License Plate Recognition of Indian Number Plates- An Image Processing Approach

Riri Pradeep Shah[1], Prof M.R Madki[2]

P.G Student, Department of Electronics Engineering, Walchand Institute of Technology, Solapur, India [1]

Assistant Professor, Department of Electronics Engineering, Walchand Institute of Technology, Solapur, India [2]

Abstract: The authentication of Indian Vehicles by their number plates is the most interesting and challenging research topic from past few years. License Plate Recognition is a system designed to help in recognition of number plates of vehicles. As the technology is getting advanced day by day, for each country there are many different aspect of designing number plates to the vehicle. 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, parking management of vehicles and collection of toll 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 aims to present a technique for license plate recognition (LPR). Images of rear end of the car will be considered. From the whole image only the license plate is extracted and segmentation will be done in order to extract the characters from the image. To recognize the characters which are extracted from the image and to recognize the number plate a suitable algorithm will be used and as a result the recognized number plate will be displayed. The characters will be recognized from the whole image and the authorized number plate will be displayed as a result.

Keywords: License plate recognition, Optical character recognition (OCR), connected component analysis, India vehicles, Authorized vehicle number plate.

I. INTRODUCTION

License plate recognition (LPR) plays an crucial role in numerous applications such astraffic law enforcement congestion pricing, unattended parking space security control of restricted areas, and automatic toll collection. As working environment are different, there is also variation in LPR techniques 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 initial 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 and to detect that region clearly some morphological operations will be.

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 font type, character size 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 situated 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 recognition of every character is carried out. Tracking of

vehicle and identification is used in many applications like crime investigation, vehicle access control, crime prevention, boarder control etc. For identification, in many vehicles, police uses cameras and install it in front of their car. The researchers has developed many different methods for License Plate Recognition (LPR) such as, morphological operation, edge extraction, combination of gradient features, salient features, a neural network for color as well as for grayscale classification, vector quantization and many more. The most challenging problem is the detection of license plate because of different lighting conditions, interference of characters, font size etc.Zimmerman and Matas and developed an algorithm to detect LPs under various conditions. This algorithm used regions of characters, which make the algorithm quite robust to view- point and illumination. However, it could hardly highlight characters overlapping from the true LPs.

## II. BLOCK DIAGRA OF THE PROPOSED SYSTEM
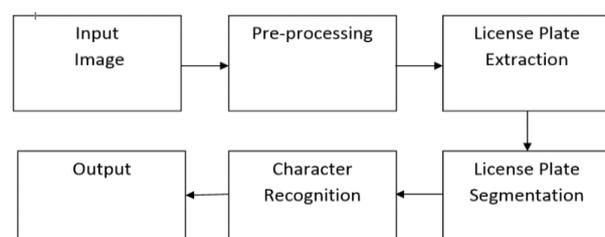
Fig. 1 Overview of proposed system

Figure 1.shows the overview of the proposed system. It image shows one by one step in sequence which is to be followed to get the required output. The proposed system has four main stages ie; pre-processing, license plate extraction, license plate segmentation and character recognition. In pre-processing stage the unwanted noise is removed using the median filter and then thergb image is converted into grey image. This pre-processing is followed by extraction where only the license number plate is extracted from the whole body of the vehicle. After that every character is segmented from the license number plate using connected components analysis. This is followed by character recognition using optical character recognition technique. Finally authorization is performed.

1) Input image:
In this phase, color images of Indian vehicles are captured. Images are captured from 4-5 meters away from the vehicle.

2) Pre-processing:
In this process, the original input image is taken as input and then the unwanted noise is removed using the median filter so that we get a filtered image. Then the same image is converted from rgb to gray as shown in figure. 2.

(a)Original Image

(b)Gray-Image
Fig. 2. Pre-processing images (a) (b)

3)Extraction of License Number Plate:
By capturing the image of back body of the four wheeler vehicle, we have the license plate that is also surrounded by the background of vehicle body. Therefore by using Connected Components Analysis the number plate is extracted from the whole body as shown if figure. 3.

Fig. 3 Extracted license number plate

4) Segmentation of Characters:
The main aim of segmentation is to extract the required information from the image. From the extracted license plate, we need to segment each and every character as well as numbers. So by using Connected Component Analysis we segment every character as shown if figure. 4.

Fig. 4 Segmented license number plate

5) To get Vehicle Number Plate:
The extracted Vehicle License Number is displayed as shown is dialogue box. (Figure. 5.)

Fig. 5 Dialogue box of license number

6) To get State of Vehicle:
The extracted number belongs to which State is displayed.(Figure. 6.)

Fig. 6 Dialogue box for State

7) To get the City of Vehicle:
The proposed algorithm also identifies the number belongs to which city. (Figure. 7.)

Fig. 7 Dialogue box for city

8) Check for Authorization:

The proposed algorithm also check whether the license plate is authorized or unauthorized. The extracted license plate compares the extracted number with the database. If the number matches with the database, it will assign as Authorized License Plate. If the number does not matched with the database, then it will display as Unauthorized License Plate. (Figure. 8.)

Fig. 8 Dialogue box for authorized vehicle number plate

III. OPTICAL CHARACTER RECOGNITION

Here we are using Optical Character Recognition to recognize the character of vehicle license number plate. It identifies the number extracted from the license plate and keeps the number or character into text file. This technique of OCR works by using the technology to capture the images and retrieve the respective numbers on the license number plate. It simply works by focusing the numbers on the image and separating them from the other part of the image. The automatic number plate recognition with Optical Character Recognition (OCR) will then work to convert the data into searchable, editable, and to easily store information in the network of database. Some of the applications of vehicle license number with OCR is tracking and tracing the destinations of the company owned vehicles.

IV. SAMPLE OF INDIAN VEHICLE NUMBER PLATE

In India, there are two types of vehicles:
A) Private Vehicles
B) Commercial Vehicles

In case of Private vehicles, it consist of white license number plate with black color characters on it.
In case of Commercial vehicles, it consists of yellow license number plate with black color characters on it.
Here we are using Private four wheeler Indian vehicles, which consists of two-letter code which specifies the state of the vehicle in which it is registered followed by two-digit code which specifies the city/district followed by series code. Then finally it is followed by four-digit code which gives actual registration number that uniquely defines each vehicle.
Below figure. 9. shows the sample image of Indian Vehicle Number plate where:
1- Indicates two letter state code

2- Indicates two digit city/district code
3- Indicates series code
4- Indicates the actual unique registration number of each vehicle
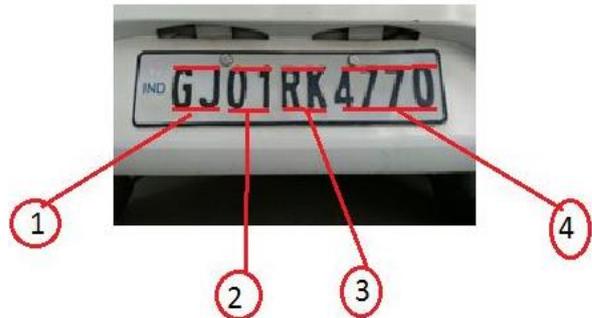
Fig. 9. Sample of Indian vehicle number plate

V. PERFROMANCE EVELUATION

A) Table for state wise correctly detected number plates.

Table. 1. State wise correctly detected number plates

State	Total Images	Correctly detected
Maharashtra	20	20
Uttar Pradesh	20	20
Gujarat	20	20
Karnataka	20	20

B) Performance chart for different states.
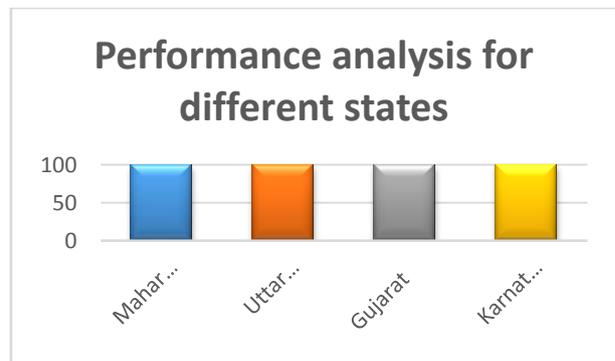
Fig. 10. Performance graph for different states.

VI. CONCLUSION

Images of the rear body of the four wheeler Indian vehicle was considered. 80 images were taken for database. The database consists of images obtained from various cities of different states. For all the images in database number were successfully extracted and detected using Optical Character Recognition (OCR). An additional feature was introduced for authorization of license number plate. The extracted number from license plate was compared with the database, and if it exists in the database then the number was labelled as authorized licensenumber plate, if not it was labelled as unauthorized number plate.

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BIOGRAPHIES

Prof M.R Madki is an Assistant Professor in Walchand Institute of Technology in E&TC department, Solapur, India. His qualification is B.E (E&TC), M.E(Electronics), Ph.D(In progress). He has 27 years of teaching experience. His area of specialization is Wireless Communication and Solar systems. He has published total 12 international journal, 5 national journal and 12 conference papers.

Miss. Riri Pradeep Shah is a P.G student in Walchand Institute of Technology from Electronics department, Solapur, India. She has completed her B.E (Electronics).