# A Smart Driver Alert System for Vehicle Traffic using Image Detection and Recognition Technique

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**Abstract— Road signs are important to ensure smooth traffic flow without bottle necks or mishaps. Road symbols are the pictorial representations having different necessary information required to be understood by driver. Road signs in front of the vehicle are ignored by the drivers and this can lead to catastrophic accidents. This paper presents an overview of the traffic sign board detection and recognition and implements a procedure to extract the road sign from a natural complex image, processes it and alerts the driver using voice command It is implemented in such a way that it acts as a boon to drivers to make easy decisions.**

***Keywords*—Road signs, Driver alert system, Image processing.**

## I. INTRODUCTION

Road signs give out a number of messages regarding the road and what you as a driver should expect on the road. They keep the traffic flowing freely by helping drivers reach their destinations and letting them know entry, exit and turn points in advance. Pre-informed drivers will naturally avoid committing mistakes or take abrupt turns causing bottlenecks. Road signs, indicating turns, directions and landmarks, also help to save time and fuel by providing information on the route to be taken to reach a particular destination. Road signs are placed in specific areas to ensure the safety of drivers. These markers let drivers know how fast to drive. They also tell drivers when and where to turn or not to turn. In order to be a terrific driver, you need to have an understanding of what the sign mean.

## II. LITERATURE SURVEY

Hierarchical Spatial Feature Matching approach is used to search the geometrical shapes within an image of a traffic signs, Hough transform is a technique, which can be used to separate features of a particular shape within an image. The classical Hough transform is most commonly used for the detection of regular features such as lines, circles, etc.

In this Paper the detection and recognition with changing lighting condition is implemented but the voice alerted is not implemented [1].

Another approach is Hue Saturation Intensity, the color space to segment the road signs color (red, yellow, blue and white) is used and the regions of interest in order to find and determine the shape of the road signs (diamond, square, hexagonal and circular), but they ignore the complexity in the case of dominant single color [2].

Another paper proposes recognition of traffic signs based on chromatic color segmentation, it uses Saturation and value to determine the chromatic zone but recognition mainly depends on color in the image of sign board and is sensitive to varying lighting condition [3].

## III. SYSTEM DESIGN

The following block diagram of the system is given below

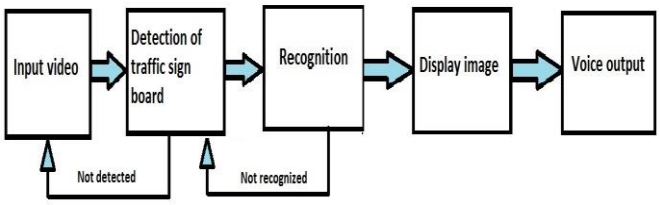


Figure 1. Block diagram of system

Here we give video stream as an input to the system, which is processed by image processing technique to detect and recognize the signboard.

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## IV. PROPOSED PARADIGM

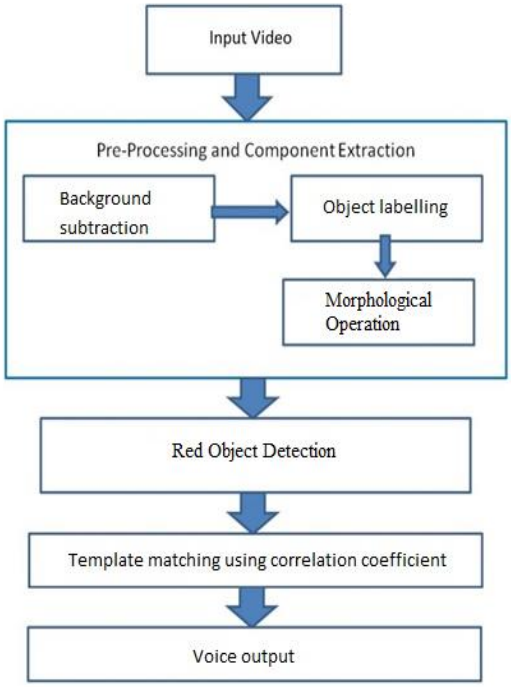


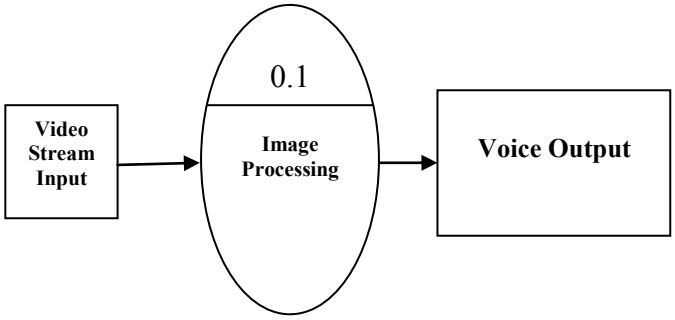

Figure 2. Architecture of the system

Here we propose a system in which the road sign board is detected and recognized, the input video consists of frames and each frame is analyzed and background subtraction technique is applied wherein an images' foreground is extracted for further processing [4].

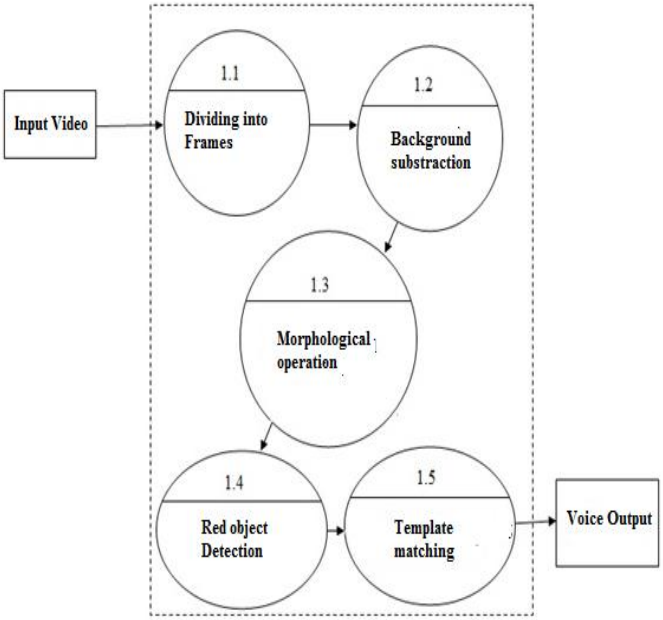
Objects in foreground are identified and the object with the red pixels are considered as red objects. The red objects are classified based on shape using Hough Transform and using correlation co-efficient technique the recognition of the sign board is done by template matching with standard images of dataset present in the database.

After recognition of sign board, the driver is alerted with the voice message.

Dataflow diagrams




Level 0: Abstract dataflow




Level 1: Detailed process involved in the dataflow.

In Level 0 the abstract view of the dataflow is shown as we discussed earlier we give video stream as data input to the System and alert message as output.

The detailed procedure involved for the dataflow is described in figure Level1 diagram [5].

## V. IMPLEMENTATION

The implementation of the proposed system consists of following modules:

### *A. Module I – Video Acquisition and Data Collection*

In this module, we collect different sign board images and define it as a standard dataset. On the other hand, we give real time video consists of sign boards as an input to the system.

### *B. Module II – Division of Frames*

The video is made of sequence of frames and the input video given to the system is divided into number of frames and each frame is considered for detection.

### *C. Module III –Background Subtraction*

Background subtraction is a widely used approach for detecting moving objects in a video. The frame considered is converted to binary image with color threshold (R, G, B) = (255, 0, 0) hence the red objects are highlighted and the frame considered is differentiated into foreground and background image by Adaptive background subtraction technique [6].

### D. *Module IV – Morphological operations*

The different morphological operations are applied on the objects that are present in the frame considered. Common image processing tasks namely noise removal, thinning, contrast enhancement are applied. To improve the quality of the image we apply the following operations such as, Dilation, Erosion, Opening and Closing. The background is subtracted and the imperfections present in the image are removed [7].

### E. *Module V – Red Object Extraction*

Once the background image is subtracted, different objects are identified. Objects with pixel which has the value (255, 0, 0) are considered to be the red objects and using the Hough transform algorithm, the objects are differentiated based on the shape. The objects with hexagonal, triangular and circular in shape are considered and resized for template matching [8].

### F. *Module VI – Template Matching*

In template matching the comparison of the resized image with standard dataset available in the database. The comparison of two images is done based on correlation coefficient algorithm. The quantitative measure of degree of association of two distinct variables is often coined as correlation coefficient which ranges from -1 to 1.

$$\text{The Correlation coefficient} = \rho_{A,B} = \frac{conAB}{StdA * StdB}$$

Procedural steps

a. Convert the images A and B into matrices.
b. Find average or mean of the matrix A and B i.e meanA and meanB.
c. Subtract mean value from the matrix A and B respectively which gives Asub and Bsub.
d. Find covariance of A and B by using the below formula
   covAB = average of (Asub*Bsub).
e. Find standard deviation of A and B, stdA and stdB.
f. Find the correlation coefficient.

If the correlation coefficient of A and B is closer to 1, then they are highly correlated [9].

### G. *Module VII –Voice Alert*

The recognized signboard is displayed along with the predefined voice output.

## VI. RESULTS AND CONCLUSION

The frame which consists of the traffic sign board is detected and processed whereas other frames without the traffic sign boards are discarded.


Figure 3. Input frame to the system

The sample frame which consists of traffic sign board is as shown in the above figure 3. And the frame is converted to binary image and morphological operations are performed as shown in the below figure.

Using Background subtraction foreground is extracted from the frame, the frame consists of objects, the object with red pixels is detected as red objects.

Using Hough Transform the objects are classified based on shape and compared with the standard data set in the database using template matching.

Figure 4. Binary image

The comparison of two images is done based on correlation coefficient technique. The alert message, as voice output to the driver is given to avoid the further fatalities or catastrophes.

Figure 5. Expected output along with the voice message

In this paper, we propose a smart driver alert system which detects and recognizes traffic signboard from video stream input and gives voice message to the driver.

We are using template matching for recognition of the sign board that uses correlation coefficient algorithm to compare two images and find a match. The proposed approach can be used in automatic vehicles, all kinds of vehicles to automate the process and to reduce road accidents.

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## REFERENCES

[1] Garcia,Sotelo and Gorostiza,"Fast Traffic Sign Detection and Recognition Under Changing Lighting Conditions",2006.

[2] Sallah,Hussin and Yusoff ,"Road Sign Detection and Recognition System for Real-Time Embedded Applications" ,2011.

[3] Truong Quang Vinh, "Real-Time Traffic Sign Detection and Recognition System Based on FriendlyARM Tiny4412 Board", IEEE,2015.

[4] Rafael C. Gonzalez and Richard E. Woods, "Digital Image Processing", Third Edition, - Pearson Education, pp. 864-874.

[5] Andreas Møgelmose, Mohan M. Trivedi, and Thomas B. Moeslund: "Traffic Sign Detection and Analysis: Recent Studies and Emerging Trends", In 15th International IEEE Conference on Intelligent Transportation Systems Anchorage, Alaska, USA, September 16-19, 2012.

[6] Carlos Filipe Paulo, Paulo Lobato Correia: "Automatic Detection and Classification of Traffic Signs. In IEEE Image Analysis for Multimedia Interactive Services", 2007. WIAMIS '07. Eighth International Workshop on, 6-8 June 2007.

[7] Miguel A´ ngel Garc´ıa-Garrido, Miguel A´ ngel Sotelo and Ernesto Mart´ın-Gorostiza, "Fast Traffic Sign Detection and Recognition Under Changing Lighting Conditions", 2006 IEEE Intelligent Transportation Systems Conference, Toronto, Canada, September 17-20, 2006.

[8] Kiran C. G., Lekhesh V. Prabhu, Abdu Rahiman V. and Rajeev K.: "Traffic Sign Detection and Pattern Recognition Using Support Vector Machine", IEEE Seventh International Conference on Advances in Pattern Recognition, Dec 2009.

[9] Siti Sarah Md Sallah, Fawnizu Azmadi Hussin, and Mohd Zuki Yusoff, "Road Sign Detection and Recognition System for Real-Time Embedded Applications", International Conference on Electrical, Control and Computer Engineering,Pahang, Malaysia,June 2011.