AUTOMATIC NUMBER PLATE RECOGNITION USING SOBEL OPERATOR

Kirit Bhalsod[1], Mr. Sandip Chotaliya[2]
[1](M.E (EC) Student), Noble group of Institutions
[2]Assistant Professor, Electronics & Communication Department, Noble group of Institutions
Gujarat Technological University, Gujarat, India.

Abstract: Automatic vehicle identification is an essential stage in intelligent traffic systems. Nowadays vehicles play a very big role in transportation. Also the use of vehicles has been increasing because of population growth and human needs in recent years. Therefore, control of vehicles is becoming a big problem and much more difficult to solve. License plate recognition (lpr) is a form of automatic vehicle identification. It is an image processing technology used to identify vehicles by only their license plates. Since every vehicle carries a unique license plate, no external cards, tags or transmitters need to be recognizable, only license plate.

I. INTRODUCTION

Plate region extraction is the first stage in this algorithm. Image captured from the camera is first converted to the binary image consisting of only 1‟s and 0‟s (only black and white). By thresh holding the pixel values of 0 (black) for all pixels in the input image with luminance less than threshold value and 1 (white) for all other pixels. Captured image (original image) and diarized image are shown in Figure 1 and 2 respectively.

Fig. 1: Captured Images

Fig. 2: Plate region

Fig. 3: Binirized Image

Fig. 4: Image involving only plate

The binarized image is then processed using some methods to find the plate region, firstly smearing algorithm is used. Smearing is a method for the extraction of text areas on a mixed image. With the smearing algorithm, the image is processed along vertical and horizontal runs (scan-lines). If the number of white pixels is less than a desired threshold or greater than any other desired threshold, white pixels are converted to black. In this system, threshold values are selected as 10 and 100 for both horizontal and vertical smearing.

If number of 'white' pixels < 10; pixels become 'black'.
Else; no change
If number of 'white' pixels > 100; pixels become 'black'
Else; no change
After smearing, a morphological operation, dilation, is applied to the image for specifying the plate location. However, there may be more than one candidate region for plate location. To find the exact region and eliminate the other regions, some criteria tests are applied to the image by

smearing and filtering operation. The processed image after this stage is as shown in Figure 1.3 and image involving only plate is shown in Figure 1.4.

After obtaining plate location, region involving only plate is cut giving the plate as shown in Figure 1.5.

Fig. 5: Plate Image

II. SEGMENTATION

In the segmentation of plate characters, license plate is segmented into its constituent parts obtaining the characters individually. Firstly, image is filtered for enhancing the image and removing the noises and unwanted spots. Then dilation operation is applied to the image for separating the characters from each other if the characters are close to each other. After this operation, horizontal and vertical smearing is applied for finding the character regions. The result of this segmentation is in Figure 2.1.
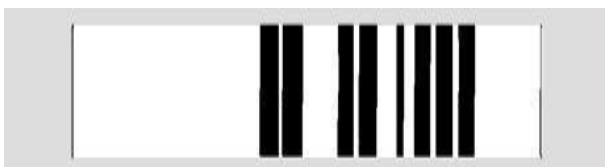

Fig. 6: Locations of plate characters

The next step is to cut the plate characters. It is done by finding starting and end points of characters in horizontal direction. The individual characters cut from the plate are as follows in Figure 2.2.

Fig. 7: Individual characters

III. CHARACTER RECOGNITION

Before recognition algorithm, the characters are normalized. Normalization is to refine the characters into a block containing no extra white spaces (pixels) in all the four sides of the characters. Then each character is fit to equal size as shown in Figure 3.1

Fig. 8: Equal-sized characters

Fitting approach is necessary for template matching. For matching the characters with the database, input images must be equal-sized with the database characters. Here the characters are fit to 36x18. The extracted characters cut from plate and the characters on database are now equal-sized. The next step is template matching. Template matching is an effective algorithm for recognition of characters. The character image is compared with the ones in the database and the best similarity is measured.

IV. ALGORITHM FOR ANPR SYSTEM

- Input image from webcam.
- Convert image into binary.
- Detect number plate area.
- Segmentation.
- Number identification.
- Save to file in given format.

A. *Input Image from File*

- Capture image from webcam.
- Store the captured image into an image file for further processing.

B. *Convert Image Into Binary*

Identify the intensity of the image.

- If image intensity = high
      Reduce intensity
  Else if intensity = low
        Increase intensity
  Else
      No change.
- Convert image into grayscale.
- Calculate appropriate threshold value for the image.
- Convert the image into binary image using the calculated threshold.

C. *Detecting Number Plate Area*

- Fill small holes including numbers of Number plate so that number plate area will be large to isolate from figure.
- Determine width and height of the image.
- Scan each pixel of line counting number of white pixels in the following system,
  If number of „white‟ pixels < x; pixels become „black‟ Else; no change

  If number of „white‟ pixels > y; pixels become „black‟ Else; no change

  The value of x and y may be changed according the image intensity and plate area.
- Use the step no. 3 for both horizontal and vertical direction.
- Check number of possible areas.
      If number of areas > 1

Select suitable area
- Logically AND with binary image obtained at "Convert image into binary" algorithm.
- Crop the required area.

D. Segmentation
- Filter the noise level present in the image.
- Clip the plate area in such a way that only numbers of plate area extracted.
- Separate each character from the plate.

E. Number Identification
- Create the template file from the stored template images.
- Resize image obtained from segmentation to the size of template.
- Compare each character with the templates.
- Store the best matched character.

F. Save To File In Given Format
- Open a text file in write mode.
- Store the character obtained from the number identification process to text file in given format.
- Close the file.

REFERENCES

[1] V. Laxmi D.K. Mohanta B.M. Karan "Comparison of different wavelets for automatic identification of vehicle license plate" doi: 10.1049/iet-its.2010.0149.

[2] Kumar Parasuraman, Member, IEEE and P. Vasantha Kumar. "An Efficient Method for Indian Vehicle License Plate Extraction and Character Segmentation" 2010 IEEE International Conference on Computational Intelligence and Computing Research.

[3] Kaushik Deb, Hyun-Uk Chae and Kang-Hyun Jo. "Vehicle License Plate Detection Method Based on Sliding Concentric Windows and Histogram" JOURNAL OF COMPUTERS, VOL. 4, NO. 8, AUGUST 2009.

[4] Er. Kavneet Kaur, Vijay Kumar Banga "NUMBER PLATE RECOGNITION USING OCR TECHNIQUE" International Journal of Research in Engineering and Technology eISSN: 2319-1163 | pISSN: 2321-7308.

[5] C.N. Anagnostopoulos, I. Anagnostopoulos, V. Loumos, and E. Kayafas. "A license plate recognition algorithm for Intelligent Transportation System applications" T-ITS-05-08-0094.

F