LICENSE PLATE CHARACTER SEGMENTATION BASED ON PIXEL DISTRIBUTION DENSITY

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Abstract

In this paper, pixel distribution density for the image character and segmentation from the vehicle license plate. This method has better efficiency of the total system and eliminates the problem of similarity elements like T, I, 1, J etc by exploiting the small but important differences among them. The experimental results show that the characters are separate from vehicle license plate. It is better accuracy of character separation from license plate.

Index Terms: *Vehicle Number Plate, Detection, Segmentation, Template matching, Pixel Distribution Density etc.*

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1. INTRODUCTION

Intelligent transportation system (ITS) is a hot research field which is drawing more and more attention. The vehicle license plate recognition system (VLPRS), which consists of vehicle license plate (VLP) location, VLP character segmentation, and VLP recognition, is an important part of it [1]. An image processing technology called License Plate Recognition (LPR) that is used to identify vehicles by their license plates is a kind of automatic vehicle identification [2]. Image acquisition, license plate detection, character segmentation and character recognition are four major phases of License Plate Recognition [3, 4]. Several areas including traffic volume control, unsupervised park monitoring, traffic law enforcement and auto toll collections on highways extensively use license plate recognition applications [5,6].

There are lots of methods to detect a license plate region in the color or gray image. The first method is a vertical or a horizontal edge based method [1, 7]. This method is intuitively adopted in the computer vision industry. In this method, there are a number of edges in the image, so it's very difficult to extract license plate region. The second method is to use the brightness pattern of the license plate region [8]. If it finds nothing similar patterns, wrong regions could be detected. The motivation of this method is to detect intensity features in the license plate. The final method is based on the color information [9-11]. Most methods using color information are sensitive to intensity change. As we can see from these research results, the characteristic features for the license plate are not useful.

By PM, characters are segmented according to their height and width ranges after their four boundaries are determined. This is a simple and fast method, but lacks adaptability while at the same time, segmentation will be impossible in case of interference of noise. In essence, TMM is another form of PM, but with a more considered segmentation process and a more precise boundary division. Its processing time is approximated to that of PM. It can deal with disconnection and conglutination phenomena of characters well, but its logical design is too complicated and it has too many iterative functions; therefore, there is still much room for segmentation of the left and right frames around the VLP image to be improved. As for CM, the characters are segmented by a clustering analysis algorithm in pattern recognition, which overcomes disconnection of characters, but since it has a big computational load and slow processing, it cannot meet real-time needs of the system.

The paper is organized as follows. Flow chart of proposed method is presented in Section II. Section III describes the pre-processing step. The character segmentation is presented in Section IV. Euclidean Feature extraction is made in Section V. The character reorganization is presented in Section VI Results are shown in section VII. Section VIII describes the conclusion.

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2. FLOWCHART OF PROPOSED METHOD

In the past decade, vehicle number detection and vehicle number extraction are the drawbacks in ITS. To solve the problem of vehicle plate detection and vehicle plate extraction using pixel distribution and template matching has been developed. The flow chart of proposed method as shown in fig.1.

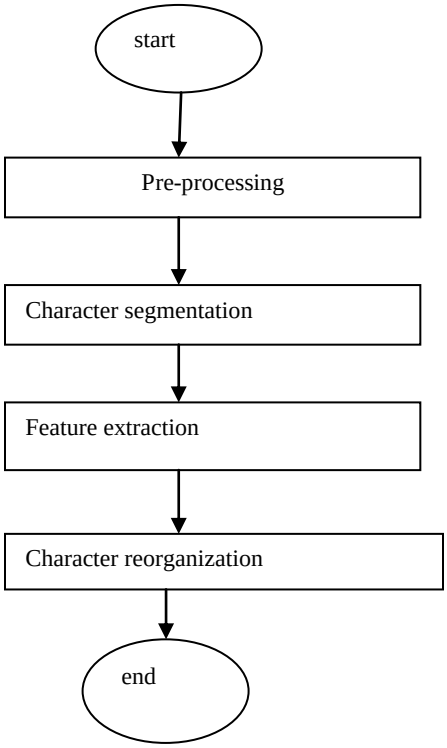

Fig.1.flow chart of proposed method

In fig.1. Each block explained in next sections

3. PRE –PROCESSING

Preprocessing the image is converted in to binary image. In this work, The standard VLP image P is about 40 ×180 pixels, the noises have been eliminated, The noise has been removed using imfilter and P has been binarized, the character is white and the pixel value is 1; the background is black and the pixel value is 0. If noise is occur in binary image, to eliminate noise using morphological operation.

Fig.2. VIN Number Image

Fig.3. Binarization Image

Morphology operation is a broad set of image processing operations that process images based on shapes. Morphological operations apply a structuring element to an input image, creating an output image of the same size. In a morphological operation, the value of each pixel in the output image is based on a comparison of the corresponding pixel in the input image with its neighbors. By choosing the size and shape of the neighborhood, you can construct a morphological operation that is sensitive to specific shapes in the input image.

4. CHARACTER SEGMENTATION

To detect character set, gray image is converted to a binary image by changing the threshold value for expanded character candidate region and plate candidate region until string of license plate is detected completely from binary image. Sometimes all the characters are not detected, so to use vertical segmentation. The vertical Segmentation Algorithm as Shown Below.

Input Plate Image
k = 0
c=0
while (k < last column number)

```
    r = 0
 /*This loop identifies the starting column of each element*/
    for i = k to last column
 /*This loop calculates total no. of white pixels in a column*/
        for row = 1 to n
            if pixel(row, i) = white, then r = r + 1
        end
       if r > threshold, then i  is the first column, break
    end
    r = 0
/*This loop identifies the last column of each element*/
    for k = i to last row

/*This loop calculates total no. of white pixels in a column*/
         for row = 1 to n
              if pixel(row , i) = white, then  r = r + 1
         end
        if r < threshold, then k is the last column, break
    end
    f [c]=  image between i and k
c=c+1
end
while
```

After the first and last columns of the component have been detected, horizontal scanning will be done to detect the first and last rows from the result. It contains only the characters or numbers without any extra area. This result will help to extract image features easily.

5. FEATURE EXTRACTION

After completion of character segmentation then apply the feature extraction. The feature extraction follow given steps.

- Euler number equal to 1 - This group contains C, E, F, G, H, I, J, K, L, M, N, S, T, U, V, W, X, Y and Z. It also contains the numbers 1, 2, 3, 5 and 7.
- Euler number equal to 0 - This group contains A, D, O, P, Q and R and it contains number 4, 6 and 9.
- Euler number equal to -1 - This group only contains character B and number 8.

It is clear that this grouping process will increase system accuracy of recognizing characters and numbers and it will also reduce the time of recognition process.

6. CHARACTER RECOGNITION

Here we use a new methodology in which the characters are separated into subgroups on the basis of their similarity or different physical appearance.

A. Division of Euler Group into sub-groups

- Euler group 1 is divided into the following subgroups:

Subgroup C: consists of C and G; Subgroup E: Consists of E and F; Subgroup K: Consists of K, X and Y; Subgroup I: Consists of I, T, J and 1; Subgroup S: Consists of 5and S.

- Euler group 2 is divided into the following subgroups:

Subgroup O: consists of O and Q; Subgroup P : consists of P and R. All rest elements are not categorized into any subgroup and have a separate template for each of them.

B. Deciding a group/sub-group to Character

Each group has a template; the template that matches with the input the most decides the group of the character. The subgroup is decided on the basis of indexes calculated by formulae:

Index of a particular template =
(Number of pixels that matched with that template) / (Total number of pixels in that template).

The subgroup whose template has highest index with respect to the character is chosen as the subgroup.

C. Recognition of Elements belonging to same Sub-group

Once, we get the subgroup then the physical characteristics of each element that differentiate it from other elements are used to identify the element. For example:-

In Subgroup E: E and F are members of this subgroup. if the input belongs to this group. Then the template shown in Fig. 9(b) is used to detect if the input is E or F as this template is a part of E but not F.

Similar methods based on the features characteristics of elements can be used to differentiate between different elements belonging in a subgroup. The total number of pixels in the upper half of I is almost equal to that of lower half, but in the case of T is 60% more than that in the lower half, this feature is used to differentiate between I & T

7. EXPERIMENTAL RESULTS

Fig.4. original license plate image

CONCLUSIONS

In the past algorithms does not gives optimum result when skewness is present in the detected vehicle number plate, the efficiency of the vehicle number plate detection algorithm used in this paper limits the efficiency of the total system. More work has to be done to increase its efficiency. The results show that the characters are separate from vehicle license plate. It is better accuracy of character separation from license plate.

REFERENCES

[1] Clemens Arth, Florian Limberger and Horst Bischof, "Real-Time License Plate Recognition on an Embedded DSP-Platform", Proceedings of IEEE conference on Computer Vision and Pattern Recognition, pp 1-8, June 2007.

[2] Broumandnia and Fathy, "Application of pattern recognition for Farsi license plate recognition", ICGST International Journal on Graphics, Vision and Image Processing, Vol.5, No.2, pp.25-31, Jan 2005.

[3] Hsien-Chu WU, Chwei-Shyong TSAI and Ching-Hao LAI, "A License Plate Recognition System in E-Government", International Journal of Information and Security, Vol.15, No.2, pp.199-210, 2004.

[4] Sorin Draghici, "A neural network based artificial vision system for licence plate recognition", International Journal of Network Security, International Journal of Neural Systems, Vol.8, No.1, pp.113-126, 1997.

[5] I-Chen Tsai, Jui-Chen Wu, Jun-Wei Hsieh and Yung-Sheng Chen, "Recognition of Vehicle License Plates from a Video Sequence", IAENG International Journal of Computer Science, Vol.36, No.1, pp.26-33, February 2009.

[6] 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, pp.771-777, August 2009.

[7] Halina Kwasnicka and Bartosz Wawrzyniak, "License plate localization and recognition in camera pictures", AI-METH 2002, November 13-15, 2002.

[8] Texas Instruments Inc., "TMS320DM6437 DVDP Getting Started Guide", Texas, July 2007.

[9] Texas Instruments Inc., "TMS320DM6437 Digital Media Processor", Texas, Page 5, November 2006 – Revised June 2008.

[10] Texas Instruments Inc., "TMS320C64x+ DSP Cache User's Guide", Literature Number: SPRU862A, Table 1-6, Page 23, October 2006.

[11] Pramod Kapadia, "Car License Plate Recognition Using Template Matching Algorithm", Master Project Report, California State University, Sacramento, Fall 2010.