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Number Plate Recognition of Still Images in Vehicular Parking System

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Abstract - *Now a days the population of India is increasing day by day, thus the number of private as well as public vehicles are also increasing with a great deal This increase in number of vehicles is also serving a reason for increase in traffic and various crimes associated with it. Thus, there is a need of a robust mechanism such as an automated vehicle recognition system to handle this task efficiently. It is used to extract vehicle license plate information from the image. The extracted information can be used with or without a database in many applications such as electronic payment systems, freeway and specific road monitoring systems for traffic surveillance. The detection of the license plate of the vehicle images is the basis for any ALPR system. This is the first step in any ALPR system and is considered as the most crucial step in the ALPR system.. In this paper implementation had done using profile projection method to segment the characters and neural networks method to recognize the characters.*

Key Words: **License Plate Recognition,MATLAB**

1. INTRODUCTION

In modern technology, Intelligent Transportation System (ITS) maintains a vital role in developed countries. LPR contains many applications in ITS like payment of parking fee, controlling traffic volume and traffic data collection etc. LPR system mainly consists of three components. 1) License plate detection 2) character segmentation 3) character recognition. License plate detection is most significant because it directly affects the overall system accuracy. This License plate detection is essentially concerned in this paper.Many technologies are used for detecting the region of car license plate. The algorithm which is based on the edge statistics and morphology is time consuming process. This problem is overcome by using block base algorithm. The method is known as "N Row Distance" method. An image is scanned with N row distance and counts the existent edges in this method. If number of edges is greater than threshold then the license plate is recognized. If threshold is large then it has to be reduced and algorithm will be repeated. The disadvantage of this algorithm is it is sensitive to the unwanted edges and they are not applied for the complex images. We use another algorithm to remove background and noise edges.

This algorithm can detect the edges and Hough transform is applied for detecting the location of license plate. But this method is difficult for extracting license plate due to the distorted or vertical or horizontal edges.A wavelet transform based algorithm is introduced for extracting the important features for the location of license plate. Kim & Chien uses symmetric regions for the location of license plate. But this is little time consuming and does not suitable for the distorted or rotated plates. Park et al. proposed neural networks. These networks can be used as filters. Zimic et al. proposes Fuzzy logic. In this Fuzzy logic there are some membership functions for the fuzzy sets such as "bright" , "dark" , " bright and dark sequence" to get the horizontal and vertical plate positions.At first, we find the total vertical edges in the image. Secondly, we use the proposed algorithm. We can remove the noise and car edges by using this proposed algorithm. Then morphological operations are applied to detect the license report. Finally, size of the plate is compared with the aspect ratio. If it is undesirable then the candidate strip will be deleted and algorithm will be repeated.

1.1 Literature Survey

In [1] this paper, author describes optical principle of the sensing system. A prism beam splitter splits incident rays into reflected and transmitted lights having different intensities. The intensity ratio of split rays is controllable with a multilayered filter in the beam splitter. The rays with different intensities are framed in a pair of CCDs synchronously. Transmitted Light is stronger than reflected; thus CCD1 frames a high exposure image in comparison with CCD2. This structure allows the sensing system to capture a pair of images corresponding to different exposure conditions simultaneously. To realize 1.5 10 dynamic range, the intensity ratio of the transmitted light to the reflected is selected as 45:1. By synthesizing a pair of images with different intensities, an image whose dynamic range is wider than an original image can be generated.

In [2] this paper, author describe a morphology-based technique is designed to locate possible positions of license plates. Since a license plate is a pattern with high variations, the features used to locate the plates should be robust to the changes of lighting conditions and view orientations. The morphological operations are used to extract the contrast features within **a** license plate as the imponant contrast features within a license plate as the imponant contrast features within a license plate as the imponant invariant to several geometrical transformations like car color, camera translation, rotations, and scaling.

Therefore, the proposed method works stable under different image alterations.

In [3] this paper, author describe well-known Otsu's method. it is one of the robust global binarization methods, and widely used for binarizing the gray-scale images due to its accurate results and high speed. As a result, the plate characters are appear clearly after binarization The next step removes any object contiguous to the border of the image. Thus, we can get rid of unnecessary objects, 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.

In [4] this paper, author describe Normalization is defined that through the interpolation, image dithering and other image processing methods, the color images collected by CCD camera are cut to the pending images which have the unified length-width and single gray-scale. Firstly, having different size and complex background, the input images collected from different acquisition terminal are transformed through interpolation method to normalization images that have equal length and equal width. in order to strengthen the license plate region and eliminate the other region in the image, we introduce the image enhancement method. In image enhancement, using a series of methods, we enhance the contrast of pending images so that the gray difference between image background and license plate increase, which makes the subsequent process easier. Here we use gray level transform method to enhance the image contrast. In this technique the gray level of interesting region is extended to the permissible maximum gray range of whole display equipment.

In [6] this paper, author describe feature-salience theory for character recognition. The task of feature selecting is how to find a set of salient features that are more effective in recognizing targets. In a real recognition process, the confidence degree of a target is added. According to the prior information, the multifeature fusion will apply the most salient features extracted. In fact, all features cannot be extracted; therefore, recognition processing needs to select the most salient features according to the factual instance. Fig. 2 shows the multifeature target recognition processing: The top refers to the feature training procedure, and the bottom refers to the actual recognition procedure. When the target's confidence measure exceeds a threshold or the confidence measure is still less than the threshold after fusing all the salient features, the recognition process will be finished.

2. Proposed Method

Most of the quantity plate detection algorithms fall in additional than one class supported totally different techniques.

To sight vehicle variety plate following factors ought to be considered:

(1). Plate size: a plate will be of various sizes in a very vehicle image.

(2). Plate location: a plate will be settled anyplace within the vehicle.

(3). Plate background: A plate will have totally different background colours supported vehicle sort. as an example a government vehicle variety plate may need totally different background than different public vehicles.

(4). Screw: A plate might have screw which may be thought-about as a personality.

A number plate will be extracted by mistreatment image segmentation technique. There ar various image segmentation strategies accessible in numerous literatures. In most of the strategies image binarization is employed. Some authors use Otsu's technique for image binarization to convert color image to grey scale image. Some plate segmentation algorithms ar supported color segmentation. A study of car place location supported color segmentation is mentioned. within the following sections common variety plate extraction strategies ar explained, that is followed by elaborate discussion of image segmentation techniques adopted in numerous literature of ANPR or LPR.

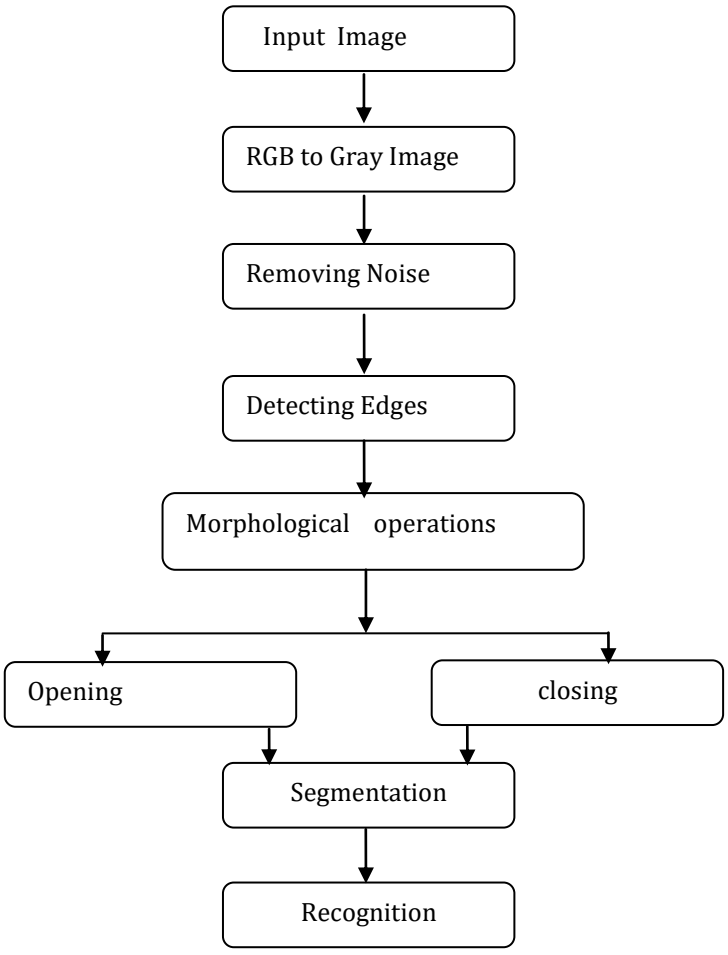

Fig1:proposed Method

As discussed earlier, the technique for the detection of license plate consists of 4 sections. First, we can find the vertical edges. Next we use algorithm for background curves and noise removing. Then we apply a new method for finding the first strip as a candidate. Finally, license plate will be detected by using the morphological operations. The below figure shows different stages in the license plate extraction.

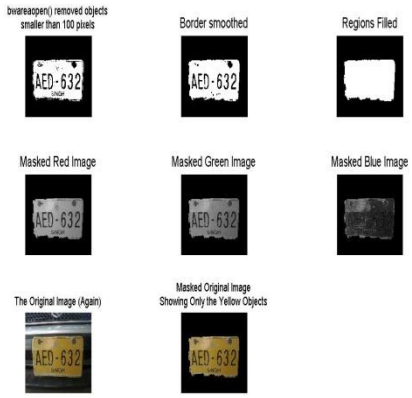

Fig 2Different stages of number plate extraction.

A. Vertical edge extraction

ROIs are the rectangular regions with white background and dark characters. Many edges are existed in this rectangle which is considered as the most important characteristic. Sobel, Canny, Prewitt are the edge detectors. Fig 2 shows the binary image of the number plate.

Fig 3 Binary image of number plate.

B. Background curve and noise removing

We can remove the short and long edges by using the proposed algorithm. Short edges are due to the noise and long edges are due to the car and background. This proposed algorithm need to scan the edge images three times. First scan will record the edge lengths away from the top start points. Second scan will record the edge lengths away from the bottom end points. Final scan will add the two kinds of lengths to indicate the actual edge length.

C. Edge statistical analysis

In this section, we are finding a strip that contains the license plate. So, we divide the image into the strip with height of 'L' pixels where L is the maximum height of the license plate in the data base. We will count the edges in the strip. Now, we find the strip with maximum edges and upper, lower strips are added to it. Then we find the row 'r' which contains maximum edges. Now, we will change the pointers to the value in a loop which license plate exists between the two pointers.

D. Morphology based license plate extraction

In this step, by using the morphological operators we connected the edges together and we compare the candidate with the aspect ratio. Dilation operators are used for three times. First a horizontal dilation, next a vertical dilation and last again horizontal dilation. By these operations we will connect the edges of existent license plate together. Then, we will search for the biggest white strip in the region and set it as a first candidate. Compare it with the aspect ratio. If its dimensions are not related to the aspect ratio then we delete this region from vertical edge image and repeat this algorithm. If not first candidate is accepted and algorithm is finished. Number plate recognition is shown in fig 3.

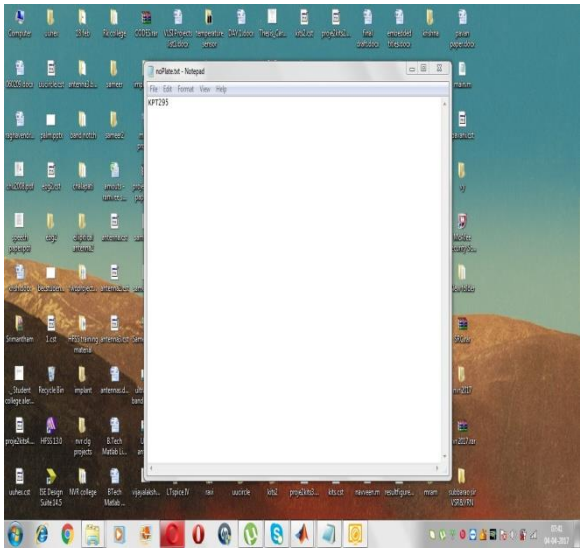

Fig 4 number plate recognition.

EXPERIMENT RESULTS

Our proposed algorithm was tested with the 310 natural color images. The images consist of different complex backgrounds. The distance between camera, license plate and angle of license plate were different. The proposed algorithm can detect the license plate with 84% accuracy. Our code is implemented in MATLAB software.

3. CONCLUSIONS

In this paper, a system is designed for extracting and recognizing the license plate of vehicles. The experimental results exhibit the utility of the proposed system. Edge base methods are more sensitive to the noise. In this paper, we proposed a new algorithm for reducing the effect of noise under complex images. This approach is successful for these images but requires more experiments to be done.

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