



## An approach to license plate recognition of Indian vehicles

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**Abstract**— The authentication of Indian Vehicles by their number plates is the most interesting and challenging research topic from past few years. As the technology is getting advanced day by day, there are many different aspect of designing number plates to the vehicle of each country. For the several respective regular administrative tasks the license number plate is used for various purposes like tracking of number plates by the traffic police, for the analysis of theft cars, for managing of parking of vehicles and toll collection etc. Unique numbers are assigned to all the motorized vehicles in India. These unique numbers are designated to the vehicles by district-level Regional Transport Office (RTO).

This paper presents a different technique for license plate recognition (LPR). Images of rear end of the car will be considered. The license plate will be extracted from the whole image and segmentation will be done in order to extract the characters from the image. A suitable algorithm will be used to recognize the characters which are extracted from the image and the recognized number plate will be displayed as a result. The characters will be recognized from the image and the authorized number plate will be displayed as a result.

**Keywords**—License Plate Recognition, Indian vehicles, Adaptive Thresholding, Template Matching.

### I. INTRODUCTION

License plate recognition (LPR) plays an important role in numerous applications such as unattended parking space security control of restricted areas, traffic law enforcement congestion pricing and automatic toll collection. As there are different working environments, LPR techniques also vary from application to application.

Number plate have very high variations of contrast. If the number plate matches the background it is difficult to identify the location. According to the light, brightness and contrast of the image changes. The morphological operations are used to extract the contrast feature within the plate.

The basic step in recognition of vehicle number plate is to detect the plate size. Generally, all number plates have rectangular shape. Hence the edges of the rectangular plate has to be detected. Morphological operations will be used to detect that region.

In India, there are standardized number plates. However they exist, are rarely practiced. As a result, lot of variations are found in the number plates in terms of character size font type and location of the number plate. Also, many unwanted characters are present on the number plate. In order to recognize the desired license number, the area of the number plate from the whole image plate has to be located in the image. The goal of localization is to subtract all the background and consider only the number plate area from the input image. From the number plate area, each character is segmented individually then and every character is recognized.

Vehicle tracking and identification is used in many applications like vehicle access control, crime investigation and prevention, boarder control etc. In many vehicles, police uses cameras and install it in front of their cars for identification of vehicles. In the literature, there are different LPR methods developed by different researchers such as, morphological operation, edge extraction, combination of gradient features, salient features, a neural network for color and also for grayscale classification, vector quantization and many more. Detection of license plate is the most challenging problem

because of different lighting conditions, interference of characters, font size etc. Matas and Zimmermann proposed an algorithm to detect LPs under various conditions. This algorithm used character regions, which make the algorithm quite robust to view- point and illumination. However, it could hardly highlight characters overlapping from the true LPs.

## II. METHODOLOGY

The input image is captured by digital camera or any mobile phone camera. The image is resized to  $256 \times 256$ . The color input image is converted to a grey scale image. Adaptive Thresholding is applied on the image to compose the binarized image. After that, the Median filtering is applied for removal of noise and to enhance the binarized image. Next, the actual size of the plate is calculated using Morphological Operations. The desired plate details are highlighted. Further license plate extraction and character segmentation is done. The overview of proposed system is shown in Figure.1

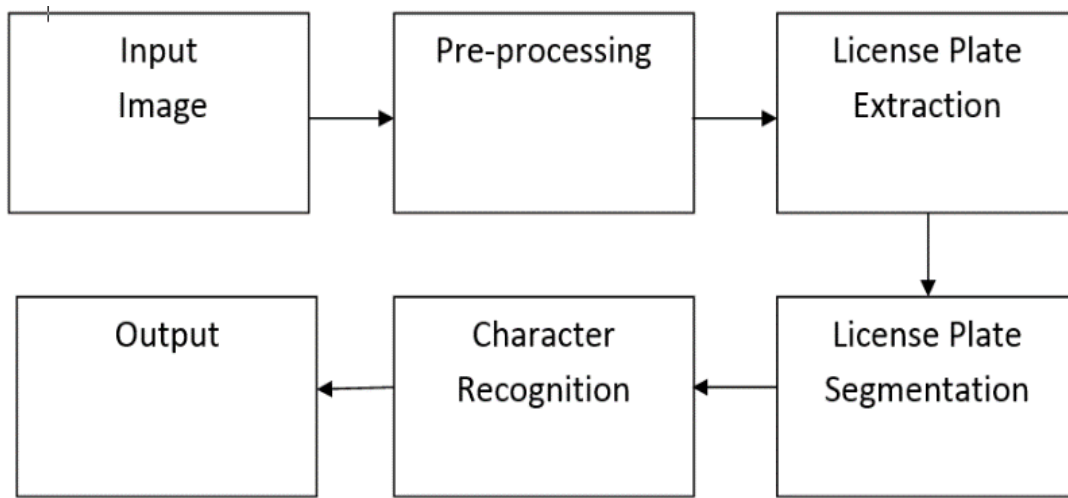


Figure 1. Overview Of Proposed System

### A. Input Image

Number plates of different states and cities with different varieties of font is considered for database creation. Sufficient number of images are taken for database and those images are considered as an input image. Here, the rear body of the four wheeler car is taken into consideration for further processing of input image.

### B. Pre-processing

Image pre-processing significantly increases the reliability of image observation. The aim of pre-processing is an enhancement of the image data that brings under control the unwanted distortions or enhances some image features important for further processing. Pre-processing of an image consists of following:

- Image resizing
- RGB to Grey conversion
- Noise removal

The first step in image enhancement is image resizing. The original image is taken into consideration and then it is resized. The size of the image is  $256 \times 256$ .

The second step in image enhancement is to convert the RGB image into Grey level image. The lowest level is 0 and the highest level is 255.

The final step in image enhancement is to remove the noise from the captured image. Median filtering is one of the digital filtering technique, used to remove noise. This noise reduction is pre-processing step to improve the results for future processing. The Median Filter removes the salt and pepper noise from an image without reducing the sharpness of the image.



Figure 2. Preprocessing Of Input Images

### C. License Plate Extraction

By capturing the image of rear body of the four wheeler car, we have the license plate that is also surrounded by the background of vehicle body. Therefore by using area extraction technique the number plate is extracted from the whole body. Using Adaptive Thresholding and Morphological filtering the required area of the license plate is calculated.

### D. Adaptive Thresholding:

In order to account for variation in illumination, adaptive thresholding is used. In adaptive thresholding different threshold value is computed for every pixel in the image. An Adaptive Thresholding process is applied after color input image is converted to grayscale. The grayscale image is converted into binary through adaptive thresholding.

- Uneven illumination

An image can be modeled as the product of a reflectance component  $r(x,y)$  and an illumination component  $i(x,y)$  as

$$f(x,y) = i(x,y)r(x,y)$$

Where,

$$0 < i(x,y) < \infty \text{ and } 0 < r(x,y) < 1$$

$i(x,y)$ : the amount of source illumination incident on the scene being viewed.

$r(x,y)$ : the amount of illumination reflected by the object.

Uneven illumination makes an originally perfectly segmentable image into an image that cannot be segmented satisfactorily using a single threshold.

One way to overcome the uneven illumination problem is to first estimate the uneven illumination and then correct it accordingly (rectification) – Upon correction, global thresholding can be employed.

Another way is to use adaptive thresholding by partition the original image into several sub images and utilize global thresholding techniques for each sub image.

### III. CONCLUSION

The proposed system develops a general framework to recognize Indian License Plate of a car using Image Processing approach. Images of the rear body of Indian vehicles with single line number plate are considered for analysis. The images are pre-processed and segmented and based on these results template matching is done. Then the numbers will be displayed in the form of output, which will help for toll collection and managing the parking of vehicles.

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