

RECOGNITION OF NUMBER PLATE BY USING MATLAB

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Abstract : *The paper presents a method to identify the authorized and unauthorized vehicles by using vehicle number/license plate. The system has implemented at the entrance for security control areas like tollgate, colleges, schools, courts etc. The proposed system first captures the vehicle image and the vehicle number plate region is extracted using image segmentation in an image. The resulting data is then used to compare with the records on a database so as to come up with the specific information like the vehicle's owner, place of registration, address, etc. Further the system is implemented and simulated in Matlab for studying of feasibility and accuracy on a real image.*

Keywords: *Number Plate Recognition, Gray Processing, Image Binarization, Image Acquisition.*

I. INTRODUCTION

With increasing number of vehicles on roads, it is getting difficult to manually enforce laws and traffic rules for smooth traffic flow. Toll-booths are constructed on freeways, where the car has to stop to pay the toll or parking fees. Also, Traffic Management systems are installed on freeways to check for vehicles moving at speeds not permitted by law. All these processes have a scope of improvement. In the center of all these systems lies a vehicle. In order to automate these processes and make them more effective, a system is required to easily identify a vehicle. Vehicles in each country have a unique license number, which is written on its license plate. This number distinguishes one vehicle from the other, which is useful especially when both are of same make and model. An automated system can be implemented to identify the license plate of a vehicle and extract the characters from the region containing a license plate. The license plate number can be used to retrieve more information about the vehicle and its owner, which can be used for further processing. Such an automated system should be small in size, and portable.

Various license plate detection algorithms have been developed in past few years. Each of these algorithms has their own advantages and disadvantages. This project described the method in which license plate is detected using confidence related predictions. As multiple detections are available for single license plate, post-processing methods are applied to merge all detected regions. In addition, trackers are used to limit the search region to certain areas in an image. It suggests a different approach of detection using binarization and elimination of unnecessary regions from an image. In this approach, initial image processing and binarization of an image is carried out based on the contrast between characters and background in license plate. After binarizing the image, it is divided into different black and white regions. These regions are passed through elimination stage to get the final region having most probability of containing a number plate.

II. PROBLEM STATEMENT

The main focus in this research project is to find alternative solutions to the image segmentation and character recognition problems within the License Plate Recognition framework. Three main stages are identified in such applications.

First, it is necessary to locate and extract the license plate region from a larger scene image. Second, having a license plate region to work with, the alphanumeric characters in the plate need to be extracted from the background. Third, deliver them to an OCR(Optical Character Recognition) system. An OCR system is a computerized scanning system enabling to scan text documents into an electronic computer file which can then edit using a word processor or computer. Optical Character Recognition. In order to identify a vehicle by reading its license plate successfully, it is obviously necessary to locate the plate in the scene image provided by some acquisition system (e.g. video or still camera). Locating the region of interest helps in dramatically reducing both the computational expense and algorithm complexity.

III. FLOW CHAT FOR NUMBER PLATE RECOGNITION

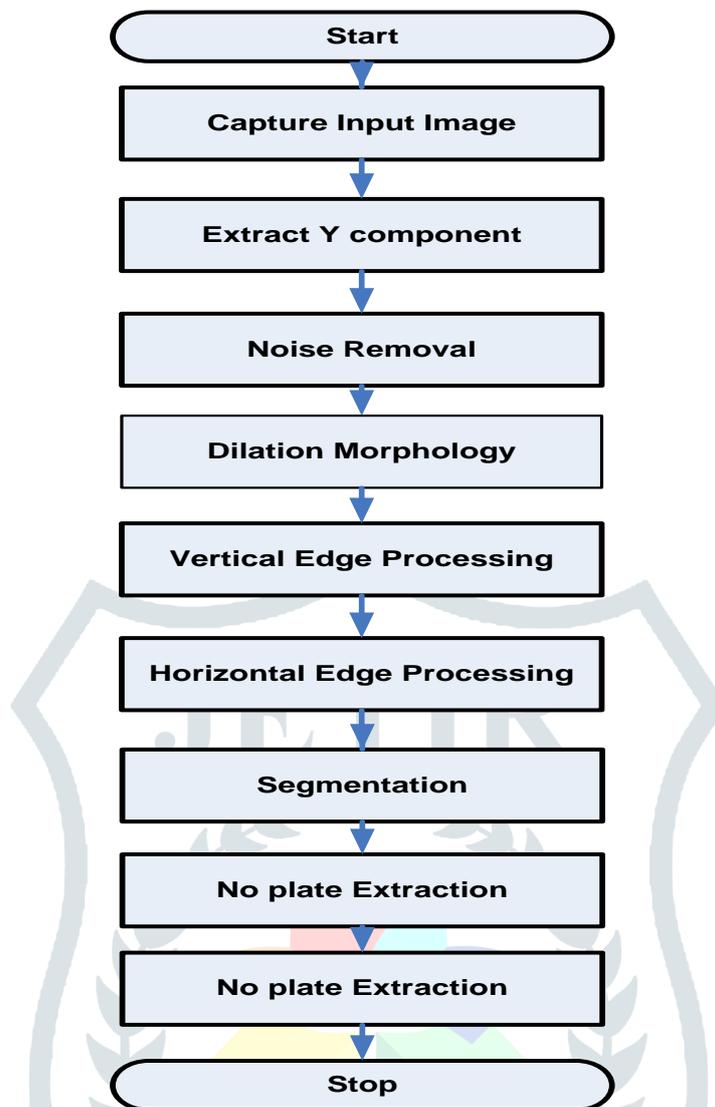


Figure. 1 Flow chat of Number plate Recognition

IV. THE GENERAL NUMBER RECOGNITION SYSTEM

Block Diagram of Number Plate Recognition (NPR) is shown in below

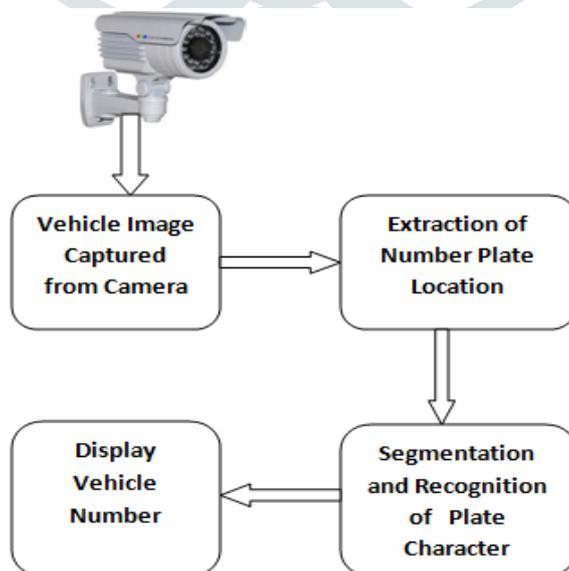


Figure. 2 Block Diagram

A. Vehicle Image Captured By Camera

The image of the vehicle whose number plate is to be identified is captured using digital camera or Webcam[2]. The image captured is stored in JPEG format. Later on it is converted in to gray scale image in MATLAB[4].

B. Extraction of Number Plate Location

In this step, RGB to gray-scale conversion 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 based on the RGB to gray-scale conversion technique[1]. The basic idea of this conversion is performed by eliminating the hue and saturation information while retaining the luminance. The following equation shows an optimal method for RGB to gray-scale conversion, as follows:

$$\text{Gray} = 0.299 * R + 0.587 * G + 0.114 * B \dots(1)$$

where R is red colour intensity value,

G is green colour intensity value,

B is blue colour intensity value.

The gray-scale image is converted to binary image (Black & White). This conversion is the most important stage in all phases of the NPR system, and more specifically for plate extraction phase. As known, the foreground and background colors of vehicle number plates are quite distinct. However, images of the vehicle number plate system often contain unevenly distributed gray intensities, or all the intensity values could lie within a small range, such as the images with poor contrast, or poor illumination. Therefore, the crucial point is to use an effective technique for binarization; otherwise, the method would fail to extract the license plate region from the vehicle image correctly[2]. In order to overcome the illumination problems, our method performs this task. As a result, the plate characters are appearing clearly after binarization. The next step removes any object contiguous to the border of the image. Thus, unnecessary objects are removed, while the plate characters will not be affected because they are surrounded by a black background. After removing the unwanted objects, a specific filter is used for illuminating the very small objects based on the size of each one[1]. The binary gradient mask shows lines of high contrast in the image. 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. The binary gradient mask is dilated using the vertical structuring element followed by the horizontal structuring element[2].

The sobel operator performs spatial gradient measurement on an image and thus it emphasizes regions of high spatial frequency that corresponds to edges. Typically it is used to find the approximate absolute gradient magnitude at each point in an input gray scale image[3]. 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 imclear border MATLAB function. 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[1].

C. Segmentation and Recognition of Plate Character

In this step get the output of extracted number plate using labeling components, and then separate each character and split the each and every character in the number plate image by using split and also find the length of the number plate, then find the correlation and database if both the value is same means it will generate the value 0-9 and A - Z, and finally convert the value to string and display it in edit box, and also store the character in some text file in this code[4].

The character recognition is now used to compare the each individual character with the character stored in the database. OCR(Optical Character Recognition) uses the correlation method to match the characters. And if both the character matches then it displays the authorized otherwise it will display the unauthorized[1].

D. Display Vehicle Number

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



Figure. 3 Matlab Image

V.NRP IMPLEMENTATION USING MATLAB

A. Input Image

This is the first phase deals with acquiring an image. In the proposed system, digital camera of 3.2 megapixel camera is used. The input image as shown in figure.4 is 120 x160 or 1200 x 1600 pixels[2].

Image Acquisition Toolbox provides functions and blocks that enables us to connect industrial and scientific cameras to MATLAB and Simulink.



Figure. 4 Original Image

B. EXTRACTION OF NUMBER PLATE LOCATION

The inputs to the system were the images of vehicles captured by a camera. RGB to gray-scale conversion is adopted, in order to facilitate the plate extraction, and increase the processing speed [2]. Colour image (RGB) acquired by a digital camera is converted to gray-scale image using equation(1). 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 [3].



Figure. 5 Gray Image

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[3].



Figure. 6 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 [2].



Figure. 7 Dilate Image

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. 8 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 below figure.8[6].



Figure. 8 Binary Image filled with holes

C. 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 is detected [2].



Figure. 9 Removed connected object image

Finally, in order to make the segmented object look natural, the image is eroded twice with one of the diamond, disk and line structuring element. This helps in extraction of number plate area of the vehicle [6].

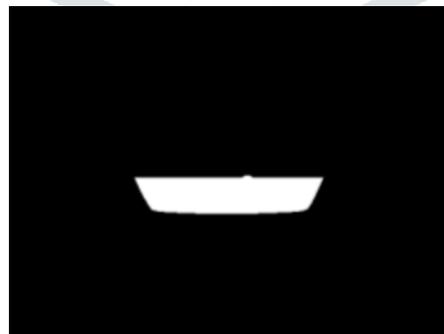


Figure. 10 Extraction of number plate area

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.



Figure. 11 Number plate of Vehicle image

VI.CONCLUSIONS

The algorithm implemented for number plate recognition. The algorithm successfully detects the number plate region from the image which consists of vehicle number. The algorithm is tested on many images and found that it successfully recognition. The system was designed keeping in view of the automation of the number plate detection system for security reason that could replace the current system of manual entry. Paper was a success in recording the number plate of a vehicle although it has got its own limitation of image processing and other hardware requirements.

VII.REFERENCES

- [1] .Ragini Bhat and Bijender Mehandia “RECOGNITION OF VEHICLE NUMBER PLATE USING MATLAB”, page 1900 & page 1901.
- [2] Anupa H 1 and Usha L 2 “ RECOGNITION OF MOVING VEHICLE NUMBER PLATE USING MATLAB”, page 7,page 8 & page 9.
- [3] Mr. Ami Kumar Parida 1 , SH Mayuri 2 , Pallabi Nayk 3 and Nidhi Bharti 4 “Recognition Of Vehicle Number Plate Using MATLAB” page 849 & page 850
- [4] Ms. Shilpi Chauhan and 2 Vishal Srivastava “Matlab Based Vehicle Number Plate Recognition” page 2284.
- [5] Amr Badr, Mohamed M. Abdelwahab, Ahmed M. Thabet, and Ahmed M.Abdelsadek “Automatic Number Plate Recognition System” page 63 & page 64.
- [6] Manisha Rathore and Saroj Kumari “TRACKING NUMBER PLATE FROM VEHICLE USING MATLAB”page 46 to page 50.
- [7] Bhawna Tiwari 1 , Archana Sharma 2 , Malti Gautam Singh 3 , Bhawana Rathi 4 “Automatic Vehicle Number Plate Recognition System using Matlab” page10.

