License Plate Detection and Segmentation: An Encircling Review

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Abstract

License plate detection and segmentation system has become a crucial role in the development of smart cities for vehicle management, investigation of stolen vehicles, and traffic monitoring and control. License plate detection and segmentation system has five stages, including license plate localization, character segmentation, and character recognition. Although the license plate recognition system has been successfully applied to the environment-controlled smart parking system, it still faces many challenging in the surveillance system such as congested traffic with multiple plates, ambiguous signs and advertisements, tilting plates, as well as obscure images taken in bad weather and nighttime. This paper proposes an algorithm to detect license plate region and edge processing both vertically and horizontally to improve the performance of the systems for high speed applications. Throughout the detection and recognition the original images are detected, filtered both vertically and horizontally, and threshold based on bounding box method. The system develops by using MATLAB13 a.

Keywords: Number plate localization, Morphological operation, noise reduction, Character segmentation, segmentation, license plate detection.

1. Introduction

The system Have you ever wonder that how a license plate detection and segmentation system works. Let me tell you the concept behind it, the camera of the system captures image of vehicle license plate and then the image is processed through multiple number of algorithms to provide an alpha numeric conversion of the image into a text format. License plate detection and segmentation of the system is used at many places like Petrol Pumps, Shopping Malls, Airports, highways, toll booths, Hotels, Hospitals, Parking lots, Defense & Military check points etc. First, let me brief you about the concept we are using for detecting number plates. There are three programs or '.m' files for this project. Template Creation (template_creation.m) – This is used to call the saved images of alphanumeric and then save them as a new template in MATLAB memory.

Letter Detection (Letter_detection.m) – Reads the characters from the input image and find the highest matched corresponding alphanumeric.

Plate Detection (Plate_detection.m) – Process the image and then call the above two m-files to detect the number.

2. Literature Review

Automatic License Plate Recognition (ALPR) algorithm using Hough transforms. Hough transforms are used to detect license plate by finding the borders of the plates. This transforms is a memory and time consuming process. In this wavelet based methods, high frequency coefficients are used to detect an accuracy of the plates. This algorithm fails on gray scale images or an image with low colour disparity.

Sarfraz's proposed the system Morphological operations based connected components analysis. These algorithms use a proper thresholding method to obtain the binary image of the plate before the further pre-processing. This detection step is not having input plate quality and parameters are cannot be tuned appropriately. Therefore, the recognition accuracy of these algorithms decreases when the plate qualities are involved. In some methods, the character recognition is based on key points of localization like SIFT and SURF algorithms[4] [5] [6]. The major disadvantages of these algorithms are taking more times and very high complexity [7]. We have proposed a new feature set for character recognition features are based on bounding box of our systems. The final systems are capable for detecting and recognizing of multiple license plates in a single frame of high speed applications.

The Vehicle License Plate Detection and Recognition System here composed of four major steps (1)Preprocessing:- where the original or RGB image is converted to Gray Scale image using NTSC Standard method. (2)Localization:- Morphological Operation were performed and huge transformation was taken into

account for edge detection Process. (3)Segmentation: - Horizontal Prognostication was applied for segmentation process. (4)Recognition: - Template matching process take place in which the pixel values of the matrix of segmented character and the template matrix were corresponding and best match value was returned as output. [13].

In that paper Automatic License Plate Recognition using Matlab was projected by P. Sai Krishna. In this paper work, simple colour conversion edge detection and removal of noise with the presentation of median filter as one of the operators is attempted. This paper work presents an approach using simple but efficient morphological operations, filtering and finding connected components for localization of Indian number plates .It propositions the identification of stolen cars .The algorithm has been tested on 20 models and is found to extract both character set and quantities from vehicle license plates images with an accuracy of 90% for four wheeler license plates [14].
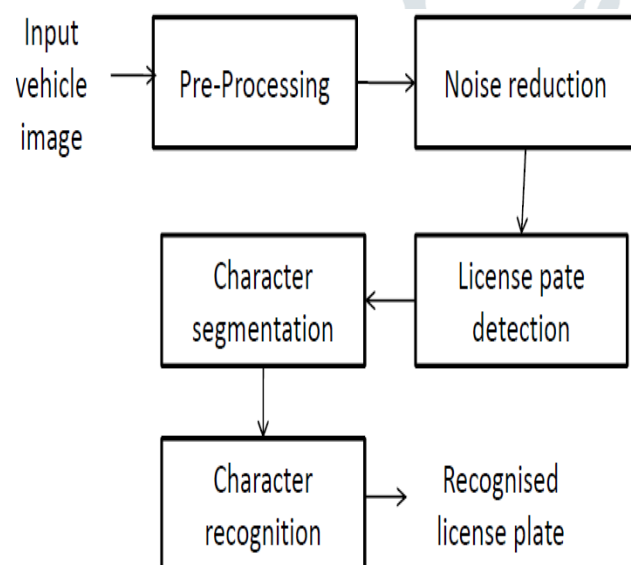
3. Proposed System

Fig.3.1 System of license plate detection and segmentation

The block diagram for vehicle number plate detection and segmentation system as shown in figure (1). There are four main steps and each step has their own dynamic role in number plate detection and segmentation.

a. Pre-processing

b. License plate detection

c. Character Segmentation of license plate

d. Character Recognition of license plate

A. Pre-Processing:

The Video or image of the vehicle is apprehended using camera of 13-megapixel resolution, whose vehicle number plate to be acknowledged. If it was a video, rehabilitated into frames and selecting the frame conditional video length and time in which frame vehicle is pure. Choosing of frame can be done using equation (1).

$$F = N*t/T ....(1)$$

Where F is the mandatory frame or image, N number of frames, t time required and T is total time of video or length of video. The dimensions of image used 120 x 160 or 1200 x 1600. First we need to transform the RGB image to Gray-scale image using equation (2) it will be easier to number plate abstraction.

$$I = 0.114*R + 0.587*G + 0.299*B ....(2)$$

To augment the number plate recognition supplementary, we use median filter to exclude noises but it not only eliminates noise it concentrates on high frequency also. So it is more significant in edge detection in an image, commonly the number plates are in rectangular figure, so we need to detect the edges of the rectangular plate.

B. Noise reduction system used median filtering performance to reduce the paper and salt noise. We have used 3x 3 masks to get eight neighbors of a pixel and their equivalent gray value.

C. License plate detection: Most of the quantity plate detection algorithms fall in more than one category based on dissimilar techniques. To detect vehicle number plate following reasons should be considered:

Plate size: a plate can be of diverse size in a vehicle image.
Plate location: a plate can be located wherever in the vehicle.
Plate background: A plate can have dissimilar background colors based on vehicle type. For the example a government vehicle quantity plate might have different background than other public vehicles.
Screw: A plate may have screw and that could be deliberated as a character.

A number plate can be removed by using image segmentation method. There are numerous image segmentation methods obtainable in various literatures. In most of the methods image binarization is recycled. Some authors use Otsu's routine for image binarization to translate color image to gray scale image. Some plate segmentation algorithms are constructed on color segmentation. A training of license plate location based

on color segmentation is debated in [18]. In the succeeding sections common number plate extraction methods are explained, which is followed by comprehensive discussion of image segmentation techniques adopted in innumerable literature of ANPR or LPR.

D. Character Segmentation of the number plate

Subsequently extracting number plate region, it scans for the associated objects in an image. As soon as the connected components are acknowledged it will assign a special label to it. Each associated components have different labels in order to discriminate each other. The development of character segmentation, it will divide the number plate into changed sub images, each sub image desires one character. Segmentation is the significant part in the vehicle license plate detection system since the character recognition absolutely depends on segmentation only. If segmentation is not done appropriately recognition will not be precise. So, to solve this problematic bounding box method has been used to achieve improved results. In bounding box method, it encompasses the labelled region with rectangular box absolutely. When the quantified the associated region is labelled, it regulates the junction co-ordinates of bounding box and also its depth and width. It always specifies he boundaries of associated objects. In this paper occupied springing boxes are recycled which absolutely relay on wrapper the corresponding related objects and also procedures the image region things.

E. Character Recognition of the number plate

Subsequently segmenting, the next step is character recognition. The main aim of acknowledgement is to employ conversion of image text to characters. Each characters from the license plate is associated completely against with the alphanumeric databank which practices template matching. In matching development, the achieved sub-image will be associated against the template images in completely possible position in the database and it computes all numerical index for each characters in order to get improved matching from template images. To find the comparison between the objects and template images regulated cross correlation is used. Standardized Cross Correlation, are Template image and Input image separately. If the found value of normalized cross correlation is bigger than the preferred threshold, then it is restructured to the new one. The match score is produced on every template image, if it scores supplementary values than the previous threshold principles it will update with the advanced one threshold for the improved match. The best

matched characters are recovered and the output is deposited in a text file.

4. Simulation Results

Experiment is conducted on (MATLAB) R2013 a simulation used for image analysis.

Algorithm

Step 1 - Captured the image through digital camera and prearranged as input to process.

Step 2 - Renovating into Color image to gray scale image

Step 3 - Image Enhancement- Eliminating of noise using median filter.

Step 4 - Plate extraction- Find rows and columns standards of the image to identify the region. edge detector is used to find the limitations, then dilated and removed associated objects Finally, we removed the desired region.

Step 5 - Character Segmentation- Springing box method is used to map respectively character, for each communication it will be mapped a box and exhibited each character into a particular image.

Step 6 - Character Recognition- Subsequently Segmenting each characters are associated with the template. If each character matches pixel by pixel corresponding image is found, it will be demonstrated into text.
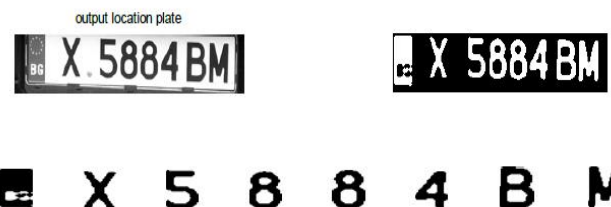

Fig3.1 Existing Experimental Result

Applications

There are numerous applications where automatic license plate recognition can be charity. The two major standards license plate recognition complements to arrangements are automation and safety.

Subsequently integrating a License Plate detection and segmentation Software Engine interested in intelligent transportation arrangements, it develops possible to systematize motorway toll collection, analyses traffic, improve law enforcement, etc.

An Intelligent Transference System equipped with LPR can make available:

a.Flexible and automatic highway toll assortment systems

b.Analysis of city traffic all through peak periods

c.Automation of weigh-in-motion organizations

d.Enhanced vehicle theft inhibition

e.Effective law implementation

f.Effective enforcement of traffic guidelines

h.Highest efficiency for border controller systems, etc.

Supplementary possible applications include:

a.Building a widespread database of traffic movement

b.Automation and uncomplicatedness of airport and harbour logistics

c.Security intensive care of roads, checkpoints, etc.

d.Vehicle surveillance · Anticipation of non-payment at gas stations, drive-in restaurants, etc.

5. Conclusion

In this paper various License Plate Recognition techniques has been discussed in details which were used by many researcher. The License Plate Recognition (LPR) System mainly encompasses the three major stages of Region of Concentration Extraction, License Plate Extraction, and Character Recognition via number of different techniques which are neglected in paper clearly. License plate recognition is interesting in case of changed weather conditions and differ number plate presentations. There are number of LPR procedures purposed in previous years. In the system, we have designed for the uncovering of licensed number plate automobiles. First we select the image, eliminate noise and find the concerned area of image, then the license plate location is removed using edge detection then segmentation of 2each characters independently. The process of vehicle number plate recognition necessitates a very high degree of accuracy when the organization is deal with different expanse of license plate detection comparable automatic parking, automatic toll booth, border control, law enforcement and many additional. In this paper we have presented a survey of License Plate detection and segmentation. It also describes how these systems are helpful for recognize quantity plate and how to increase recognition rate, character segmentation and plate region extraction proportion.

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