

# Traffic Sign Detection and Driver Alert System

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**Abstract-** Road traffic constitutes a major part in the problem of society. As the road traffic is increasing day by day there is a necessity of following the traffic rules with proper discipline. Traffic rules consists of traffic sign boards and traffic signals which are meant to be followed by everyone in the society. To provide a comprehensive assistance to the driver for following the traffic signs, we are representing Traffic sign detection and driver alert system. This gives the driver a sort of assistance which alerts the driver and reduce the work of the driver. The camera used is installed on the vehicle. Traffic signs are detected by examining the colour using the colour space. Our methodology of implementation used for segmentation and recognition of the obtained image is Principle Component Analysis (PCA) algorithm. By implementing this algorithm we get precise results and an efficiency of 95.66%.

**Index Terms-** Traffic sign detection, colour space, Principle Component Analysis, Segmentation.

## I. INTRODUCTION

India records a huge number of accidents in the world. In this situation, an automatic system used to detect and recognize traffic signs, mounted on vehicles, would help a lot. Millions of people are injured annually in vehicle accidents. Many of them are avoidable, especially those which are caused by missing the traffic sign boards. Automatic traffic sign detection and recognition plays a crucial role in building an autonomous system for e.g. Drive less Cars. Traffic signs are designed in such a way that they are legible for anyone to interpret the message or warning from that particular sign. They are designed with highly contrast and saturated colours.

An autonomous system which is able to detect, recognize and infer the traffic signs would be a prodigious help to the driver. Subsequently it will reduce the driver's work of memorizing and understanding the traffic signs, this will also reduce the number of accidents occurring on the road. Hence, all the traffic signs will be noticed. There is also a probability that objects of similar colour combination appears in the image similar to a traffic sign [7]. While detecting the traffic signs, the system come across many situations. Subsequently it encounters various problems due to weather conditions while detecting the traffic signs. The different weather conditions which affects the detection of traffic signs adversely are: Rain, Low intensity of light, Fog, Smog. Damaged traffic sign boards also create a problem in the detection and recognition of traffic signs. We aim to put

forward a technique which can be used to detect and recognize traffic signs in real time [4]. The speed of processing is improved by using the technique of PCA algorithm [1].

Traffic signs have several distinctive features that are extracted using PCA algorithm in order to analyse the sign, which will help the system to detect and interpret the sign. Generally, the traffic signs are mounted erect, hence the camera can focus on them easily. The extent of distortion which is caused due to change in the geometry of the traffic sign boards is very less.

The first research paper on traffic sign detection was published in Japan in the year 1984. The aim was to give vision to the computer system to detect outdoor objects. Since then many research institutes and industries have conducted research in this field, and a huge amount of work has been performed in this particular domain. Different programming techniques have been used, and a lot of progress has been achieved during the last decade.

The main goal of this project is:

- Detection, and Recognition.
- Feature extraction process of PCA algorithm.
- Sensing nearby objects using IR sensor.
- Speed change according to sign.
- Display the instruction.
- Announce via speaker.

## II. METHODOLOGY

### A. BLOCK DIAGRAM

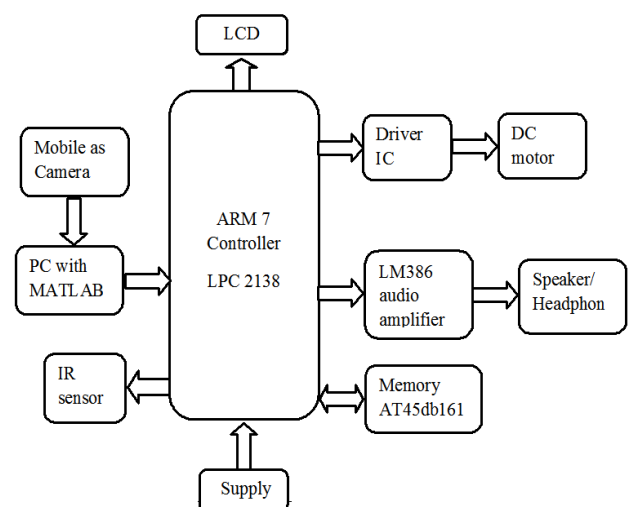


Fig.1 Block Diagram

**Camera:**Capture the sign board image.

**MATLAB:** Process PCA algorithm on captured image. It performs segmentation morphological operation on an image. It performs operation on database image which is stored in folder; path of which is provided in MATLAB code, and captured image. If both images are matched then string is sent to controller.

**ARM Controller:**It receives output from MATLAB code via USB to RS-232 converter to MAX232 to controller. Controller performs operation and sends to other outcomes of controller.

**IR Sensor:**IR sensor is used to detect nearby objects to avoid collision, DC motor stops working when sensor detects object.

**DC motor:**It shows speed difference before and after detection of speed limit sign board recognition.

**Memory IC:**This IC is used to store voice. It is 8bit .wav format voice.

**Audio amplifier and Speaker:**Audio amplifier amplifies the audio and using speaker according to sign, voice is announced.

**LCD:**LCD is 16×2 display, it displays instruction according to sign board.

#### B. SYSTEM OVERVIEW

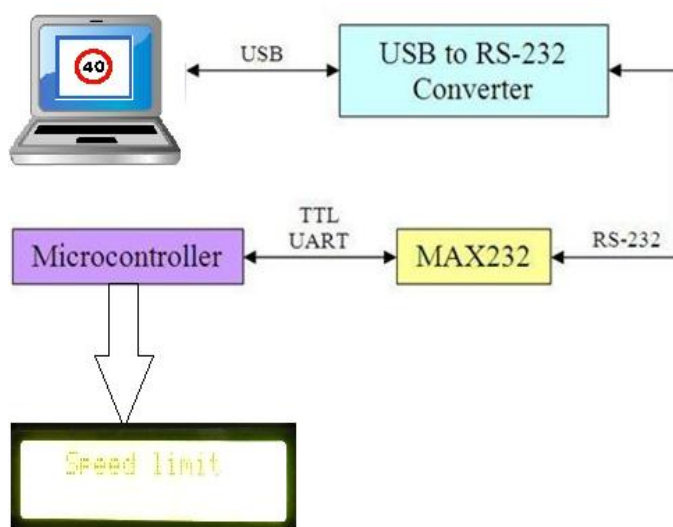


Fig.2 Overview of System

Overview of system is shown in above figure, in pre-processing morphological segmentation is performed on an image. After that if image is matched with database image then corresponding string is sent to microcontroller via USB to RS-232 to MAX232 to controller. Microcontroller controls the operation of system, it provides output according to the image. Also IR sensors are placed on the system which has range of 15cm. This can detect nearby obstacle and system will stop moving.

### III. RESULTS

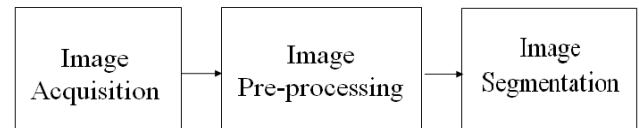


Fig.3 Operation steps on an image

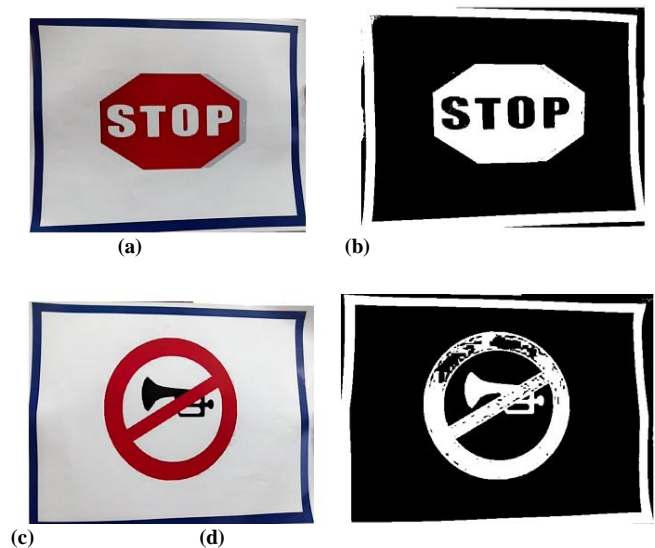


Fig.4 Pre-processing of images (a) & (c) real time captured images and (b) & (d) their segmented output

In pre-processing of an image, image is captured in real time which is compared with database image. On both images, database and real time captured image morphological segmentation operation is performed using Euclidean distance formula. Firstly, the connectivity of the components in the obtained image is checked and if it is less than 1000 (our experimental value) then that component is removed so that the noise is eliminated and after that morphology operations are performed.

**Euclidean distance formula:** -  $\text{dist}((x, y), (a, b)) = [(x - a)^2 + (y - b)^2]^{1/2}$

### IV. CONCLUSION

In this paper we put forward an approach based on Principle Component Analysis technique which is performed on an image for traffic sign detection and recognition. In the above stated methodology, firstly, the connectivity of the components in the obtained image is checked and if it is less than 1000 (our experimental value) then that component is removed so that the noise is eliminated and after that morphology operations are performed; and then the letters are segmented and recognized by Multiclass Support Vector Machine (SVMs) classifiers [2]. We make the use of Euclidean distance in the detection phase. We use Eigen vectors in the recognition stage [1].

We have verified our method on some traffic speed sign board database and the accuracy rate has been reached to

95.66% for detection and recognition stage. Also sometimes accuracy decreased when the light intensity is very low. This algorithm has higher speed and efficiency.

Since this work is employed for images, as a future scope we have scheduled to implement this system for traffic sign detection and recognition in real time video streaming. Another future scope is to transmit these detected and recognised traffic signs to nearby vehicles to alert them [10]. This can be done by using a GSM module.

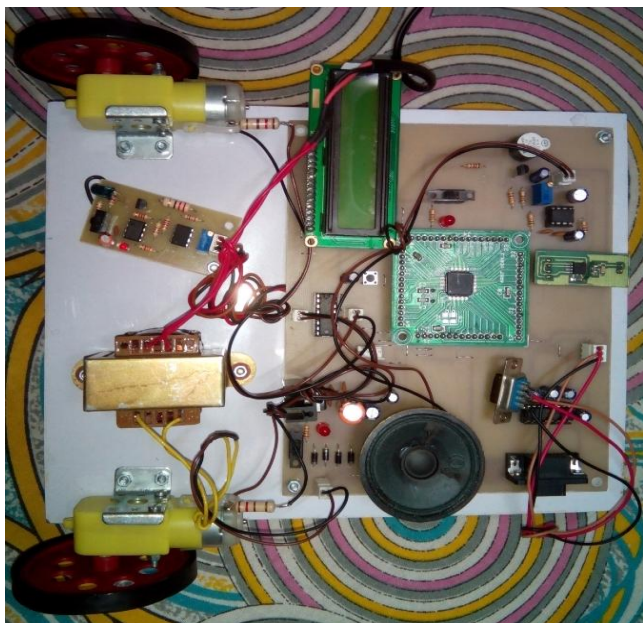


Fig.5 Circuit Setup

## V. ACKNOWLEDGMENT

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