelength in the noticeable range. Here we essentially accentuation on the shade of the movement sign for its acknowledgement in light of fact that many spots a standard arrangement of hues are utilized as a part of activity sign. Shading based division is accomplished by utilizing distinctive shading models. Shape is likewise considered as a vital element of the street sign portrayal and the substance are perceived by using different element extraction strategies and classifiers.

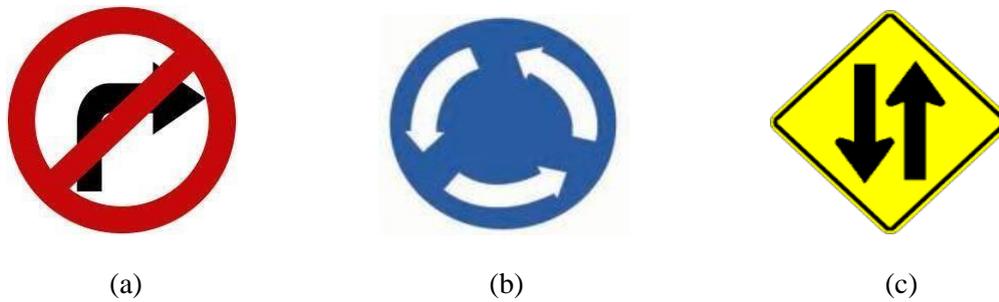


Figure 1. Standard Symbols used as traffic signs

The Red Green Blue (RGB) shading is the essential shading space utilized as a part of PCs to show shading pictures. In resulting research work the RGB shading space has tentatively being observed to be non-powerful in portioning objects from outside situations with changing lighting conditions. Particularly when shifting lighting conditions produce distinctive shades of shading on a street sign and RGB space has been observed to be influenced by reflections and illuminations.

We fragment the districts of enthusiasm with the assistance of HSV model [11]. Yixin Chen, Yi Xie and Yulin Wang have disclosed us how to separate and identify activity signs in light of shading and shape qualities in his paper , “Detection and Recognition of Traffic Signs Based on HSV Vision Model and Shape features”.

II. PROPOSED METHODOLOGY

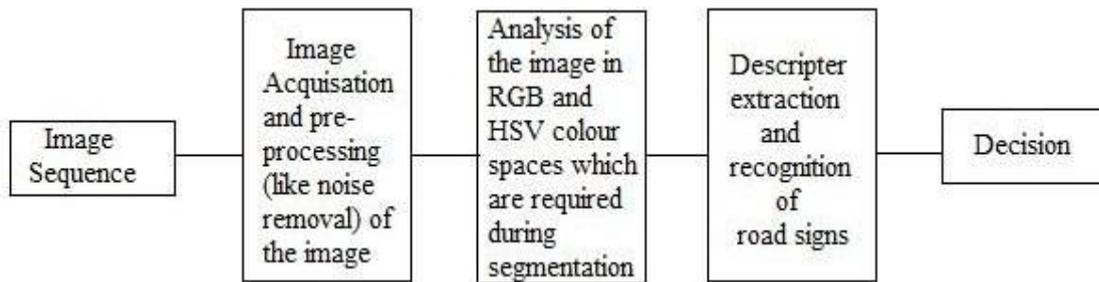


Figure 2. Block diagram for the proposed method

The pre – processing or pre-handling step is not a mandatory one. The essential capacity of the pre-processing stage is to upgrade the info picture. Camera alignment is a stage which finds the extraneous and characteristic parameters for a camera set on vehicles. In a grayscale digital image the estimation of every pixel is a solitary , that is, it conveys a type of forced data. Pictures of this sort , otherwise called highly contrasting , are made only out of shades of black to white , differing from dark as the weakest power to white as the most grounded. An example of a gray scale image is given in Figure 3(b) while Figure 3(a) shows the original image.



Figure 3(a). Original image



Figure 3(b). Grayscale image

The histogram gives the graphical portrayal of the tonal appropriation in the computerized picture. It plots the quantity of pixels in each tonal esteem. Histogram equalization is a technique provides complexity modification utilizing the histogram. This method is the process of successfully equalized spreading of pixels across the whole tonal esteem. For example, Figure 3(c). Histogram equalization is a technique of contrast adaptation in image processing with the help of the image's histogram. Histogram equalization is accomplished by spreading out the most frequently used intensity values in the image.

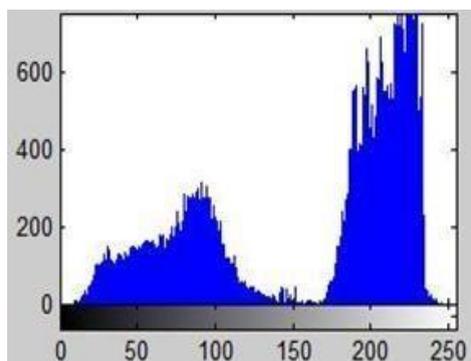


Figure 3(c). Histogram of the image

DETECTION TECHNIQUES

Color

The fundamental assignment in this segment is to produce the plausible street sign . Therefore , in this stage, we have to remove the Region of Interests (ROIs) from respective frames and set them up for acknowledgement organize. To ensure the precision in acknowledgement every conceivable ROI sought to be viewed as; this is on the grounds that each ROI could be a sign. There are numerous sorts of methods that can be utilized for hunting down ROIs. The activity sign we wish to identify has obvious physical attributes, for example , color and its geometric shape. These sorts of attributes are mulled over and a lot of research spotlights on these angles.

Data transmitted though brilliant shading is undoubtedly the most essential and eminent characteristic of activity signs, because the signs should be effortlessly seen by humans. As of late , the TSDR system mostly regarded color analysis as a preparatory reason for division. Color-based investigation methods are a part of fragment distinctive hues and to provide ROIs which will facilitate recognition. Color segmentation consists of dividing an image into subsets of associated pixels that have comparable shading properties. Identification is frequently in view of a procedure of division which concentrates on comparative sorts of properties and it lessen the space for discovering ROIs. Color segmentation thresholds are the most common method. Though a series of thresholds, the interested ROIs can be hunted . The ROIs is actually the color luminance reflected under the light source; the shade of a question relies on upon the area and force of the light sources. The decision of an appropriate color space is vital. Here for our investigation we have mainly approached the RGB and the HSV color space.



(a)



(b)

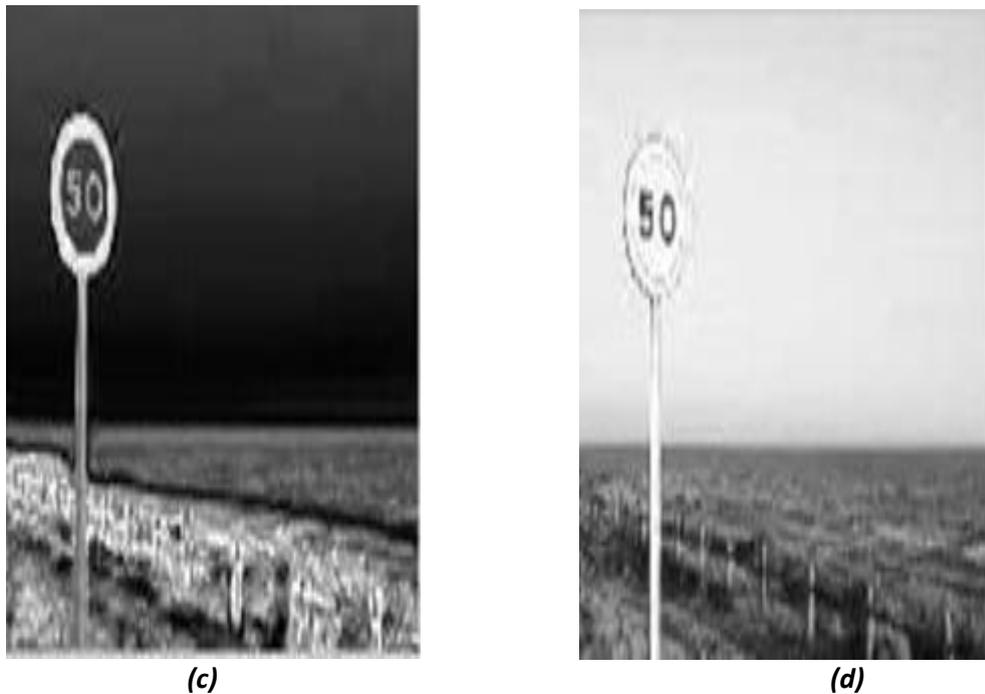


Figure 4. Outputs showing the (a) Image in the HSV color space (b) Saturation Image of the HSV color space (c) Hue Image of the HSV color space (d) Value Image of the HSV color space

The RGB space is additionally viewed as an added substance shading space capacity to shape different sets of hues by consolidating distinctive powers of the essentials i.e. Red, Green and Blue. In RGB color space, all-zero vectors speaks to a pixel of dark shading and an all-one vector is regarded as white. Firstly, the RGB images, taken by an advanced camera, need to be changed into HSV space. And then, H and S segments should be extracted. On the off chance that the dark estimations of parts have a specific shading (red, yellow, or blue) in the gray scale, the estimate will be held ; if this is not the situation , it will be set to 0. In the division procedure , the part of hue assumed the focal part ; this is on account of it shows more invariance with regards to shadows and highlights, to varieties in light conditions , and to change in shadingimmersion.

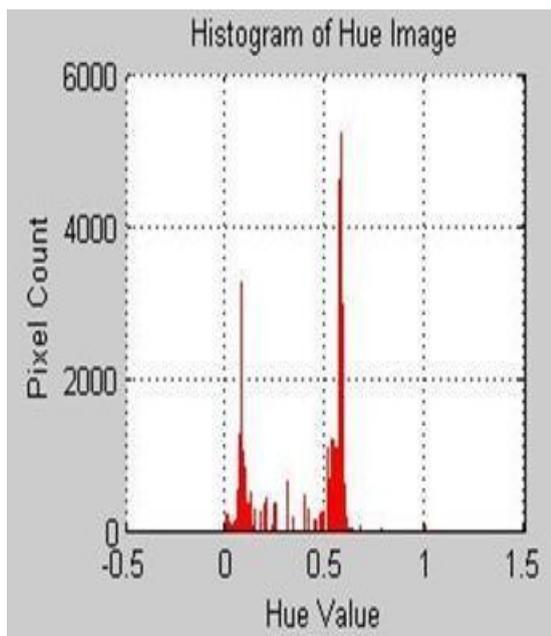


Figure 5(a). Histogram of Hue Image

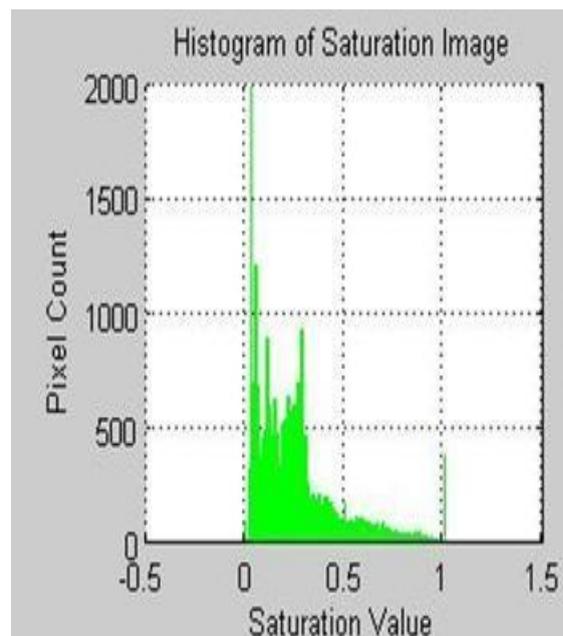


Figure 5(b). Histogram for Saturation Image

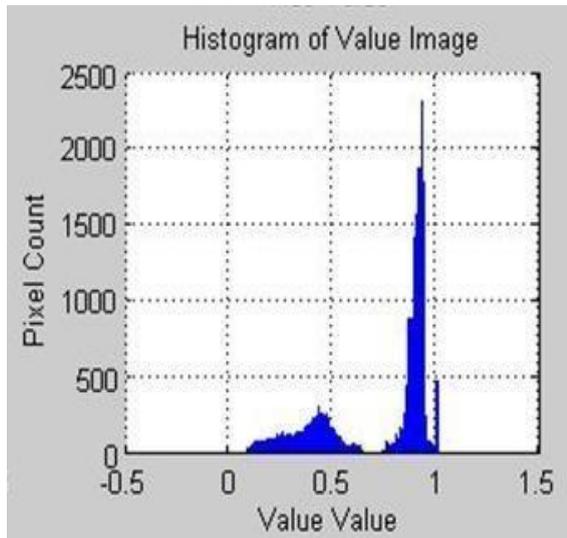


Figure 5(c). Histogram of Value Image

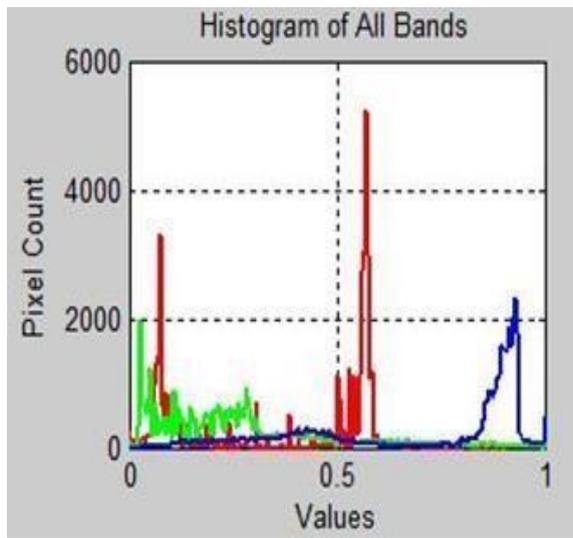


Figure 5(d). Histogram of all bands of the image



Figure 6(a). Segmented image 1



Figure 6(b). Segmented image 2



Figure 6(c). Segmented image 3



Figure 6(d). Segmented image 4

Shape

Notwithstanding hues , shapes are utilized for location. One of the focuses supporting the utilization of shape data for street sign acknowledgement is the need to standard hues among the nations .Frameworks depend on hues should be tuned by moving starting with one nation then onto the next. Basically there are three sorts of activity signs: circle, triangle and rectangle . Signs with different geometric orientation have diverse traits, such as circularity, rectangularity, elongation and separation from the centroid to edge. Since in the characteristic scene there are some mind blogging foundations like activity signs shading , constructing exclusively in light of shading assessment is not solid.

Notwithstanding location techniques in view of shape can additionally dispose of the foundation which has comparative hues , in light of the fact that the intricate foundations frequently don't have the exceptional state of movement signs . In the genuine scene the shooting is dubious ,up took activity signs will misshape, for example is triangle is the most part of triangular , so circle will be oval .In this way the characteristic esteem scope of rectangle degree , stretching degree and round degree are utilized to decide the objective territory. The information in the table can predict the issue viably.

DIFFERENT SHAPES CORRESPONDING TO THE VALUE RANGE OF THE SHAPE ATTRIBUTE

Shape	Circular degree C	Rectangular degree R	Elongation degree E
Circle	$C \geq 0.75$	$R > 0.70$	$E > 0.85$
Triangle	$0.35 < C < 0.70$	$0.4 < R < 0.65$	$E > 0.80$
Rectangle	$0.60 < C < 0.75$	$R > 0.80$	$E > 0.30$

As a result of entangled foundation existing in normal scenes , judgment district shape in light of Circular degree (C),Rectangular degree (R),Elongation degree (E), attribute still has big error. A strategy for rectifying of shape and figuring the number of vertices corresponding thesis raised. While adjusting the area of a triangle or rectangle the quantity of vertex of the district will be ascertained. As we know, there are three vertices in a triangle and four vertices in a rectangle, so if the provisional orientation does not correspond to the quantity of the vertices, the area will be rejected. The affine transform is a technique used to correct the geometric contortions or disfigurements that happen for various camera alignments. Affine transformation is a direct linear mapping technique. Sets of focuses straight lines or parallel lines and planes saves its inventiveness even after Affine change. For example – Revision of rectangular activity signs can embrace a comparable output. Four vertices of the rectangle gets Four gathering relating focuses directions , to ascertain the parameters of relative change to change revision.

III. DISCUSSION

In the process of image measurement and machine vision applications we need to establish the imaging geometry model on cameras. This model helps us to determine the corresponding relationship between points in the image and the 3-dimensional geometric position of respective that points in the surface space of the object. Regardless of the image measurement or the machine vision applications, camera calibration is a very critical aspect. The accuracy and stability of the calibration algorithm will affect the calibration accuracy directly. In real world, though the camera should capture moving objects for the road sign detection and all the processing should be done on the videos captured by the camera, but in this project we try to implement the technique first on still images and not on moving pictures. Thus the images on which we perform the operations are 2-dimensional images rather than 3-dimensional pictures. While analyzing the shapes there will be vigorous use of various edge detection algorithm, corner point detection, matching algorithm and various other coordinating calculations. The natural and the climate conditions dependably change. Subsequently under such conditions nature of the picture caught will debase which will specifically influence the acknowledgement of the sign. Objects that have indistinguishable qualities from the activity signs may show troubles for framework while deciding the area of signs like publicizing sheets (mainly square and rectangle) , this notice storing may be like the shape and shade of the movement sign as will result in fragmented target locale assurance too.

The first paragraph under each heading or subheading should be flush left, and subsequent paragraphs should have a five-space indentation. A colon is inserted before an equation is presented, but there is no punctuation following the equation. All equations are numbered and referred to in the text solely by a number enclosed in a round bracket (i.e., (3) reads as "equation 3"). Ensure that any miscellaneous numbering system you use in your paper cannot be confused with a reference [4] or an equation (3) designation.

IV. CONCLUSION

In this study we used the standard set of road signs that is used in most countries. Here we mainly emphasis on the color of the traffic sign for its recognition because in most countries a standard set of colors is used in traffic sign. Here we used input images in "Bitmap image" or ".bmp" format for processing and study, however this is applicable for all other standard formats of images like .jpg, .png.

This proposed methodology is basically studied in three stages, that is, pre-processing, recognition(i.e. acknowledging the sign) and detection(discovery). The received image may be influenced by different sorts of commotion or can be somewhat adulterated, so the image needs pre-processing before it can be utilized.

In the pre-handling step we have played out the fundamental picture preparing procedures like changed into dark scale image , then determined the histogram ,performed histogram balance (equalization), and furthermore converted into HSV space required for the investigation of the image. We have also additionally connected many de-noising system which helps in control manipulation of the image data to produce a top-notch picture. The pre-handling is trailed by picture acknowledgement and location. Shading based location strategies are utilized as a part of request to fragment diverse hues and to give locale of interests which will encourage acknowledgement. Shading division (analysis) comprises of dividing a picture into subsets of associated pixels that have comparative shading properties. The decision of an appropriate Color Space is essential. Identification depends on a procedure of division which concentrates on comparative sorts of properties. For deciding the shading , that is, whether it is red, blue or yellow we have utilized the RGB space whereas to check the inward bit of the activity sign we utilized the HSV space.

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