



Implementation of an Extensive Number-Plate Recognition & Authentication (NPRA) System using MATLAB

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Abstract- *The recognition of Indian automobiles by their number plates is the interesting research area from past few years. It has been seen that the vehicle number plates are in diverse size and shape and also have diversity in color on the basis of country. This paper focuses on an approach based on straightforward but well-organized morphological operation and a well-known edge detection approach. Number plate authentication is widely used in areas such as vehicle parking, traffic management, access control for highly secured areas, and monitoring of theft vehicles. The proposed method will work on both white and yellow color plates. Here with recognition of number plate, authentication of number as well as vehicle color verification is done. Vehicle color verification is also done to make sure that in case of vehicle robbery victim may replace the theft vehicle number plate with different registered number plate. When system monitors the number it will found it registered and grant permission. Here vehicle color will increase system reliability. The work is divided in to two phases. In first phase, activities like license plate location detection, image acquisition, optical character recognition (OCR) and edge detection technique is applied on input image. The outcome of first phase is segmented characters. Second phase involves activities like template matching and vehicle color verification. The paper also intends vehicle authorization by verifying number and vehicle color from vehicle registration database.*

Keywords- *Number Plate Recognition & Authentication (NPRA), Optical Character Recognition (OCR), Sobel Edge Detection, Morphological processing, Template Matching.*

I. INTRODUCTION

The license plates of vehicles are main thing the basis of which the identification is made. Vehicle identification is done either manually or automatically. Automatic identification is an application of the image processing technique. Automatic identification systems and vehicle authentication are used for parking, traffic management, access control and monitoring of wanted vehicles. The digital image is an entry in the system and the captured image will pass through various image processing techniques such as image acquisition, enhancement, morphological imaging, segmentation and filtering, recognition, etc. All these works are divided into two phases.

- a. In a first stage, in activities such as the detection of the location of the license plate extraction and segmentation.
- b. Second phase includes activities such as matching model.

After recognition of the plate of the vehicle authentication control number will be performed from the database. If the recognized number is genuine the door will open another if the number of vehicles is invalid then the door will be closed and a report message will be generated for the security personnel involved.

As it is known that all afford a place in the last year on the vehicle recognition process is based on optical character recognition.

II. RELATED WORK

Lot of effort was made in the extraction techniques of the vehicle license plate. As it is known that, in India, the license plate is of rectangular shape. [1] [2] uses the method based Edge Detection to detect the shape of the input image from the rectangle. This approach is the most simple and effective. [1] [3] uses the Sobel edge detection to find the edges which is due to the difference in color between the license plate and the vehicle body. [6] [7] [8] The image processing Morphology is used for extraction of the license plate image input from. It adds additional functionality that helps eliminate unnecessary tiny parts of the license plate. [4] proposed a hybrid method which is a combination of statistics and Morphology Edge. The accuracy of the vehicle license plate localization is 99.6%. [3] Used the Hough transform to find the straight lines in an image which indicates the registration plate. There is a limit of extraction driven approach that takes a lot of computing time.

In [5] Optical Character Recognition is the technique in the image processing. It is used to classify / scan alphanumeric text into the computer - readable text to recognize the license plate. It requires the pretreatment step to remove the limits that helps to recognize characters. It processes information more quickly, accurately and efficiently and also minimizes errors. In [10] adaptive binarization is used to convert the evening intensity at noon. In [13] Fixed background color is used and reduces edge points and removes the false regions.

[11] Uses the horizontal and vertical projection for segmentation offer. [12] Overcomes its problem by combining with Contour transformed with Hough transform.

Template Matching [9] is used to test the characters with models that are designed. It is useful for the recognition of fixed-size characters and not broken. It is small blocks of an image and match the pattern image with. design pattern is essential part of template matching. Pattern design must match the models in the corresponding picture also has a certain amount of offset to other models. In [14] the neural network approach is used, then the character is detected by the mapping matrix and training. With this average recognition rate approach 96.53% is obtained by twice hidden layer.

In the approach to the analysis [15] Spectral is used to pull on the location of the license plate image input and an analytical approach to connected components and SVM extraction techniques characteristics are used for segmentation character from.

All the above work-related and other work in this area only used the OCR and simple template match but in these models there is an infringement of opportunity for theft, if the victim uses plate registration number instead of those mentioned theft number plate vehicle.

III. PROPOSED WORK

The proposed method works on both white and yellow plates. Here, with the license plate recognition, authentication number and checking the color of the vehicle is made. color verification of the vehicle is also made to ensure that in the case of a victim flight vehicle can replace the flight number plate vehicle with different registered license plates.

When the system monitors the number, it will be found recorded authorization and large. Here the color of the vehicle will increase system reliability. The work is divided into two phases. In the first phase, the activities such as the detection of the license plate location, acquisition of the image, the optical character recognition (OCR) and the edge detection technique is applied to the input image. The result of the first phase is segmented characters.

Here we use the extensive approach edge detection with the morphological processing like dilation and erosion. Second phase includes activities such as pattern matching and checking the color of the vehicle.

The fundamental steps of proposed model are shown below in figure 2. The steps are as follows:-

- I. Perform Image Acquisition on input image
- II. Perform Pre-processing
- III. Perform Image Enhancement and histogram equalization
- IV. Perform Color image processing to create gray scale and binary image
- V. Identification of vehicle number plate and color
- VI. Morphological Processing for edge detection & Segmentation
- VII. Template Matching
- VIII. Authentication of vehicle number (template generated number from database) and verification of vehicle color from database.

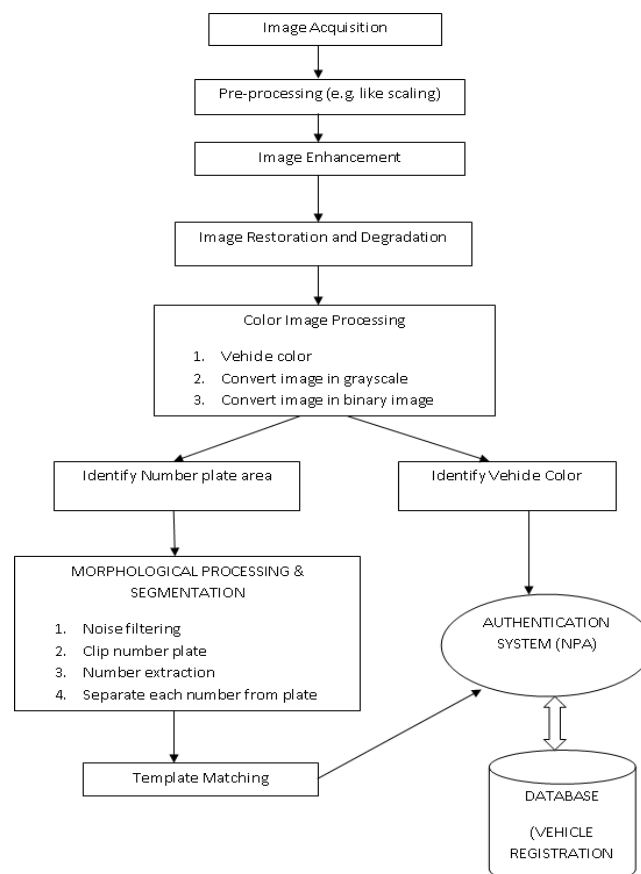


Fig 1: Number Plate Authentication (NPA) System

0	1	2	3	4	5	6	7	8	9	A	B	C	D	E
F	G	H	I	J	K	L	M	N	O	P	Q	R	S	T
U	V	W	X	Y	Z									

Fig 2: Templates used for matching

The template generated number and template based matching is done with the help of templates shown in above mentioned figure 3.

IV. IMPLEMENTATION USING MATLAB

In this section all implementation through MATLAB will be shown on an image. The input image is shown in figure 3 which is in image acquisition phase.



Fig 3: Input Image



Fig 4: Image after Histogram Equalization



Fig 5: Gray scale image



Fig. 6: Binary image

Figure 4 shows the image histogram equalization and then in figure 5 gray scale image is shown, which is generated from histogram equalized image. Then the gray scale image will be converted in binary image. Now some morphological operations will be performed.

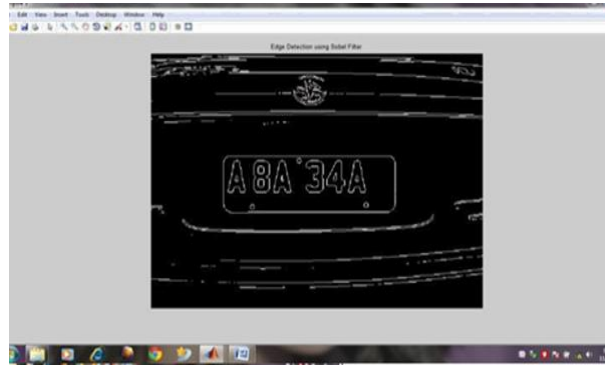


Fig. 7: Edge Detection

Edge detection operation is shown in above figure 7. Following code shows the extracted number plate which is shown in figure 8.

Equations: $b=a(R/3: R, 1: C)$;

a = Original Image, R= Row, C= column.

Find the area number using following equations $B=STATS$. BoundingBox;

$Xmin=B(2)$;

$Xmax=B(2)+B(4)$;

$Ymin=B(1)$;

$Ymax=B(1)+B(3)$;

$LP=b(Xmin+25: Xmax-20, Ymin+10: Ymax-10)$;

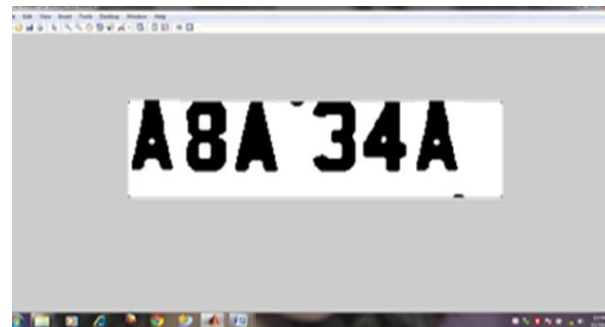


Fig.8: Extracted Image



Fig.9: Image after morphology operation imopen



Fig.10: Image after morphology operation imclose


```
subplot(3, 4, 4);  
imshow(blueBand);  
title('Blue Band');  
and so on.....  
% Threshold each color band.  
redthreshold = 68;  
greenThreshold = 70;  
blueThreshold = 72;  
and so on.....  
redMask = (redBand>redthreshold);  
greenMask = (greenBand<greenThreshold);  
blueMask = (blueBand<blueThreshold);  
and so on.....
```

V. CONCLUSION

The above proposed work is a hybrid approach is a combination of pre-processing such as histogram equalization, edge detection, morphological processing and segmentation. In the first phase of the extraction plate number, the extraction is performed in characteristics such as color, the limit or the presence of the characters. Here also it recognized the vehicle color. In the step of segmenting characters, character extraction is performed by projecting characters color information, through labeling characters, or characters matching the position. In the second phase, the character recognition is performed by template matching technique. The fact that several format plates become a rather tedious task to automatically recognize tuition also funds and the environment increase the challenge. In the future MATLAB based application will more safely and accurately control parameters.

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