**✚IJESRT**

# INTERNATIONAL JOURNAL OF ENGINEERING SCIENCES & RESEARCH TECHNOLOGY

## VEHICLE REGISTRATION PLATE DETECTION AND RECOGNITION SYSTEM

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## ABSTRACT

Vehicle Registration Plate (VRP) Detection & Recognition System is one type of intellectual transport system and is of considerable interest because of its application in detecting the registration plate affixed on Indian vehicles. One of the key special of Registration Plate detection system is the Character Segmentation so it also finds application in highway electronic toll collection and traffic monitoring system. This type of application puts high demands on the consistency of Registration Plate detection system[1]. A lot of work has already been done regarding license plate recognition systems for Korean, European, Chinese and US license plates.

The purpose of this paper was to develop an application which senses and recognize Indian  license plates from cars at a gate, for example at the entrance of the parking area. The system, based on  PC with video camera, catches video frames which includes a visible car license plate and process them. Once a license plate is detected, then characters are recognized displayed on the MATLAB command window or checked against a database.  The main effort is on the design of algorithms used for extracting the license plate from a single image, authentication of the license plate, separating the characters of the plate, authentication of the character of license plate for detection process, and finally identifying the individual characters.

**KEYWORDS:** Vehicle Registration plate(VRP), Histogram equalization technique( HET), Red green blue(RGB), Probalility density function( PDF), Optical character recognition( OCR).

## INTRODUCTION

This system is an image-processing technology used to detect the VRP of the Indian vehicles. As we know that it is must for all the vehicles to have license plate. So our detection system helps in detecting whether the registration plate affixed with the vehicle[2]. This technology is very helpful in security and traffic installations. Lot of research has already been done for Korean, Chinese, American and other registration plates[3]. First we present the Problem Statement then we discuss some detail features of VRP. Next we discuss the basics that are commonly used in VRP detection system. Following this, we present the applications, building of proposed VRP detection system. Finally the objectives of the work are stated.

Problem Statement: To design an Automated VRP Detection system using MATLAB.
Structure of the proposed system: Input to the system is an image sequence acquired by a digital camera that consists of the Registration plate and its output is the recognized characters of the registration plate[4]. This system consists of 4 main module, viz. Image acquisition and preprocessing, Registration plate extraction, Character segmentation, Character recognition.
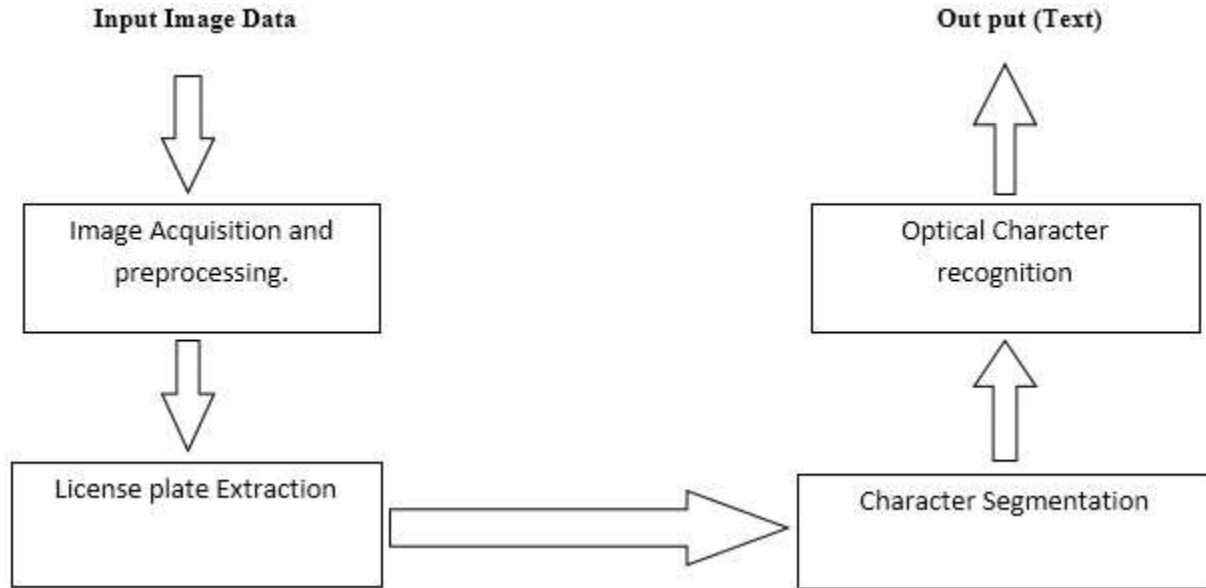
## AN OVERVIEW OF THE SYSTEM

**Image Acquistion and preprocessing:**

This is one of the initial phase of the detection system. This mainly deals with acquiring an image by image acquising method[5]. After acquisition of an image next step is preprocessing of an acquired image.This steps includes color image to gray scale image conversion, then Histogram equalization technique is used for contrast enhancement of the dilated image[6].

The above stated method mainly works on the gray scale image so it is necessary to convert input color image to 2-dimensional gray scale image.

I = rgb2gray(color image) converts the true color image RGB to the gray scale intensity image.
(HET) can be used to boost the contrast of input gray scale images. Suppose the variable y in interval [0, 1] where y = 0 representing black and y=1 representing white.
w=T(y)    0<=y<=1 which will produce a level w for every pixel value y.
T(y) should satisfies the following below listed conditions:
1) T(y) should be single-valued and monotonically increasing in the interval 0<=y<=1.
2) 0<=T(y)<=1 for 0<=y<=1.

Random variable is an another alternative way to represent the gray levels of an image in the interval [0,L-1] and we all know that the most fundamental method to describe the random variable by its PDF.. So let $p_v(v)$ and $p_w(w)$ are PDF of random variable v and w[6].
From the basic theory of probability we know that if $p_v(v)$ and T(v) are known and  then PDR $p_w(w)$ can be obtained using

$$p_w(w)=p_y(y)\left|\frac{dy}{dw}\right|$$

So the PDF of the transformed variable is determined by the gray level PDF of the input image and the transformed function[7].

A transformation function has the form of

$$w=T(v)=\int_0^v p_v(x)dx,\text{ where x is a dummy variable}$$

Where right side of this equation shows cumulative distribution function of random variable v.By using Leibniz's rule
$$\frac{dw}{dv}=\frac{dT(v)}{dv}$$

$$= \frac{d}{dv}[\int_0^v p_v(x)dx]$$

The above mapping is called histogram equalization[8].



*Fig.1 Input color image*



*Fig. 2  Gray scale image*



*Fig. 3 HET image*

## LICENSE PLATE EXTRACTION
The main principle of extraction  is the adrupt  variation in the contrast between the characters and the background of the license plate region. As license plate can either be yellow or white and the letters are written with black color so

there will be frequent changes in the intensity.So the rows that contain the license plates will show adrupt variation in intensities this provides my basis for identification of registration plate from the processed image[9].



*FIG4: TRUE NO. PLATE EXTRACTION*

## CHARACTER SEGMENTATION

It is most important process because the output of the segmentation is carry forward to the recognition system where each character is recognize distinctly. The main basis of segmentation is that there is an sudden change in the intensity levels between the letters and the background of the license plate[10].

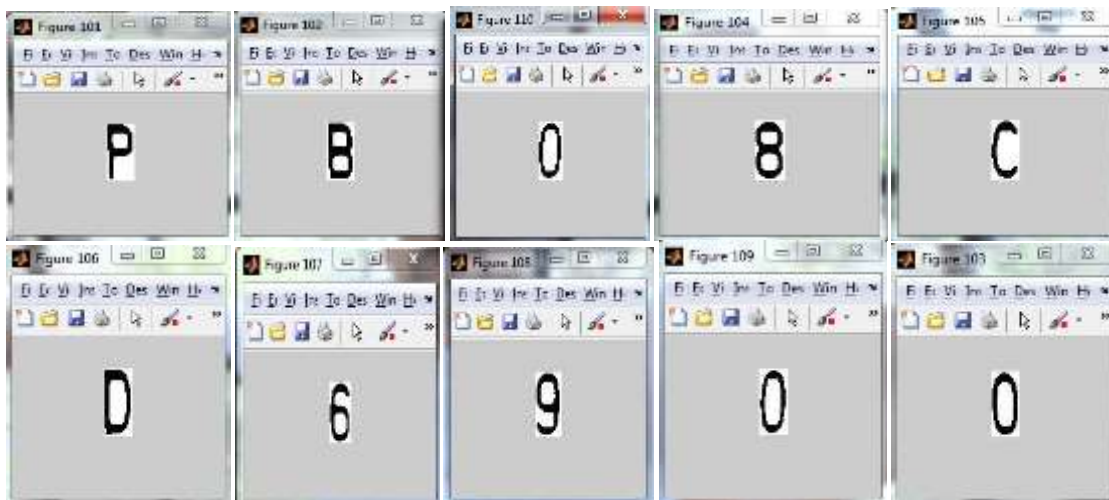The sobel edge detector method is used for extracting the characters from the above processed image.



*Fig.5 Segmented characters*

## CHARACTER RECOGNITION

In my research proposal I have used OCR for character recognition. It is a technique that compares portions of images against one another. It can be used in manufacturing as a part of quality control or a way to detect edges in image[4].
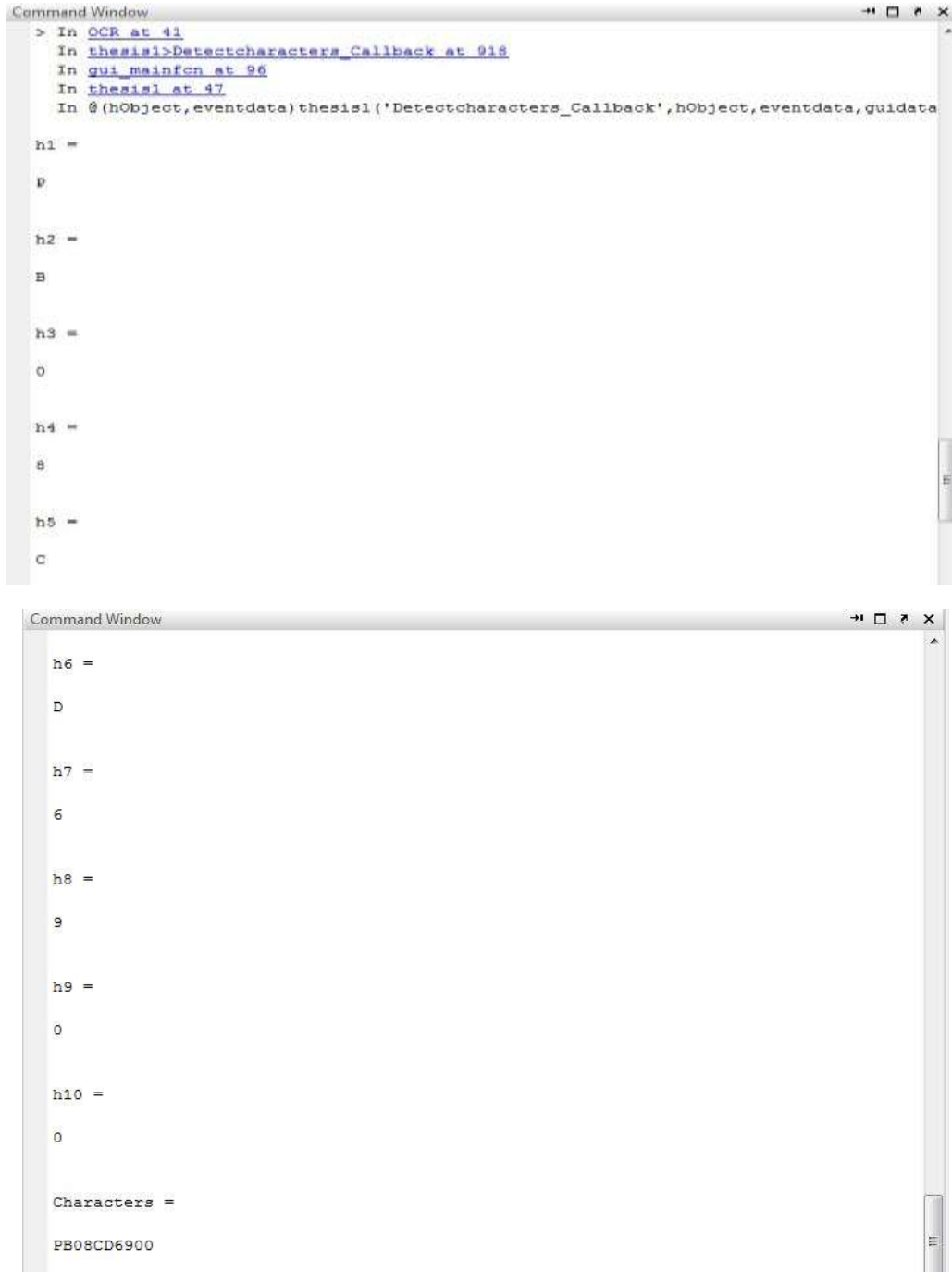
*Fig.6 MATLAB command window displaying recognize characters.*

## CONCLUSION

The process of VRP system requires a very high degree of accurateness when we working on a road or parking which may not be possible manually. To overcome this problematic, lot of efforts have been made by researches across the world for last many years. We have used MATLAB to obtain the desired results. MATLAB provides an easy approach for debugging and correction of errors in our algorithm and also is an ideal tool for faster employment and verification of any algorithm before actually realizing it on a real hardware.

The setup has been tested for 117 vehicles containing different number plates from different states. In our process of detection after optimizing the parameters like , contrast and gamma, adjustments, finest values for lightening and the angle from which the image is taken we get an overall efficiency of 96.3% from this system.

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