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NUMBER PLATE RECOGNITION SYSTEM USING SEGMENTATION TECHNIQUE

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ABSTRACT

License Plate Recognition plays an important role on the traffic monitoring and parking management. Administration and restriction of those transportation tools for their better service becomes very essential. In this paper, a fast and real time method has an appropriate application to find plates that the plat has tilt and the picture quality is poor. In the proposed method, at the beginning, the image is converted into binary mode with use of adaptive threshold. And with use of edge detection and morphology operation, plate number location has been specified and if the plat has tilt; its tilt is removed away. Then its characters are distinguished using image processing techniques.

Keyword: License Plate Recognition, Edge Detection, Image Processing, Malab, Mean Filter

I. INTRODUCTION

Vehicle License Plate Recognition (VLPR) also known as Automatic Vehicle License Plate Recognition (AVLPR) was invented in 1976. Many scientist groups took interest in VLPR after 1990s with the development of digital camera and the increase in processing speed. VLPR is an image processing technology which enables to extract vehicle license number form digital images. It consists of a still or video camera which takes the image of vehicle, find the location of the number in the image and then segments the characters and by using the k -Nearest Neighbour (KNN) scheme, it translates the license number of pixel value into numerical or string. VLPR can be used in many areas such as parking inventory [1], [2], security control of restricted areas [3], traffic law enforcement, congestion pricing, and automatic toll collection [4]. Typical VLPR System consists of four modules: image acquisition, license plate extraction, character segmentation, and character recognition. The efficiency and accuracy of the system largely depends on the second module and various approaches have been used for this purpose. To detect the region of car license plate, many techniques have been used. The algorithm presented in [5] using projection and Euclidean distance reaches 87% as its performance. The algorithm presented in using sliding concentric windows and probabilistic NN reaches 86% as its overall performance. What is reported in using filtering and template matching depicted its performance as 91%. The method presented in [6] with Gabor filter and connected component reported its plate detection rate as 91.7%. The algorithm reported in [14] applying edge analysis and feed forward NN reaches 92.3% as its character recognition rate. In [7] adaptive boosting (AdaBoost) is combined with Haar-like features to obtain cascade

classifiers for license plate extraction. The Haar-like features are commonly used for object detection. Using the Haar-like features makes the classifier invariant to the brightness, colour, size, and position of license plates. In, a new and fast vertical edge detection algorithm (VEDA) was proposed for license plate extraction. VEDA showed that it is faster than Sobel operator by about seven to nine times. In and [8] combination of edge statistics and mathematical morphology showed very good results, but it is time consuming and because of this problem, [9] uses block-base algorithm. In a novel method called "N row distance" is implemented. This method scans an image with N row distance and counts the existent edges. If the number of the edges is greater than a threshold then the license plate is recognized, if not threshold have to be reduced and algorithm will be repeated. This method is fast and has good results for simple images. Disadvantage of this paper is that the edge based algorithms are sensitive to unwanted edges such as noise edges, and they fail when they are applied to complex images. A wavelet transform-based algorithm is used in [10] for extraction of the important features to be used for license plate location. This method can locate more than one license plate in an image. Methods which are symmetry based are mentioned in. In, firstly, it takes the input image into a grayscale, then for analyzing the location of plate the operation of morphology such as erosion and dilation is applied, and the plate is extracted with use of vertical and horizontal projection among various candidates. In the plate is a location with the black background and white writings. In this way that, firstly, takes the image into the HSI and applies the capability of being black colour of its background for this purpose, it uses a mask and segments the image according to HSI colour intensity parameter and creates a binary image. For cancelling probable noises, it uses the operation of erosion and dilation, then labels the existing candidates and for cancelling the candidates which aren't the location of plate, it applies the geometric capability of the plate and other characters, then for recognizing a primary candidate, it uses the colour intensity histogram, and recognizes the location of plate. In this paper a new method based on mathematical morphology and KNN classifier is presented that in comparison with other methods has better operation on a condition that plate was tilt in the images or ambient light was low.

II. IMAGE PROCESSING

When the license plate recognition systems are applied in outdoor areas, they are affected by weather and lighting conditions, as well as the complex backgrounds. This may bring noise to the acquired images. Noise is inevitable, but most of the noise can be eliminated with a smoothing filter. Through the de-noising procedure, subtle fractures can be linked and tiny abrupt parts can be softened. The principles that appear to be the most relevant to the image de-noising are preventing the original image edge from being destroyed, retaining the image outline and lines as much as possible, keeping the continuity of the image and increasing the contrast between regions of interest and not of interest. In this study, the standard median filter which has important features such as time saving, high precision and good performance is used. The center pixel in the scan window is to be de-noised. The first step is to sort all the pixel values in the scan window and find the mid-value, then change the mid-value into the standard median of the sorted sequence. Figures 1 and 2 show the experimental results. Through this method, information of image edges is saved as much as possible and the contrasts between regions of interest and not of interest are increased.

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Figure 1: Original images

Figure 2: Results of De-noising

Edge Detection:- The edge of images reflects the information such as boundary of the area, brightness discontinuity, texture changes and surface orientation, etc., so it is also the important basis of regional segmentation in interested areas. In addition, image edge detection also can remove irrelevant details and noise. In China, license plate contains seven characters, including Chinese characters, Latin letters and numbers. Because of the structure of Chinese characters is complicated, the number of strokes is more and texture change is comparatively obvious. From Figure 4, it is noticed that compared with other areas, the gray area of the license plate changes more frequently and the edge information is richer. So the edge detection can be used to extract license plate area, separate prominent targets and background. This paper adopts method of Sobel edge detection. In Figure 3, the detection effect is shown.

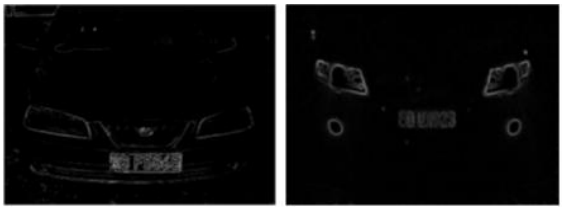

Figure 3: Edge detection.

License Plate Localization:-

The starting point of the license plate location is to judge the license plate through the features of the car license plate area. Available license plate features include five aspects: (1) that the geometrical features of the license plate, that is the height, width and their proportions, are within the confines; (2) the form feature is that the license plate is in a rectangular frame and characters are arranged according to certain rules in the rectangular frame with intervals; (3) the gray distribution of car license plate area feature is that the horizontal lines through the license plate have a gray distribution of continuous peaks and troughs; (4) the horizontal or vertical projection characteristics of car license plate area present a continuous peaks and troughs distribution and (5), the spectrum processes the image by row or column DTF transformation and its diagram contains the location information of the license plate. According to the rules set in 2007 by the People's Republic norm GA36 2007 mobile license plate standard in China, the basic characters of a vehicle license plate are as follows:

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Color features. China has the following color placements for the license plate background and characters: blue background with white letters, and yellow-black, black-white, white background with red or black letters, etc. The color of background and character form a sharp contrast, and the license plate color is not consistent with the body color. In the surroundings, there is a low chance of finding the same color schemes, so the color can be used as a feature for license plate location. (2) Outline Size characteristics. The license plate size of small cars in China meets the standard X3–X7, with each character being 5 mm-wide and 90 mm-high. The space is 10 mm between Chinese characters and letters, while it is 12 mm between characters. It can be obtained according to the prior knowledge that the license plate location in the original image changes within a certain scope. (3) Character features. In vehicle images, areas around the license plate are, compared to other areas, rich in edge points and texture, and rectangular with a fixed aspect ratio . These unique features are adopted to distinguish the license plate from its background. Accordingly a license plate recognition method is developed based on fusion of significant features. This method improves the accuracy and adaptability of license plate localization.

III. FLOW CHART OF PLATE RECOGNITION

The stream of operations required for number plate detection from vehicle image is shown in Figure 4. Extraction of number plate process starts with accepting a vehicle image in RGB as input. So as to improve processing speed, the first RGB is changed over into gray level image. Further, the gray level image is upgraded to remove the noise with protecting the sharpness of the image by median filter. The shapes of vehicle number plates are either rectangle or square. This apriori learning is exploited in this system maccepting vehicle image which is not tilted by using sobel operator [Gon 2002] finding vertical and horizontal. Using this technique finds the regions with high pixel contrast values, because various edges join characters in the number plate Using edge recognition some insignificant regions are evacuated in which the horizontal edges and vertical edges are plainly obvious, the remaining reaches are hopeful regions for number plate. Sobel edge location operation is finished using two masks of size 3x3 as shown in Figure 4. These masks are proposed to perceive horizontal and vertical edges respectively. Additionally, the masks are planned to change over the subsequent image into binary image, during the procedure of edge area.

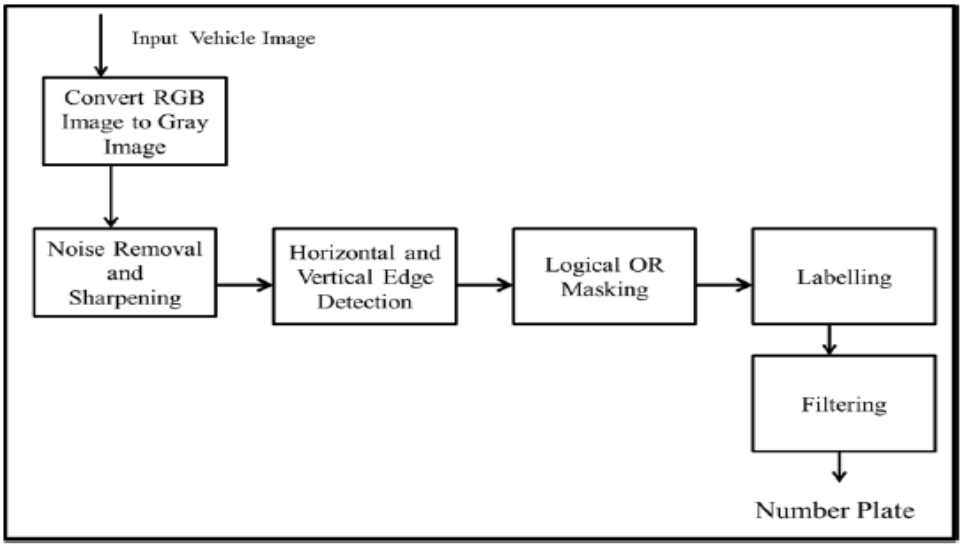

Figure 4: Stages in Proposed Model for Detection of Number Plate

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IV. EXPERIMENT RESULT

The experiments are conducted through testing with 495 segmented vehicle number plate images and synthetically generated number plates in different orientations as it was difficult to get good number of oriented number plates naturally. For each test sample the autocorrelation value is computed and the classification is made based on range values specified. The Figures 5 (a) through 5(b) shows few samples of oriented input images and corresponding corrected number plates.

(a) 0^0 Orientation

(b) 90^0 Orientation

(c) Corrected 90^0 Number Plate

(d) 180^0 Orientation

(e) Corrected 180^0 Number Plate

(f) 270^0 Orientation

(g) Corrected 270^0 Number Plate

The result of overall efficiency of proposed method is 65.05% with 22.42% of wrong detections and 12.53% of rejections. The rejections are due to autocorrelation threshold values computed falling outside range values. The wrong detections are due to overlapping of autocorrelation threshold values.

V. CONCLUSION

In this paper, application software is designed for the recognition of civil vehicle license plates. License plate images were pre-proc**e**ssed and the plate locations were extracted first. Then, we corrected the skew of license plates and separated the plate characters individually by segmentation. Finally, according to the features of Chinese letters, we applied template matching with the use of an algorithm for recognition of plate characters. This system is designed for the identification of Chinese license plates and was tested over a large number of images. Finally through license plate recognition experiments, it was proven that the system designed in this study for Chinese license plate reorganization performed with better than 92% recognition rates.

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