Real Time Vehicle Registration Number Plate Recognition System

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ABSTRACT: Basically, video surveillance system is used for security purpose as well as monitoring systems. But Detection of moving object is a challenging part of video surveillance. Video surveillance system is used for Home security, Military applications, Banking /ATM security, Traffic monitoring etc. Now a day's due to decreasing costs of high-quality video surveillance systems, human activity detection and tracking has become increasingly in practical. Accordingly, automated systems have been designed for numerous detection tasks, but the task of detecting illegally parked vehicles has been left largely to the human operators of surveillance systems. The detection of Indian vehicles by their number plates is the most interesting and challenging research topic from past few years. It is observed that the number plates of vehicles are in different shape and size and also have different color in variouscountries.

This work proposes a method for the detection and identification of vehicle number plate that will help in the detection of number plates of authorized and unauthorized vehicles.This paper presents an approach based on simple but efficient morphological operation and Sobel edge detection method. This approach is simplified to segmented all the letters and numbers used in the number plate by using bounding box method. After segmentation of numbers and characters present on number plate, template matching approach is used to recognition of numbers and characters. The concentrate is given to locate the number plate region properly to segment all the number and letters to identify each number separately.

KEYWORDS: Number Plate Recognition (NPR), Support Vector Machine (SVM), Automated Teller Machine (ATM).

I.INTRODUCTION

Number plates are used for identification of vehicles all over the nations. Vehicles are identifying either manually or automatically. Automatic vehicle identification is an image processing technique of identify vehicles by their number plates. Automatic vehicle identification systems are used for the purpose of effective traffic control and security applications such as access control to restricted areas and tracking of wanted vehicles. Number plate recognition (NPR) is easier method for Vehicle identification. NPR system for Indian license plate is difficult compared to the foreign license plate as there is no standard followed for the aspect ratio of license plate. The identification task is challenging because of the nature of thelight.

Experimentation of number plate detection has been conducted from many years; it is still a challenging task. Number plate detection system investigates an input image to identify some local patches containing license plates. Since a plate can exist anywhere in an image with various sizes, it is infeasible to check every pixel of the image to locate it. In parking, number plates are used to calculate duration of the parking. When a vehicle enters an input gate, number plate is automatically recognized and stored indatabase.

In NPR system spectral analysis approach is used were acquiring the image, extract the region of interest, character segmentation using SVM feature extraction techniques. The advantage of this approach is success full recognition of a moving vehicle [1]. It is difficult to detect the boundary of the Number plate from the input car images in outdoors scene due to colorof characters ofthenumber plate and Background of the Number plate the gradients of the original image is adopted to detect candidate number plate regions.[2]. There are also algorithms which are based on a combination of morphological operation, segmentation and Canny edge detector.
 License plate location algorithm consist of steps like as Edge Detection, Morphological operation like dilation and erosion, Smoothing, segmentation of characters and recognition of plate characters are described in [3][4][5][6].

II.THE GENERAL NPR SYSTEM

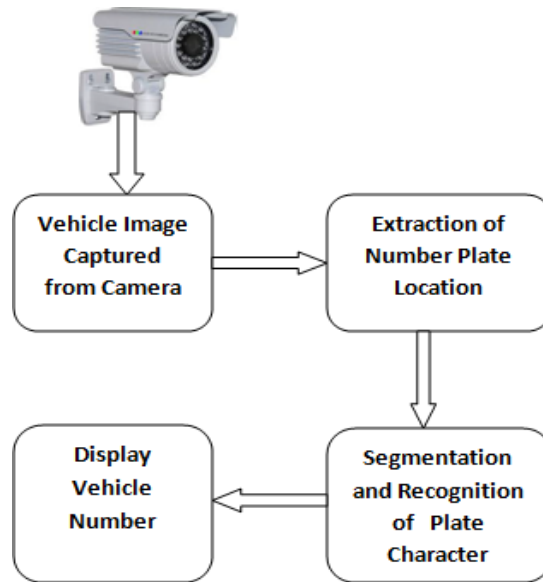Block Diagram of Number Plate Recognition (NPR) is shown in Fig. 1:

Fig.1. System Block Diagram

Blocks of general NPR system are discussed below:

1.**Vehicle Image Captured by Camera**

The image of the vehicle whose number plate is to be identified is captured using digital camera of 5 megapixel.

Fig. 2. Captured Image of the vehicle

2.**Extraction of Number PlateLocation**

In this step the number plate is extracted by firstly converting RGB Image i.e., the captured image to Gray Scale Image. Here mathematical morphology is used to detect the region and Sobel operator are used to calculate the threshold value.After this we get a dilated image. Then imfill function is used to fill the holes so that we get a clear binaryimage.

3.Segmentation and Recognition of Plate Character

Here bounding box technique is used for segmentation. The bounding box is used to measure the properties of the image region. The basic step in recognition of vehicle number plate is to detect the plate size. Here the segmented image is multiplied with gray scale image so that we only get the number plate of thevehicle.

4.Display Vehicle Number

After undergoing the above steps, the number plate is displayed in MATLAB window.

1. NPR implementation using MATLAB

The entire process of NPR implementation using MATLAB is given below:

1.INPUT IMAGE

This is the first phase deals with acquiring an image. In the proposed system, digital camera of 5-megapixel camera is used. The input image is 120 x160 or 1200 x1600pixels.
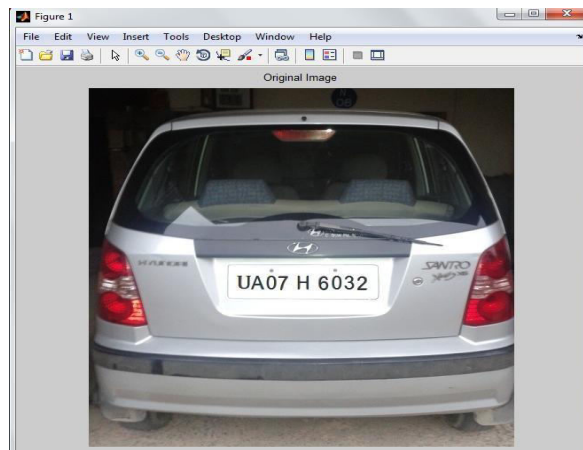

Fig.3. Original Image

2.EXTRACTION OF NUMBER PLATELOCATION

The inputs to the system were the images of vehicles captured by a camera. RGB to gray-scaleconversion is adopted, in order to facilitate the plate extraction, and increase the processing speed. Color image (RGB) acquired by a digital camera is converted to gray-scale image using

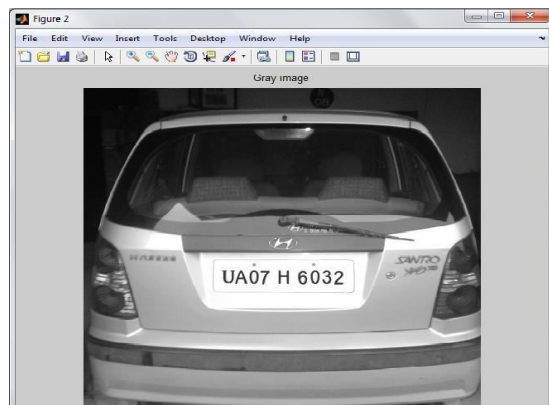$$I\ gray = 0.114*R + 0.587*G + 0.299*B \ldots\ldots\ldots(1)$$

Fig.4. Gray Scale image

The basic step in recognition of vehicle number plate is to detect the plate size. In general number plates are in rectangular shape, hence it is necessary to detect the edges of the rectangular plate. Mathematical morphology is used to detect the region of interest and Sobel operator are used to calculate the threshold value, that detect high light regions with

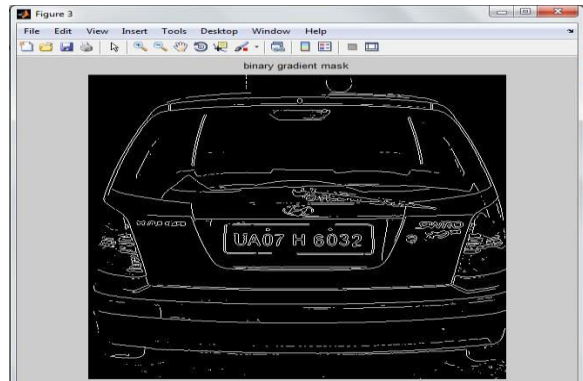high edge magnitude and high edge variance.

Fig.5. Binary gradient image with sobel edge detector.

The binary gradient mask shows lines of high contrast in the image. These lines do not quite delineate the outline of the object of interest. Compared to the original image, gaps in the lines are observed that surrounds the object in the gradient mask. This linear gap disappears if the Sobel image is dilated using linear structuring elements. Structuring element is represented as matrices, which is a characteristic of certain structure and features to measure the shape of an image which is used to carry out other image processing operations. The binary gradient mask is dilated using the vertical structuring element followed by the horizontal structuring element.
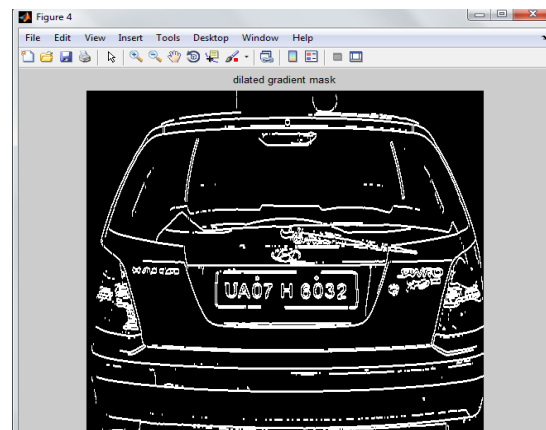

Fig.6. Dilated image

MATLAB toolbox provide a function imfill (BW, "holes") that fills holes in the binarized image. The dilated gradient mask shows the outline of the cell quite nicely, but there are still holes in the interior of the cell. The set of background pixels are known as hole that have not removed by filling the background from the edge of the image. Figure 7 shows after removal of lower than 100 connected pixels. The dilated gradient mask shows the outline of the region quite nicely, but there are still holes in the interior of the region, to fill these holes imfill function in MATLAB is used. By filling holes, the image of the captured vehicle is shown in Fig.7
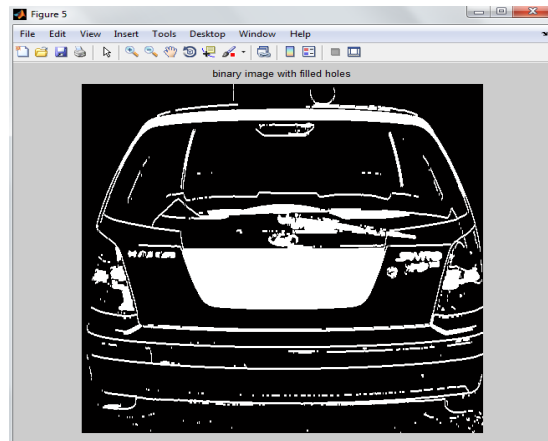
Fig.7. Binary Image with filled holes.

3.REMOVE CONNECTED OBJECTS ON BORDER

The region of interest has been successfully segmented, but it is not the only object that has been found. Any objects that are connected to the border of the image can be removed using the imclearborder MATLAB function. The connectivity in the function was set to 4 or 8 to remove diagonal connections and fill the hole to locate the plate region. After removing the lower pixel components actual plate region isdetected.
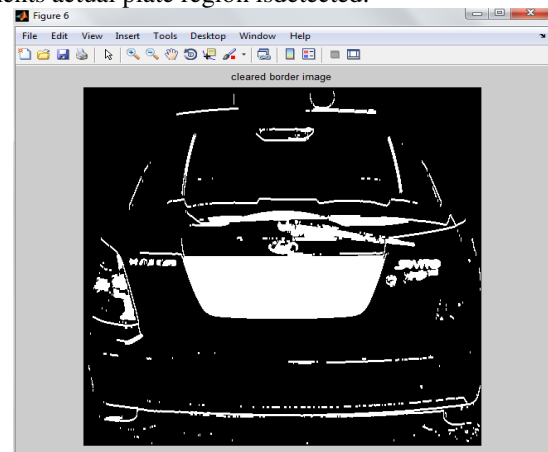

Fig.8. Removed connected objectimage

Finally, in order to make the segmented object look natural, the image is eroded twice with one of the diamonds, disk and line structuring element. This helps in extraction of number plate area of thevehicle.
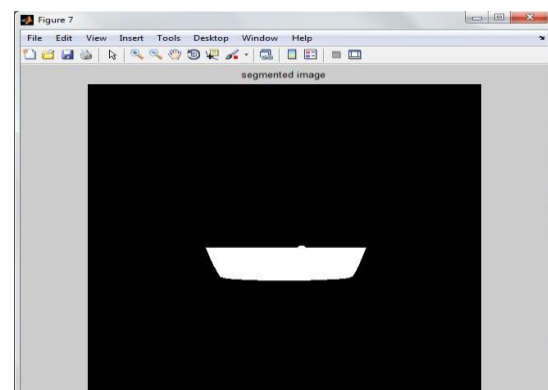

Fig.9. Extraction of number plate area

To get the only number plate area in a vehicle image with characters and numbers present on it,the segmented image is multiplied with gray scale image.
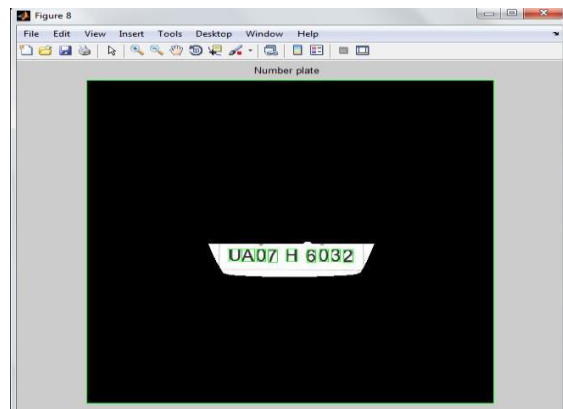
Fig.10. Number plate of Vehicle image

4.CHARACTER SEGMENTATION

Segmentation is one of the most important processes in the number plate recognition, because all further steps rely on it. If the segmentation fails, a character can be improperly divided into two pieces, or two characters. The ultimate solution on this problem is to use bounding box technique. The bounding box is used to measure the properties of the image region. Once a bounding box created over each character and numbers presented on number plate, each character & number is separate out for recognition of number plate. The result of operation is shown in Fig.11

Fig.11. Number Plate with bounding box image
Fig.12. Image of each character

The above figure shows the image of each character that is present in the number plate of the vehicle sequentially.

5.CHARACTER RECOGNITION & DISPLAY THERESULT

It is employed for the purpose of conversion of images of text into characters. Number plate recognition is now used to compare each individual character against the complete alphanumeric database using template matching. The matching process moves the template image to all possible positions in a larger source image and computes a numerical index that indicates how well the template matches the image in that position. Matching is done on a pixel-by-pixel basis. The template is of size 42×24 as shown in Fig.13.Since the template size is fixed, it leads to accurate recognition.
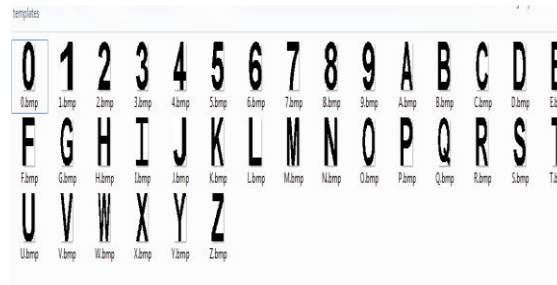
Fig.13. Templates Used for Template Matching

III. RESULT AND DISCUSSION

We have tested our project with below vehicle registration number plates.
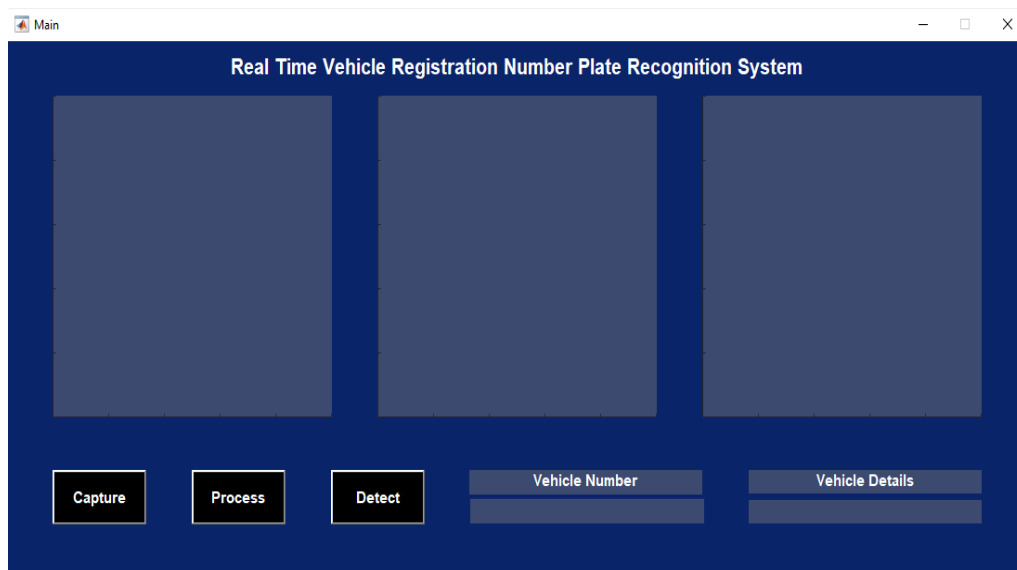

Fig.14. Sample for testing the NPR

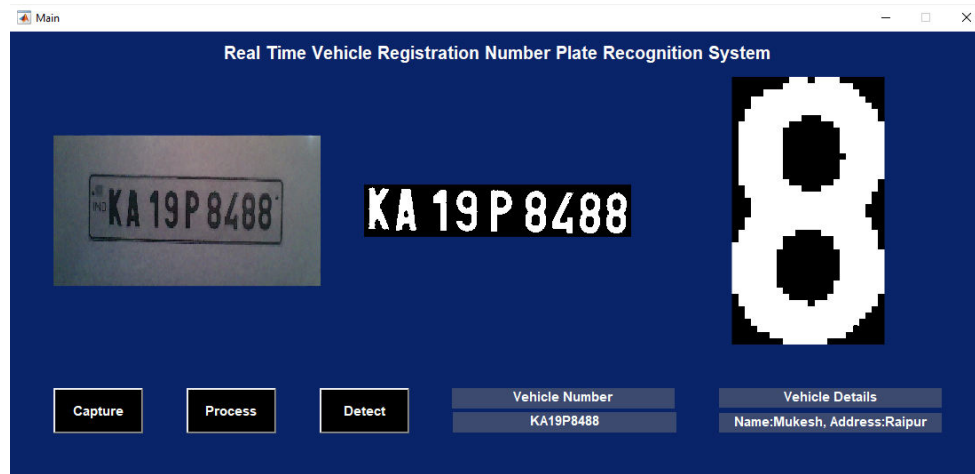Fig.15. Graphical User Interface of our project

Fig.16. NPR result with database details

IV. CONCLUSIONS

In this system, an application software is designed for the detection of number plate of vehicles using their number plate. At first plate location is extracted using morphological operation then separated the plate characters individually by segmentation.Finally template matching is applied with the use of correlation for recognition of plate characters.
Some of possible difficulties:
Broken number plate.
Blurry images.
Number plate not within the legal specification.
Low resolution of the characters.
Poor maintenance of the vehicle plate. Similarity between certain characters, namely, o and d; 5 and s; 8 and b, e; o and 0,etc.

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