ISSN2394-3777 (Print)
ISSN2394-3785 (Online)
Available online atwww.ijartet.com

International Journal of Advanced Research Trends in Engineering and Technology (IJARTET)
Vol. 5, Special Issue 9, March 2018

# ANPR Design for Detecting Vehicle Using Image Processing

T. BALAMANI[1]
PG Scholar
Department of Electronics and Communication Engineering
M.KUMARASAMY COLLEGE OF ENGINEERING
KARUR, INDIA
Balajul93@gmail.com

***Abstract:*** **Transportation today has become an important and essential part in the routine of people's lives. Therefore, the number of vehicles used for transportation also increases. Identification of vehicle using the number plate is helpful in many practical applications. License plate recognition is a crucial component of many intelligent transportation systems. Identification of vehicle is done by reading the number plate using the image or video of car without human intervention. This detection of vehicle by reading the number plate data is accomplished using various image processing techniques. Successfully recognizing the vehicle requires considering various practical scenarios like weather conditions and image capturing situations. The identification of number plate data is done by image acquisition, image recognition and character extraction processes. This process of extracting the data from image gives good accuracy and can be used in real time applications.**

***Keywords: Number plate detection, Character recognition, Plate extraction, intelligent transportation.***

## I.INTRODUCTION

Every city has its own way of allocating numbers to vehicles. This data about the vehicle can be used by officials to enforce law in transportation systems. It is getting troublesome for manually authorizing a vehicle with the expanded transportation system. To enforce the law for further tents difficult with the stream of fast-moving vehicles. . Data obtained from the vehicle can be used to improve this system. Automatic identification of number plate data is useful for enabling automation in transportation systems. So there is a scope for improvement. To improve this system the major part is vehicle so identification of the vehicle is important [1]. All the vehicles have unique data for number plate. The task of reading number plate data can be automated and implemented independent of human aid using image processing techniques. This automated recognition works with the image or video taken [2]. It extracts the region of number plate from the whole image and then recognizes the number from the image. The number plate data provides information about the vehicle and this can be used for further processing [3]. Automatic identification is useful in many applications. This detection method is still developing since the detection of data from an image is a complex task. In previous research works for gray scale conversion some methods uses Top-Hat transformation [4] which is a mathematical morphological transformation function. Basic image gray scale conversion [5] is also used. Image down sampling method [6] is used in some ANPR systems before converting the image into gray image. In some methods angle and length is estimated [7] in order to convert the blurred image into deblurred image. Color property is also considered in plate images which has multicolour in it [8]. In some methods with the frequency curve of vertical and horizontal, line taken from the cumulative distribution is considered for character segmentation process [9]. Customized strip search method also used for recognizing the system based feature of colour in the image [10]. Canny edge detecting operator can be used for ROI selection [11]. Various colour specifying classifiers and image searching methods are discussed in [12-13].

The proposed detection method starts from taking an image of vehicle. Initially the image is converted into gray image by using the adaptive threshold method. Adaptive threshold value is decided based on the pixel intensity local mean value in chosen window value. Then some morphological functions like erosion and dilation applied in order to remove the noise present in the image due to many reasons like weather and fast moving vehicles [14]. Image captured in the camera may have background things which do not represent the data of the number plate. Image segmentation and Random Sampling Consensus extraction method is used to separate the number plate region from the image captured. Connected component analysis used to extract the connected components data of the number plate. Support Vector Machine Character

ISSN2394-3777 (Print)
ISSN2394-3785 (Online)
Available online atwww.ijartet.com

International Journal of Advanced Research Trends in Engineering and Technology (IJARTET)
Vol. 5, Special Issue 9, March 2018

recognition method which is a classification method used to classify whether the recognized character is a number or character. By using character segmentation method the characters in the image are segmented then using an efficient way of recognizing characters in the region segmented by the segmentation method [15]. This identifies the characters required for further process. This is applicable in many places like securing industry transportation, traffic control, transportation system with intelligence control and counting the vehicles. The proposed method concentrates on the number plate detection under a variety of climate circumstances [16].

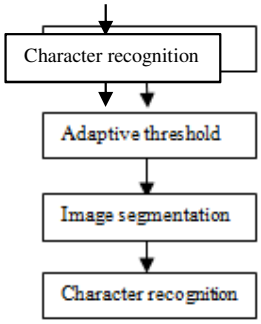


Fig.1 Process of number plate recognition system

## II. RELATED WORK

A coarse detection method which includes morphological operations, filters and contour validations is an accurate method and it also uses Hybrid discriminative restricted Boltzmann machine which has restriction in the recognition of characters. The image which has the swingeing transform in the intensity, uncharacteristic images it uses the adaptive block threshold to convert binary images. This Process stores very convenient datasets but also the processing time is high. For segmenting other regions than the number plate data region from the image filters are used based on the size, ratio and orientation of the number plate image. In order to make a distinction between the factors of the identified images and unidentified images a statistical correlation based method is used this results a best match of the pictures based on the statistical correlation [17]. It is not sensitive for small noises. In some cases the image taken from the camera is in blurred condition so in order to recognize the character in the blurred image they estimated the height and angle of the image in coarse and fine way. Image which has low visibility due to fog is enhanced by Tamura and CLAHE method. To fill the small holes Local counting filter that preserves high dense white areas is used. Prior to the cropping connected components (CCC) small thin white areas, regions other than the number plate, Low connectivities between white pixels have to be removed [18] but this estimation also has some artefacts in the deblurred image. Image down sampling method which can extract the candidate region with a density filter is used but for difficult scenario scenes this method cannot recognize the exact region of the number plate data [19]. Single wavelet transform precisely detects the number plate data at varying conditions and it is useful for real time applications but for distorted number plates this will not precisely detects the data from the image. The SVM (Support Vector Machine) classifier is a polynomial kernel of fifth degree homogeneous strategy. For color plates flexible threshold method is used which decides based on the luminance factor present in the color of the number plate image which cannot identify the data of number plate for transformed number plates by sludge or any other factor. It estimates the kernel and it is used to find the final result of deblurring image with the simple NBID algorithm. This problem can be reduced by parameter estimation [20]. Based on the hue and shape of the image also number plate data can be identified but it is not suitable for all weather conditions. There are the various related works regarding identifying the number plate data from the image [21-24].

## II. PROPOSED METHODOLOGY

This proposed approach consists of three main phases which includes plate detection, segmentation of number plate and pulling out the data from the image. Each phase of automatic number plate detection technique consists of some algorithm which gives better results than the previous works. In the first phase adaptive threshold methodology is used which is more accurate for the acquisition of number plate area from the image. In the second segmentation phase Connected component analysis and RANSAC is used which accurately segment the number plate area from the acquired image. At the last stage using second class SVM number plate data from the image can be pulled

ISSN2394-3777 (Print)
ISSN2394-3785 (Online)
Available online atwww.ijartet.com

International Journal of Advanced Research Trends in Engineering and Technology (IJARTET)
Vol. 5, Special Issue 9, March 2018

out.

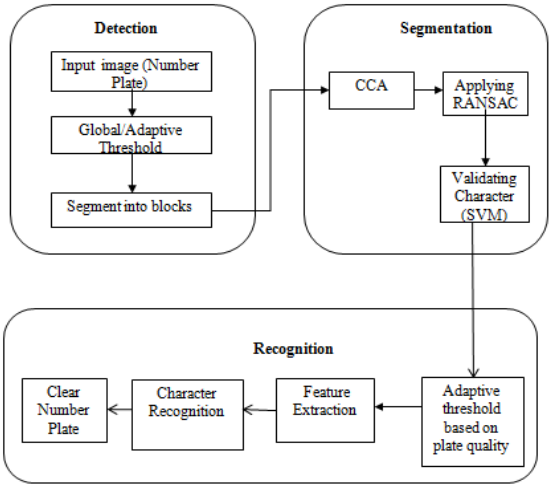


Fig.2 Proposed methodology

**a. Plate detection**

This proposed methodology detects the number plate data from the image taken from brightly lit and dim lit situations. Initially the input image is changed into gray image and then Global threshold method is used. Adaptive thresholding is a form of thresholding that takes into account spatial variations in illumination. This thresholding is applied based on the pixel intensity in the window. Before that local mean value is found based on the pixels in the image. Window Size values are selected depends on the size of the letters in the image. In order to find the size of the letters in the image utmost and at least values are set for the height and width of the letters. These values must be set manually for the application. Recognizing the number plate in daytime and night time is important since it has varying brightness level. For identifying the candidates region Random Sampling Consensus (RANSAC) is used. RANSAC is a recompling method that produces candidate key by using the minimum number of data points required to estimate the main replica constraints. It has many steps initially a window is selected for the image which is converted as binary image. Size of the window is selected which is two times greater than the original input image. Then connected component algorithm is applied to the binary image. With the help of window the region which does not contain plate character region are omitted. This process is done N number of times this N depends upon the components x.

Number of operations N=x(x-1)/2

For low condition of light variation, number plate is not found by cameras. In some countries number plates are coated by Infrared sensitive materials so for those number plates Infrared projectors are used. For these scenarios IR cameras can be used. The IR projector is mostly useful at night to brighten the plates. Also need to synchronize the camera exposure time with the IR projector pulses in order to capture images with clearer plates. IR projector which operates invisibly is an important alternative to the flashlights.


Fig.3 Sample test images

**b. Segmentation of number plate**

For the segmentation process, the proposed method works well on both clean and unclean plates. With the before detection step the location of number plate area can be found. With the help of the random sampling consensus algorithm a line is marked. The exact place of number plate area is determined with the range of horizontal and vertical margins of the number plate. Then, they are arranged with their range to the vertical area and horizontal area in the window chosen. Then the chosen area is connected as a line for next process. The total line is calculated with the help of these points. This process is continued till getting the exact segmented part of the number plate area.


Fig.4 Segmented image

**c. Pulling out number plate site**

Based on the superiority of the number plate thresholding is utilized. It doesn't spread on the image

ISSN2394-3777 (Print)
ISSN2394-3785 (Online)
Available online atwww.ijartet.com

International Journal of Advanced Research Trends in Engineering and Technology (IJARTET)
Vol. 5, Special Issue 9, March 2018

improvement. A two class SVM (Support Vector Machine) classifier is skilled to identify whether the identified data is a character or number. Support Vector Machine is a direct device learning algorithm which can be used for both categorization and deterioration test. It is widely used in classification problems. Each data as a point in n-dimensional space where n is number of features with the value of each feature being the value of a particular coordinate. Hyper plane which shows the difference between two phases is found with the value of each attribute. If the answer is positive, the cumulative density functions (CDFs) of inner and outer areas are calculated for each character independently. Then, using CDF we can find a value that more than 70% of the pixels have intensity of less than that value. Now two cumulative functions are there so standard deviation of those functions need to be calculated. With this deviation value adaptive thresholding is applied to the image of the number plate. This boosts the accuracy of detection for unclean plate images. Main benefit of this proposed scheme is it's adaptive phase for both clean and unclean number plates. Following features are need to be calculated.

**WALL DISTANCE:** With the help of active pixels which has more intensity values in the image this is calculated. Active pixel depends upon the format of the image. For example an 8 bit gray image has 255 active pixels in it. In order to calculate the wall distance the total area of the image is spitted into 12 parts that as four rows and 3 columns in both vertical and horizontal aspect. The closest and farthest difference between the active pixels in horizontal and vertical region is calculated. DTW is a 48-dimensional vector.

**CROSS TIME**: This calculation comprises the six broadest white to black and black to white transition in slanting a alphabet in flat and perpendicularly. For each row and column of an alphabet, the six widest transitions are calculated. These calculations are arranged and the initial three rows and columns with all transitions are saved with their ranges. Categorisation is improved because of saving the ranges for dirty alphabets and for random transitions. Cross time is a 24-dimensional vector.

**ACTIVE REGION RATIO (ARR):** Total number of active pixels is segmented into four and three pixels in each division.

**HEIGHT TO WIDTH RATIO (HWR):** It is a single dimensional scalar representative which has same height and width, high height and width and height with more width. These four features are able to recognise vehicles plates with character size of at least 7 × 3 pixels.

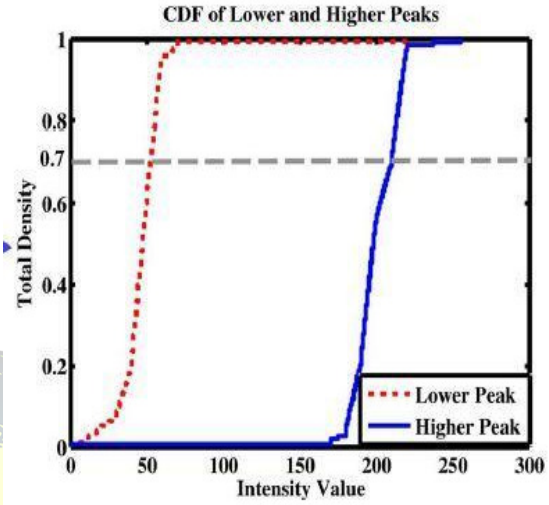


Fig.5 CDF of number plate

## IV.RESULTS AND DISCUSSION

This proposed method is simulated in MATLAB 2014.This proposed system detects the number plate data 96% accurately for various climate circumstances. Here totally 300 number plate images are taken for consideration that is number plate images taken from low illumination condition and high illumination condition and also various climate circumstances. Images in the data sets are in different sizes they vary from 16 × 80 to 25 × 150. The average time for processing various count of number plate is shown in the table.1. The main attribute of the automatic number plate recognition system is it should evaluate the number plate data under different climate circumstances. This proposed system accurately identifies the number plate data for these circumstances without any human intervention. This proposed method initially gives high accuracy on detecting the number plate region and it provides better results in segmenting only the number plate area from the whole image taken from the scene which may contain other objects in the background. The overall processing time is also less compared to the previous methods. Though it has advantage still there are some drawbacks. This method cannot identify the data in which the image has small noises.

**Table.1 Evaluation table Average processing time (ms)**

ISSN2394-3777 (Print)
ISSN2394-3785 (Online)
Available online atwww.ijartet.com

International Journal of Advanced Research Trends in Engineering and Technology (IJARTET)
Vol. 5, Special Issue 9, March 2018

| Method / No. Of Plates | Plate detection | Plate recognition | Total accurate detection time (ms) |
|---|---|---|---|
| Zero | 52 | 145 | 65 |
| one | 60 | 90 | 125 |
| Two | 40 | 20 | 35 |
| Three | 67 | 43 | 52 |
| Four | 42 | 38 | 43 |

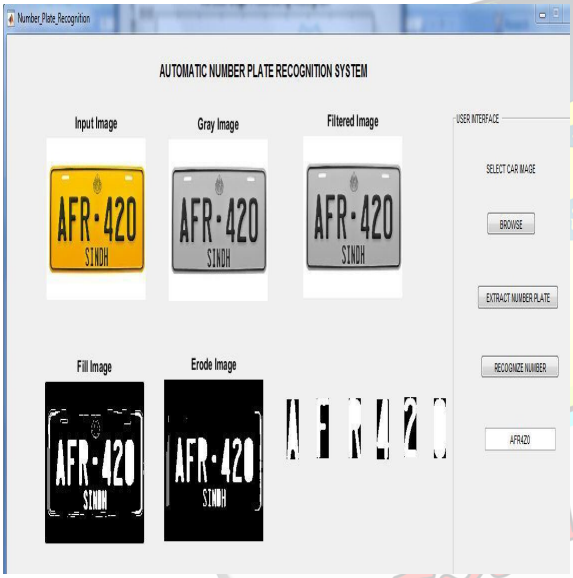


Fig.6 Automatic number plate recognition system

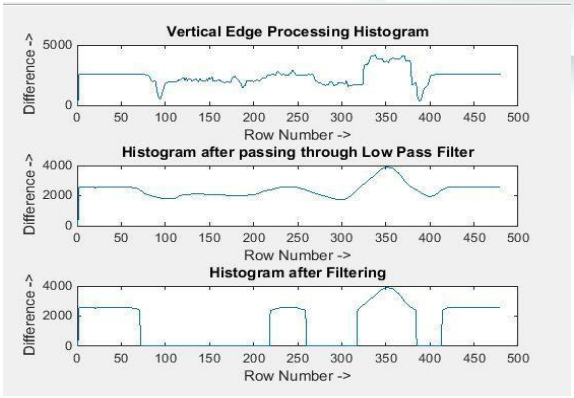


Fig.7 Histogram of alphabets in vertical

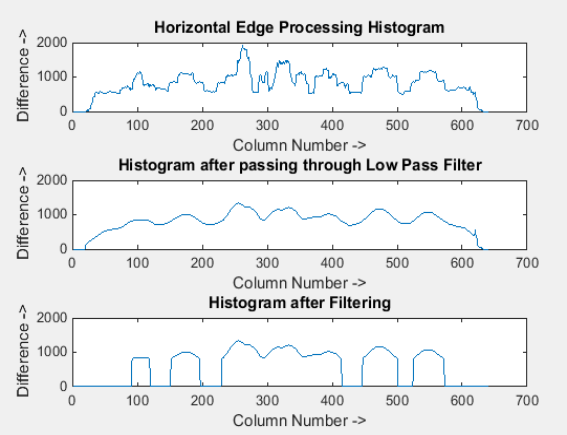


Fig.8 Histogram of alphabets in horizontal

## V. CONCLUSION

This proposed method uses adaptive threshold method which works better than other thresholding methods. A modified RANSAC method which detects the outlier points in the segmented image accurately is used in this proposed technology. These proposed techniques along with the tested images and those evaluated results gives a perfect solution for the problems in designing an automatic number plate recognition system which can be effectively applied in various intelligent transport systems. The proposed system is useful in implementing automatic recognition of a vehicle at day, night times and also at different climate conditions. It is robust and also provides reliable performance.

## REFERENCES

[1] Mutua simon mandi, Bernard shibwabo, Kaibiru mutual Raphael, "An automatic number plate recognition system for car park management" in International journal of computer Applications, Volume 175- No7,2017

[2] H. Cho, J. Wang, and S. Lee, "Text image deblurring using text-specific properties," in Proceedings of European Conference on Computer Vision (ECCV), Oct 2012, pp. 524–537.

[3] Ying Wen, Yue Lu, Jingqi Yan, Zhenyu Zhou,Karen M. von Deneen, and Pengfei Shi, "An Algorithm for License Plate Recognition Applied to Intelligent Transportation System" in IEEE Transactions on intelligent transportation systems, vol.12,no.3, September 2011,pp 830-845

[4] Chao Gou, KunfengWang, Yanjie Yao, and Zhengxi Li," Vehicle License Plate Recognition Based on Extremal Regions and Restricted Boltzmann Machines" in IEEE transactions on intelligent transportation systems, vol. 17, no. 4, APRIL 2016,pp 1096- 1106

ISSN2394-3777 (Print)
ISSN2394-3785 (Online)
Available online atwww.ijartet.com

International Journal of Advanced Research Trends in Engineering and Technology (IJARTET)
Vol. 5, Special Issue 9, March 2018

[5] Samiul Azam ,Md Monirul Islam, "Automatic license plate detection in hazardous condition" in Elsevier Inc,2015, pp 172-186

[6] Yule Yuan,Wenbin Zou, Yong Zhao, Xinan Wang, Xuefeng Hu, and Nikos Komodakis. "A Robust and Efficient Approach to License PlateDetection" in IEEE transactions on image processing, 2016

[7] Qingbo Lu, Wengang Zhou, Lu Fang, and Houqiang Li. "Robust Blur Kernel Estimation for License Plate Images from Fast Moving Vehicles" In IEEE transactions on image processing,2016

[8] Hitesh Rajput, Tanmoy Som and Soumitra Kar, "An Automated Vehicle License Plate Recognition System" in The IEEE computer society,2015,pp56-61

[9] Jingyu Dun and Sanyuan Zhang, Xiuzi Ye, Yin Zhang**, "**Chinese License Plate Localization in Multi-Lane with Complex Background Based on Concomitant Colors"in IEEE Intelligent transportation systems magazine, 2015, pp 52-61

[10] Amir Hossein Ashtari, Md. Jan Nordin, and Mahmood Fathy," An Iranian License Plate Recognition System Based on Color Features" in IEEE transactions on intelligent transportation systems, Vol. 15, no. 4, august 2014,pp 1690-1705

[11] Rahim Panahi and Iman Gholampour, "Accurate etection and Recognition of Dirty Vehicle Plate Numbers for High-Speed Applications" in IEEE transactions on intelligent transportation systems, vol. 18, no. 4, APRIL 2017.

[12] W. Zhou, H. Li,R. Hong,Y. Lu, and Q. Tian, "Bsift: toward data independent codebook for large scale image search," IEEE Transactions on Image Processing (TIP), vol. 24, no. 3, pp. 967–979, 2015.

[13] W. Zhou, M. Yang, H. Li, X. Wang, Y. Lin, and Q. Tian, "Towards codebook-free: Scalable cascaded hashing for mobile image search," IEEE Transactions on Multimedia (TMM), vol. 16, no. 3, pp. 601–611, 2014.

[14] Chirag Patel, Dipti Shah, Atul Patel. "Automatic Number Plate Recognition System (ANPR): A Survey", International Journal of Computer Applications,Volume 69– No.9, May 2013

[15] Bhavin A Patel, Ashish Singhadia. "Review on Automatic Number Plate Recognition System Using Improved Segmentation Method" International Journal of Emerging Technology and Advanced Engineering Volume 4, Issue 9, September 2014

[16] Dolley Shukla, Ekta Patel. "Speed Determination of Moving Vehicles using Lucas-Kanade Algorithm" in International Journal of Computer Applications Technology and Research,Volume 2– Issue 1, 32-36, 2013, ISSN: 2319–8656

[17] H.Erdinc Kocer, K.Kursat Cevik. "Artificial neural networks based vehicle license plate recognition" Elsevier, WCIT-2010, pp 1034-1037

[18] Riazul Islam, Kazi Fatima Sharif and Satyen Biswas "Automatic Vehicle Number Plate Recognition Using Structured Elements" in IEEE Conference on Systems, Process and Control (ICSPC 2015), 18 - 20 December 2015

[19] Sean Lawlor, Timothy Sider, Naveen Eluru, Marianne Hatzopoulou, and Michael G. Rabbat, "Detecting Convoys Using License Plate Recognition Data" ieee transactions on signal and information processing over networks, vol. 2, no. 3, september 2016

[20] P.Sowmya, N.krishna chaitanya, "Automatic number plate recognition system using an improved segmentation" in International journal of innovative technologies, Vol 03,issue 03, jul 2015, pp 0319-0322