TRACKING NUMBER PLATE FROM VEHICLE USING MATLAB

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ABSTRACT

In Traffic surveillance, Tracking of the number plate from the vehicle is an important task, which demands intelligent solution. In this document, extraction and Recognization of number plate from vehicles image has been done using Matlab. It is assumed that images of the vehicle have been captured from Digital Camera. Alphanumeric Characters on plate has been Extracted and recognized using template images of alphanumeric characters.

This paper presents a new algorithm in MATLAB which has been used to extract the number plate from the vehicle in various luminance conditions. Extracted image of the number plate can be seen in a text file for verification purpose. Number plate identification is helpful in finding stolen cars, car parking management system and identification of vehicle in traffic.

KEYWORDS

Number plate Extraction, MATLAB, Recognization, Digital Camera, luminance condition.

1. INTRODUCTION

Number plate extraction is hotspot research area in the field of image processing. Many of automated system have been developed but each has its advantages and disadvantages. It is assumed that this algorithm worked on images which have been captured from fixed angle parallel to horizon in different luminance conditions. It is also assumed the vehicle is stationary and images are captured at fixed distance.

An automated system is developed using MATLAB in which image is captured from camera and converted in Gray scale image for pre processing. After conversion, dilation process is applied on image and unwanted holes in image have been filled. After dilation, horizontal and vertical edge processing of has been done and passed these histograms through low pass filters. Low pass filters filter out unwanted regions or unwanted noise from image. After this filtering, image is segmented and region of interest is extracted and image is converted into binary form. Binary images are easily processed as compared to coloured images. After Binarization, each alphanumeric character on number plate is extracted and then recognized with the help of template images of alphanumeric characters. After this, each alphanumeric character is stored in file and whole number plate is extracted successfully.

The paper is organized as follows: Section 2 presents literature survey of number plate extraction Section 3 presents the proposed methodology for number plate extraction. Section 4 presents the experimental results. Section 5 shows result. Section 6 draws conclusion.

2. LITERATURE SURVEY

Chittode J S et al. [1] developed algorithm which is applied on the car park systems to monitor and manage parking services. Algorithm is developed on the basis of morphological operations and used for number plate recognition. Optical character is used for the recognition of characters in number plate.

Peng H et al. [2] presented an algorithm named "Document Image Recognition". DIR is most effective approach which is used to find most similar template for input image in a database. The algorithm is developed on the basis of global matching of CBP Chunyu C et al. [3] presented a technique for recognition of number plate from vehicle image. This technique is implemented using MATLAB and characters are recognized using edge detection segmentation and pre processing of image.

Lekhana G.C et al. [4] developed an efficient real time on-line Number plate recognition system. NPR algorithm works in different steps firstly image acquisition, using fusion of spectral analysis characters are segmented and characters are recognized.

Paunwala C.N et al. [5] proposed a methodology which finds ROI using morphological processing and directional segmentation. The ROI is the area which includes the number plate from which alphanumeric characters are recognized. This method is tested on different databases which contain images.

Singh M et al. [6] developed an efficient approach works on opening and closing of morphological operations. Firstly localization of plate in image has been done then skew correction is done for segmentation process of alphanumeric characters. Recognization is done using the template matching.

Kranti S et al. [7] presented a methodology for number plate extraction named "Feature based number plate localization ". This methodology mainly deals on two methods edge detection and window filtering method. Both methods are used in this methodology and give efficient results.
Ganapathy V et al. [8] developed a methodology for Malaysian vehicles. This methodology is mainly based on Hough transform and morphological analysis and results extraction of number plate with 95% accuracy.

Othman K et al. [9] used an approach which is texture based approach and worked on edge information for localization and recognition. Multi layer perceptron and neural network are used for segmentation of alphanumeric characters of license plate.

3. METHODOLOGY

Methodology is shown in flowchart. Step by step process is followed for pre processing of image. MATLAB provides all image processing function and toolbox. MATLAB have large library functions and set of tools.

Main features of MATLAB are following:

1. It provides advanced algorithm for high numerical computation.
2. Ability to define user define functions and large collection of mathematical functions.
3. For plotting and displaying data, two and three dimensional graphics are supported.
4. Online help is present which is very much helpful for new user.

5. Powerful, effective and efficient matrix and vector oriented high level programming language is provided by MATLAB.
6. Several toolboxes are provides for solving domain specific problems. Some of toolboxes are Image processing toolbox. Fuzzy logic, Digital signal processing toolbox, neural network toolbox etc.

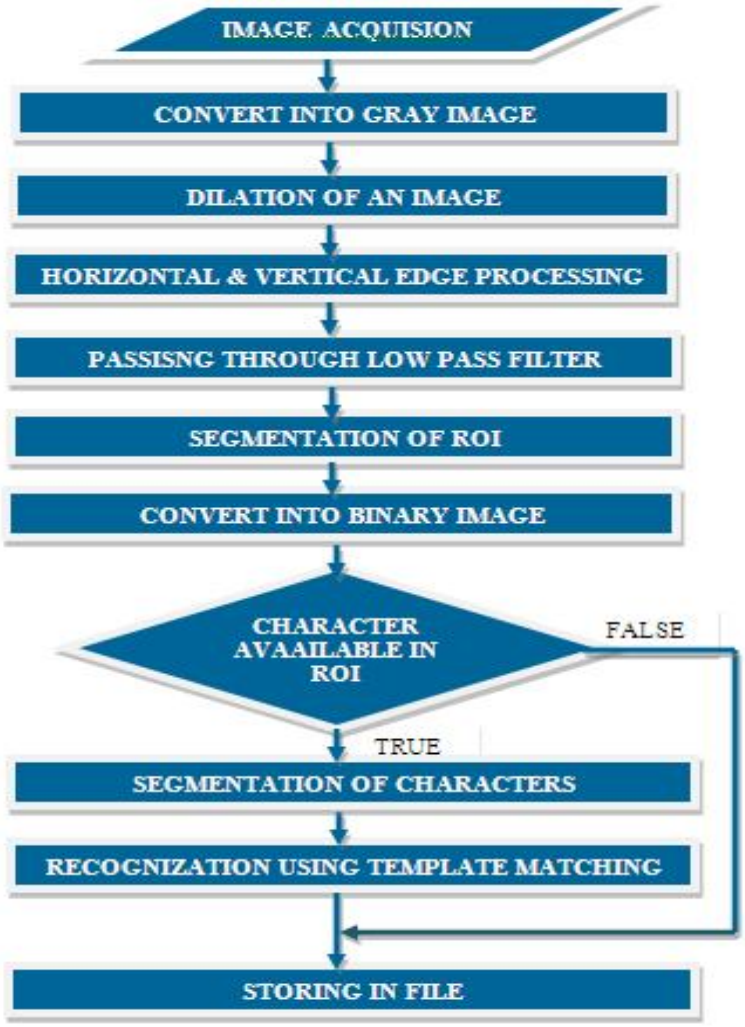

Figure 1. Flowchart

Step 1: Image Acquisition

In this step image is captured from digital camera. Image should be taken from fixed angle parallel to horizon. Vehicle should be stationary. Input image is shown in figure2.

Figure 2. Input Image

Step 2: Convert into Gray image

This algorithm works on Gray level image, for pre- processing and identifying the required information. In this step coloured image is converted into the Gray scale image. Gray scale image is shown in figure 3.

Figure 3. Gray Image

Step 3: Dilation of an Image

In this step, image has been dilated. Dilation is a process for filling holes in an image, sharpen edges of an object maximize brightness and connect the broken lines. Dilation can remove unwanted noise from image. Dilated image is shown in figure 4.

Figure 4. Dilated Image

Step 4: Horizontal & Vertical edge processing

Horizontal and Vertical histogram denotes the column wise and row wise histograms. These histograms represent the row wise and column wise sum of difference of Gray scale values among neighbouring pixel values. Firstly, horizontal histogram is calculated by traversing each column then vertical histogram is calculated by traversing each row.

Step 5: Passing histograms through low pass filter

Histogram values are passed through low pass filter because values of histogram between consecutive row and column changes drastically, to minimize loss of information smooth out changes. In this step histogram value is averaged out among both sides. This step is performed for both horizontal and vertical histograms. Filtering removes all the unwanted regions of an image. Passing histogram through low pass filter is shown in figure 5 and 6.

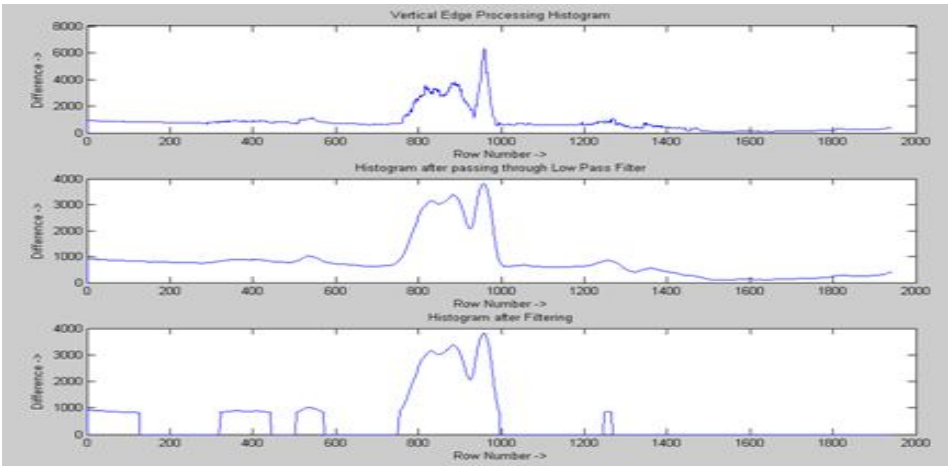

Figure5. Vertical Edge processing

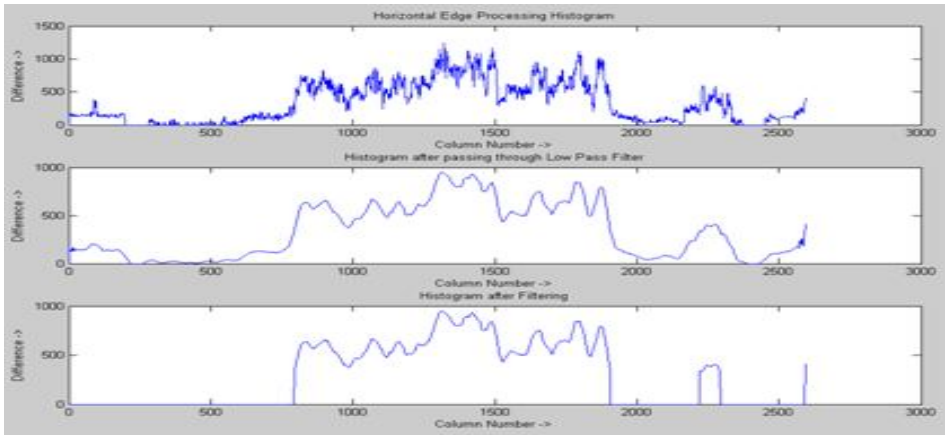

Figure 6. Horizontal Edge Processing

Step 6: Segmentation of Region of Interest

Image has been segmented. In this step all the regions which have probability of license plate has been identified and coordinates of such probable region has been stored. The following figure shows the segmented region. The segmented regions are shown in fig7.

Figure7. Segmented Image

Step 7: Extraction of region of interest

From above segmented image, region with maximum histogram value is taken as the most probable region for number plate. Among all the regions, the region with highest horizontal and vertical histogram value is identified. This region is considered as highest possibility of containing number plate and is extracted shown in figure 8.

Figure 8. Extracted Image

Step 8: Convert into Binary Image

Image is converted into binary image from Gray scale. Intensity change value is calculated easily as compared to Gray scale and colour image. Binary image is shown in figure 9.

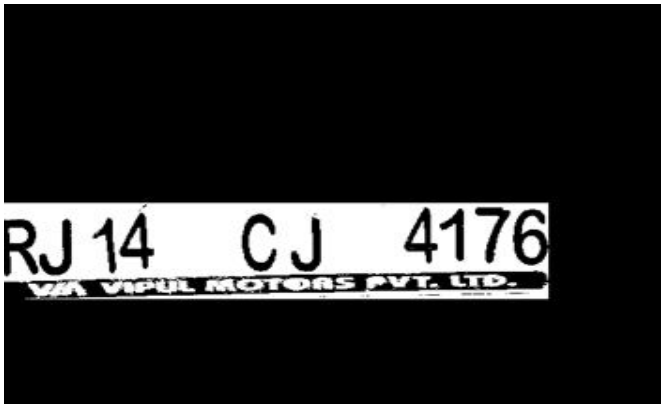

Figure9. Binary image of extracted image

Step 9: Segmentation of alphanumeric character

Individual alphanumeric characters are segmented. Segmentation has been done by using smearing algorithms in both horizontal and vertical histogram. For filling space of inner part of each character the vertical smearing algorithm is applied and some threshold value is determined. Similarly, horizontal smearing algorithm is applied. Each individual alphanumeric character is extracted by finding starting and ending points of character in horizontal direction. These characters are shown in figure 10.

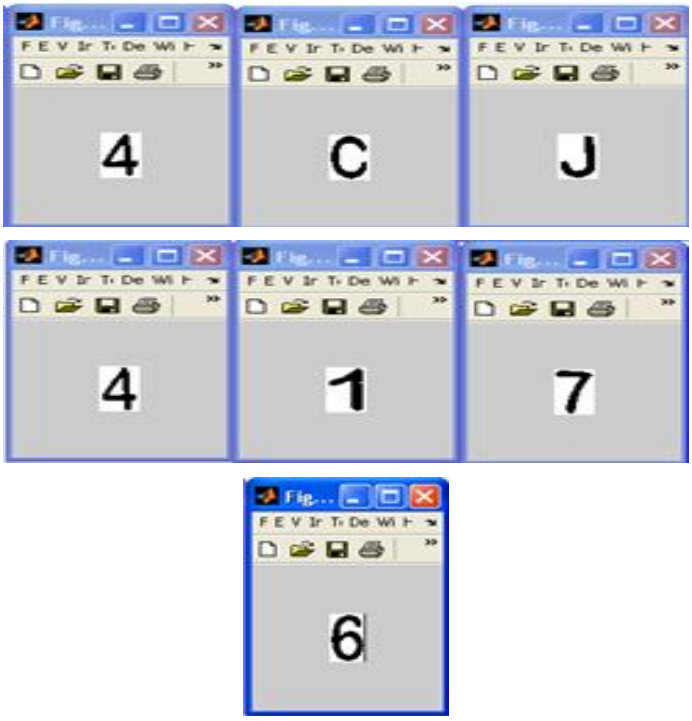

Figure10. Extracted characters from number plate

Step 10: Recognization of individual character

For Recognization of individual alphanumeric character, template based Recognization method is used. In template based algorithm, segmented image is compared with one image which is stored in database named as template image. In both images best matched similarity is compared. This similarity is matched with statistical method correlation. The image for which the correlation coefficient for template image is maximum that image is best matched. These template images are shown in figure 11.

Figure 11. Template Images

Step 11: Storing in file

After extracting, number plate is stored in file with complete information like characters on number plate and date on which it is extracted. This shown in figure 12

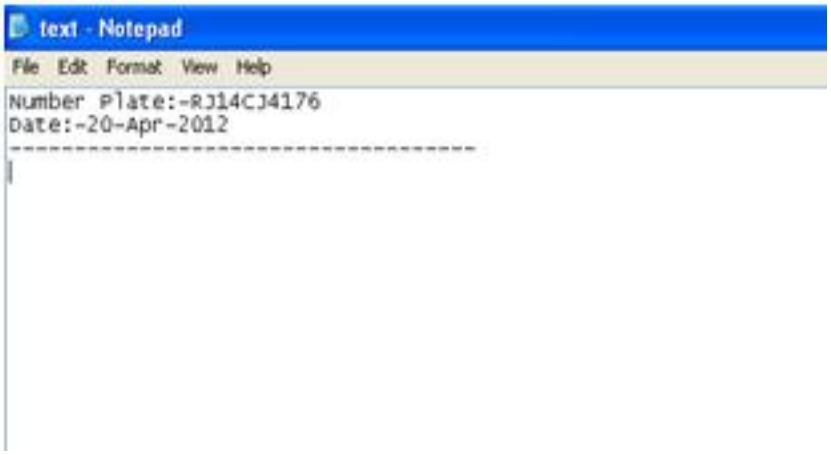

Figure 12. Extracted plate is stored in file.

4. RESULT

The system works with 99% accuracy when images are captured from fixed distance and captured from the centre position. Vehicle should be stationary and image is captured from fixed angle parallel to horizon. Car number plate should be according to 1989 motor vehicle limited.

There are few problems where system does not work, these figures are shown figure 13. In these figure either the system does not extract number plate from Gray scale due to some luminance conditions or due to problematic backgrounds.

Figure13. Problematic images where number plate is not extracted

5. CONCLUSION

Number plate extraction needs extremely high accuracy when working on images of busy roads or parking areas. This system gives about 90% of efficiency and has been tested with nearly 40 vehicles.

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