CONTOUR BASED NUMBER PLATE RECOGNITION SYSTEM USING EM SEGMENTATION METHOD

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ABSTRACT

Vehicle number plate recognition systems are considered to be the core part in parking management, toll management, vehicle speed control management. Many algorithms and techniques have been developed by many researchers for detecting the number plate of any vehicle which is the unique tag . The purpose of this research paper is to effectively locate and segment the number plate. Contour based technique is used to locate the number plate with higher accuracy and extension maximization clustering method is applied to effectively segment the number plate from the given input image. Experimental results show the effectiveness of EM segmentation method to crop the plate region very accurately.

KEYWORDS: Number Plate, Image processing, Edge, Contour, Localization, Segmentation

INTRODUCTION

In this research paper, an efficient segmentation approach based on contour method for locating the number plate is identified. The number plate under complex background such as poor lighting can also be located very accurately with the clustering based algorithms. ANPR is the challenging and interesting research background field in image processing. The low quality and poor contrast in the obtained vehicle images are improved by using various image contrast preprocessing techniques and the best one is selected. At the second part, a canny edge detection algorithm is used to extract the edges of the enhanced image and the clustering algorithm is used to generate the contours. The Median filtering is used in the proposed method to remove the unwanted noises from the given input image. As a result of eliminating the several features such as region area, edge density and the aspect ratio , the number plate region is identified using contour based technique. Expectation maximization algorithm is used to reduce the contours, so as to locate the region of interest very efficiently.. The number plate is then segmented from the input image using EM segmentation method. The proposed method is experimented on images of vehicles that

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are captured using high resolution camera at different lighting conditions. At the final stage template matching method is used to compare the characters obtained as output and the resultant characters are displayed in the notepad. The experimental results are stored in an excel sheet.

LITERATURE SURVEY

(Dr. JayashriVajpai et al ,2011) compared the different edge detection techniques and proved that canny edge detection produce good results for segmenting car number plate. (P.Anishiya, S. Mary Joans, 2011) used the dilation and erosion technique for image morphological operations for recognizing the number plate for Indian cars. (R.Radha and C.P.Sumathi,2012) used mathematical morphology which is a set theoretic method for analyzing the image and extracting image components that are very much required in shape representation and extraction of geometrical structure..(Shivakumar et al.,*2005)*used a hybrid approach to locate the region of interest. Texture analysis and connected component methods are merged to produce the good result. For edge detection canny method is used .To find the text regions connected component analysis is used. To eliminate the non- text regions, feature analysis method is applied. The complex background images can also produces better output using the proposed method.

Various image segmentation methods that are used to recognize the characters of the number plate are studied and the short comings of those models are also analyzed. The approach used by (S.Ozbay and E.Ercelebi,2005) was pixel propagation method that uses smearing technique to recognize the characters of the binarized image. The threshold value based segmentation is carried out on the images. Each character segmentation is done using similar algorithm and finally the text was classified from the input image. The drawback of using this method is if the threshold value assigned wrongly that leads to improper segmentation. In (Kasmat.V et al, 2005), an algorithm that uses Hough transformation and the prior knowledge in horizontal and vertical segmentation is presented The prior knowledge is used to overcome the difficulties like noise, plate frame problems, problem in plate rotation and lighting inconsistency is presented . This method overcomes the drawbacks of image binarization. In (Tran DucDuan et al, 2005) Hough transform and contour methods are used. To narrow down the points contour based algorithms are used and then Hough transform is applied but Hough method requires large memory, so this is the drawback in using this method. and also it is very difficult to implement this method to the image that contains more noise.

As per the existing literature review, most of the researchers have used Hough transform and the pixel propagation to segment the region of interest from the given input image. But using these methods have some disadvantages .The Hough transform method requires huge memory space and pixel propagation technique may leads to improper segmentation due to predefined threshold value.

In order to overcome all these shortcomings this paper provides a region based image segmentation method that uses region growing approach to segment each character in the area of region of interest. The region of interest was identified from the given input vehicle image using image morphological techniques. Many researches have been done to extract the text from the given image . (Hemalatha.R.J *et al ,2018)*implemented the segmentation of images with the help of active contours.. (B.H Shekhar*et al, 2014)* uses a gradient difference of Haar method a hybrid approach to locate the texts in real images. Then the text regions are generated by morphological operations.

In (A.J.Jadhav Vaibhav Kolhe Sagar Peshwe ,2013), SVM is applied for classification and recognition. Noise of the image is filtered by implementing Otsu filteration method. Gradient difference are accurately evaluated by the fusion of   Daubechies DWT . The color space is evaluated using Euclidian distance.Non text regions are eliminated from the image using global thresholding method.

OBJECTIVES

The main objective of this research is to design and develop the automatic number plate recognition using Matlab tools. To study and analyses different images of the cars to isolate the number plate using contour based clustering method.Various edge detection and image morphological techniques have been studied and analyzed to get a better result.Cluster based algorithms are studied and the method used to find out the expected regions based on the clusters are studied.

METHODOLOGY

Input vehicle image

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Gray scale Conversion

↓

Morphological processing

↓

Binarized image

↓

Contour based Locating NP image
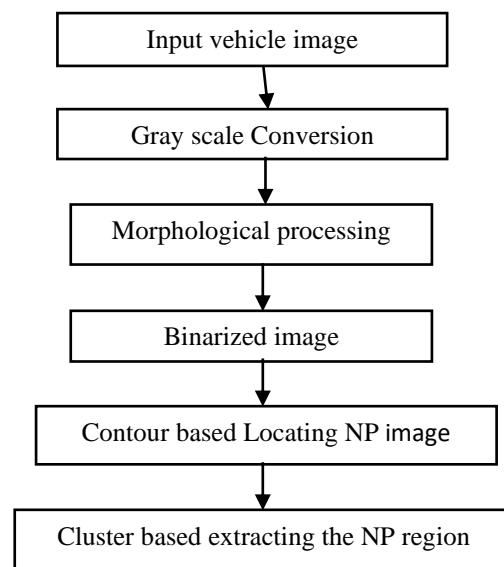
↓

Cluster based extracting the NP region

FIGURE 1

Figure 1 depicts the methodology of the proposed ANPR .In image acquisition phase the input vehicle image is captured as a picture or video sequence using high pixel resolution camera or by CCTV camera. Preprocessing of an image includes conversion of color image into a grayscale image, edge detection of an image, noise removal from an image and locating the region of interest. The input color image of vehicle is converted in to grayscale image for further processing , unwanted noise present in the image is removed to get the clear image and the edges of the input image is found out to get more sharpened image.

Preprocessing of the given input image results in producing the noiseless clear edged image from which the number plate which is considered to be the region of interest is located by using image thresholding or binarization method.

The region of interest in our research is number plate and the ROI information is computed using contour extraction method.. After preprocessing the input vehicle image was first blurred to remove noisy contours in edge detection results. Applying adaptive thresholding in contour extraction can separate the regions almost well (Figure 6). The details, in general, can vary significantly based on the location where thevehicle image is taken .Number plate from the given input vehicle image is isolated and the alphanumeric character of the plate is segmented using cluster based extension maximization (EM)character segmentation technique. In this research paper a dataset of 896 car images which is taken in real time scenario is tested with the proposed method benchmark model that uses EM cluster segmentation is used to isolate the number plate from the input car image

ANPR is a research oriented area in which the number plate of the given vehicle image can be localized. This work includes many morphological image processing activities. First step is to read the input vehicle image. The input vehicle image will be converted into the gray scale image as shown in Figure 2 and 3 respectively.

FIGURE. 2 ORIGINAL IMAGE   FIGURE. 3 GRAYSCALE IMAGE

Binary image is generated using grey thresh from the gray scale image.. The average of all pixel values gives the threshold value. .Median filtering method is applied to reduce the maximum noise present in the binary image. Image enhancement technique such as edge detection using canny edge detector, dilation and erosion are used for further enhancement of the given image. Figure 4 and Figure 5 shows the images of noise removal and edge detected respectively.

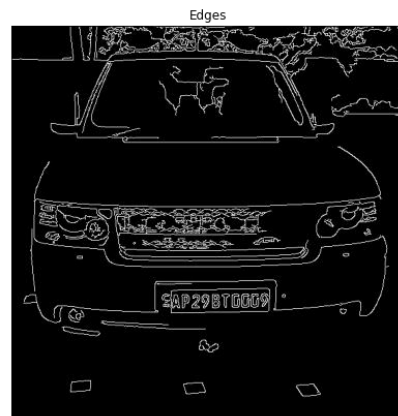FIGURE. 4 NOISE REMOVAL   FIGURE. 5 EDGE DETECTION

Next the enhanced methods are used to get the more sharp edges which is shown in Figure 6 and regions of the image are drawn contours to ensure character isolation in Figure 7.
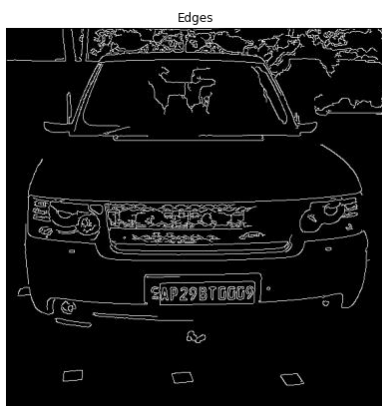

FIGURE. 6 EDGE ENHANCEMENT   FIGURE. 7 REGIONS OF IMAGE WITH CONTOURS

FIGURE. 8 IMAGE WITH REDUCED CONTOURS   FIGURE. 9 IMAGE WITH REDUCED CONTOURS

The region of interest is identified with reduced contours in Figure 8 and Figure 9 respectively.Finally the number plate is segmented from the given input image using the cluster based EM method as shown in Figure 10. Image segmentation is adopted in this work for dividing the image into its constituent regions. The subdivision will be carried out until the objects of interest have been isolated. In image segmentation pixels with the same label share certain characteristics. The result of image segmentation is a set of objects that jointly cover the entire image. After image pre-processing, the noise free image will be the input image passed to the segmentation module, where the input image is decomposed into attributes to segment the input image into several characters.

FIGURE. 10 NP REGION SEGMENTED

RESULTS & DISCUSSION

The proposed method produces the accuracy of 98% in detecting the number plate. 878 number plates have been correctly located and segmented out of 896 sample car images .Accuracy is the proportion of true results among the total number of cases examined.

CONCLUSION

The method proposed in this paper seems to be very appropriate in locating and segmenting the number plate. The result analysis proves that the proposed algorithm is providing the better result than the existing methods. The proposed EM clustering method produces a better result of localization and recognition of different license plates under various environmental and lighting conditions. .Reduced contours is used to exactly locate the number plate which is the region of interest in this research. Number plate is segmented from the given input image based on the reduced clusters which is done using cluster based EM segmentation technique. Expectation maximization is a cluster based method used to efficiently segment the number plate from the given image. Samples of number plates from Indian vehicles which has the alphanumeric characters are used as test data for locating and segmenting purpose. This research work will be extended in future to locate the number plates of other countries that use different languages. Matlab tool was used to develop the entire system.

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