International Journal of Scientific and Technical Advancements
IJSTA
ISSN: 2454-1532

AUTOMATIC NUMBER PLATE RECOGNITION

Priyanka Sharma[1], Sidhant Sharma[2],Sameru Sharma[3], Kanav Mansotra[4], Navneet Gupta[5], Aditya Goswami[6]
[1,3,4,5,6]Department of Electronics and Communication Engineering, GCET, Jammu, J&K.
[2]Department of Computer Engineering, GNDU, Amritsar.
[1]priyankasharma1808@gmail.com,[2]Sidhant47@gmail.com,[3] sameru33@gmail.com,
[4]mansotrakanav@gmail.com, [5]nav892012@gmail.com [6]aditya.abhi20@gmail.com

Abstract - ***An effort has been made to develop Automatic Number Plate Recognition (ANPR) system which identifies the characters directly from the image of the license plate. Due to the different types of number plates being used, the requirements of an automatic number plate recognition system are different for each country. In this paper, a number plate localization and recognition system for vehicles in India is proposed. This system is developed based on digital images and can be easily applied to commercial car park systems[7] for the use of documenting access of parking services, secure usage of parking houses and also to prevent car theft issues. The proposed algorithm is based on a combination of morphological operation with area criteria tests for number plate localization. Segmentation of the plate characters was achieved by the application of region props function in MATLAB, labeling and fill hole approach. The character recognition was accomplished with the aid of optical characters by the process of Template matching.***

Keywords— ***ANPR, OCR, edge detection, correlation, MATLAB, region props***

I. Introduction

The purpose of this paper was to build a real time application which recognizes license plates from cars at a gate, ANPR as stated in the name recognizes the number plate automatically. When a car is detected, the camera takes a picture of the car .The characters can then be identified using optical character recognition (OCR) [4],[5]. For example, at the entrance of a parking area, the system based on regular PC with camera, catches frames which include a visible car license plate and processes them. Once a license plate is detected, its digits are recognized, displayed on the User Interface. The system based on a personal computer and software packages available, MATLAB program and a digital camera, which help to capture the images of the vehicle license plate. Next, an algorithm is created to train and identify the vehicle license plate for the purpose of recognition. The general algorithm involves the following steps:

1. Image Processing: The image captured is preprocessed and reduction in the contrast.
2. Plate localization and extraction: To obtain the vehicle plate sub image.
3. Character Segmentation/Recognition: Resample and threshold in order to isolate the license plate and vehicle license plate character. Then recognition of vehicle license late character.
4. Evaluating the performance of the algorithm and compare the input image with the database.

II. Related Work

The problem of ANPR is being studied since the 90‟s. The early approaches were based on characteristics of boundary lines. The input image being first processed to enrich and enhance boundary line-information by using algorithms such as the gradient filter, and resulting in an image formed of edges. The image thus processed was converted to its binary counterpart and then processed by certain algorithms, such as Hough transform, to detect lines. Eventually, couples of 2-parallel lines were considered as a plate-designate. Another approach was based on the morphology [2] of objects in an image. This approach focuses on some salient properties of vehicle plate images such as their brightness, contrast, symmetry, angles, etc. Due to these features, this method could be used to detect the similar properties in a certain image and locate the position of number plate regions. The third approach was based on statistical properties of text. In this approach, text regions were discovered using statistical properties of text [3] like the variance of gray level, number of edges, edge densities in the region, etc. This approach was commonly used in finding text in images, and could well be used for discovering and designating candidate number plate areas as they include alphabets and numerals. In

Priyanka Sharma, Sidhant Sharma, Sameru Sharma, Kanav Mansotra, Navneet Gupta, and Aditya Goswami,“Automatic Number Plate Reognition,” *International Journal of Scientific and Technical Advancements*, Vol. 5, Issue 1, pp. 97-100, 2019.

addition, there have been a number of other methods relating to this problem focusing on detecting VNP using artificial intelligence and genetic algorithms [1]. All of the systems discussed above have some kind of limitations for example they are plate size dependent, colour dependent, Work only in certain conditions or environment like indoor images etc. The method proposed here is independent of colour, size, location and angle of the number plate of the vehicle.

III. Proposed System

The below shows the proposed ANPR Process

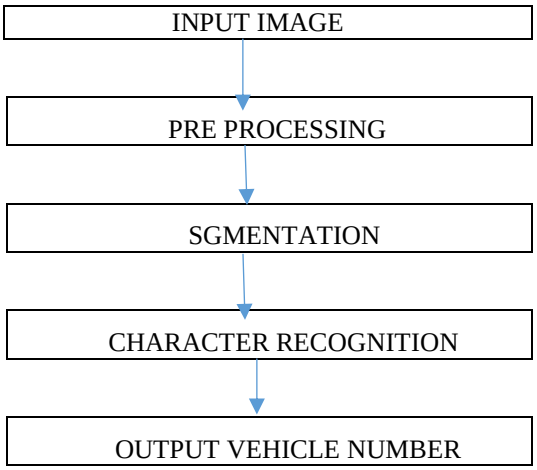

Figure 1.1 Proposed ANPR Process

1. Input image

The initial phase of image processing for Vehicle License Plate Recognition is to obtain images of vehicles. Electronic devices such as optical (digital/video) camera, webcam etc can be used to capture the acquired images. For this project, vehicle images will be taken with a digital camera.

Fig 1.2 Original image for recognition

The images will be stored as colour JPEG format on the camera. Then proceed using the MATLAB function to convert the vehicle JPEG image into gray scale format Input of this system is the image captured by a camera placed at a distance of 4-5metres away from the vehicle as shown in figure 1.2.

2. Pre-processing

The RGB image is then converted into a gray scale image for easy analysis as it consists of only two colour channels. Median filtering is then implemented for the effective removal of speckle noise, salt and pepper noise (impulsive noise). The aim of this process is to increase and improve the visibility of the image. Image Enhancement techniques consists process of sharpening the edges image, contrast manipulation, reducing noise, colour image processing and image segmentation as well. The gray image is then cropped which is a recognition process whereby it will extract the smallest rectangle which will contains the edge of the license plate and license plate itself. As the license plate surrounding is of no importance, this cropping process will highly increase the speed of image processing.

3. Character Segmentation

Segmentation is one of the most important processes in the automatic number plate recognition, because all further steps rely on it. In MATLAB, the function region props (for "region properties") provides a shortcut for determining many properties of a black and white or labelled image. Measure properties of image regions (blob analysis) the region props syntax is STATS = region props (L, *properties*), it measures a set of properties for each labelled region in the label matrix L.Positive integer elements of L correspond to different regions. For example, the set of elements of L equal to 1 corresponds to region 1; the set of elements of L equal to 2 corresponds to region 2; and so on. The return value STATS is a structure array of length max (L (:)). The fields of the structure array denote different measurements for each region, as specified by properties. Properties can be a comma-separated list of strings, a cell array containing strings, the single string 'all', or the string 'basic'. This table lists the set of valid property strings. Property strings are case insensitive and can be abbreviated.

Table 1.1: List of set of valid property strings

'Area'	'EulerNumber'	'Orientation'
'BoundingBox'	'Extent'	'Perimeter'
'Centroid'	'Extrema'	'PixelIdxList'
'ConvexArea'	'FilledArea'	'PixelList'
'ConvexHull'	'FilledImage'	'Solidity'
'ConvexImage'	'Image'	'SubarrayIdx'
'Eccentricity'	'MajorAxisLength'	
'EquivDiameter'	'MinorAxisLength'	

Priyanka Sharma, Sidhant Sharma, Sameru Sharma, Kanav Mansotra, Navneet Gupta, and Aditya Goswami,"Automatic Number Plate Reognition," *International Journal of Scientific and Technical Advancements*, Vol. 5, Issue 1, pp. 97-100, 2019.

If properties are the string 'all', region props computes all the preceding measurements. If properties are not specified or if it is the string 'basic', region props computes only the 'Area', 'Centroid', and 'Bounding Box' measurement.

4. Character recognition

It is employed for the purpose of conversion of images of text into characters. The goal of Optical Character Recognition (OCR) is to classify optical patterns (often contained in a digital image) corresponding to alphanumeric or other characters. The process of OC involves several steps including segmentation, feature extraction, and classification. Each of these steps is a field onto itself, and is described briefly here in the context of a MATLAB implementation of OCR. Examples of OCR applications are listed here. The most common for use OCR is the first item; people often wish to convert text documents to some sort of digital representation.

1. People wish to scan in a document and have the text of that document available in a word processor.
2. Recognizing license plate numbers.
3. Post Office needs to recognize zip-codes.

Before recognition algorithm, the characters are normalized. Normalization is to refine the characters into a block containing no extra white spaces (pixels) in all the four sides of the characters. Then each character is fit to equal size. Fitting approach is necessary for template matching. For matching the characters with the database, input images must be equal-sized with the database characters. The extracted characters cut from plate and the characters on database are now equal-sized. The next step is template matching. Template matching is an effective algorithm for recognition of characters. The character image is compared with the ones in the database and the best similarity is measured. To measure the similarity and find the best match, a statistical method correlation is used. Correlation is an effective technique for image recognition which was developed by Horowitz. This method measures the correlation coefficient between a number of known images with the same size unknown images or parts of an image with the highest correlation coefficient between the images producing the best match.

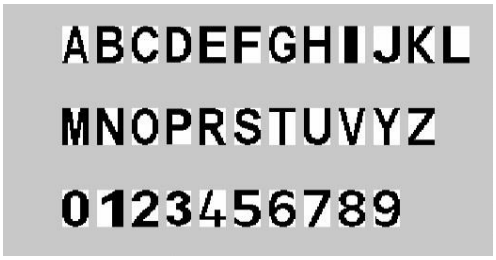

Fig 1.3: Database characters

Fig 1.4 Output of OCR on the segmented license Plate.

IV. Conclusion

The development of the Vehicle license Plate Recognition System is quite successful Implemented using MATLAB version R2013a.

For this project, the various processes used are as follows:

1. Read the colour image into MATLAB
2. Convert the image from RGB to Gray
3. Noise reduction using median filter.
4. Extract each character and number from the image using image segmentation techniques
5. Result is to be displayed finally

V. References

[1] Lee J.W., Kweon I.S:"*Automatic number-plate recognition: neural network approach.*" IEEE Vehicle Navigation and Information Systems Conference, vol.3.1. no.12, pp. 99-101 (1998).

[2] Shridhar, M.; Miller, J. W V; Houle, G.; Bijnagte, L., "*Recognition of license plate images: issues and perspectives*,"Document Analysis and Recognition, 1999. ICDAR '99. Proceedings of the Fifth International Conference on , vol., no.,pp.17,20, 20-22 Sep 1999.

[3] Eun Ryung Lee; Pyeoung Kee Kim; Hang Joon Kim, *"Automatic recognition of a car license plate using colour image processing,"* Image Processing, 1994. Proceedings. ICIP-94., IEEE International

ISSN: 2454-1532

Conference, vol.2, no., pp.301, 305 vol.2, 13-16 Nov 1994.

[4] Leonard. G. C. H. & Colin P. (2005), *Automatic Number Plate Recognition for Australian Conditions*, Macquarie Park, New South Wales:Macquarie University

[5] Ondrej M. (2007), Algorithmic and Mathematical Principles of Automatic Number Plate Recognition Systems, Brno, Czech Republic: Brno University of Technology.

[6] F. Martin, M. Garcia and J. L. Alba. *"New methods for Automatic Reading of VLP's (Vehicle License Plates),"* in Proc.IASTED Int. Conf. SPPRA, 2002, pp: 126-131.

[7] Optasia Systems Pte Ltd, *"The World Leader in License Plate Recognition Technology"* Sourced from:www.singaporegateway.com/optasia, Accessed 22 November 2008.

[8] Francesca O.:Experiments *" License Plate Recognition System."* DISI, Università degli Studi di Genova, Technical Report number: DISI-TR-06-17(2007).