iJRASET
International Journal For Research in Applied Science and Engineering Technology

INTERNATIONAL JOURNAL FOR RESEARCH

IN APPLIED SCIENCE & ENGINEERING TECHNOLOGY

Volume: 4 **Issue:** V **Month of publication:** May 2016

DOI:

www.ijraset.com

Call: 08813907089 | E-mail ID: ijraset@gmail.com

International Journal for Research in Applied Science & Engineering Technology (IJRASET)

Pattern Matching and Analysis of Vehicle Number Plate's Recognition System Using Template Matching

Prof.H.E.Khodke[1], Prof.B.K.Patil[2], Prof.Y.R.Nagargoje[3]
[1,3]Sanjivani K.B.P.Polytechnic, Kopargaon, Everest College of Engineering &Technology, Aurangabad

Abstract*— A pattern is any arrangement of objects or entities. The term "arrangement" is used here to indicate that a pattern is by definition non-random and at least potentially describable. All theories imply some pattern, but theories and patterns are not the same thing. Patten matching and analysis of automated number plate's recognition system using template matching play an important role for security control of a highly restricted area like military zones or area around top government offices e.g. Parliament, Supreme Court etc. pattern matching and analysis of number plate recognition system have many applications like payment of parking fees; toll fee on the highway; traffic monitoring system; border security system; signal system etc. This system successfully detects & recognizes the vehicle number plate on real images and the problem of recognizing ambiguous character is solved.

***Keywords*— Introduction, Literature survey, Pre-processing, Feature Extraction, Template matching, Result**

I. INTRODUCTION

Number plates are used for identification of vehicles all over the nations. Vehicles are identifying either manually or automatically. Automatic vehicle identification is an image processing technique of identify vehicles by their number plates. Automatic vehicle identification systems are used for the purpose of effective traffic control and security applications such as access control to restricted areas and tracking of wanted vehicles. Number plate recognition (NPR) is easier method for Vehicle identification. NPR system for Indian license plate is difficult compared to the foreign license plate as there is no standard followed for the aspect ratio of licence plate.

The identification task is challenging because of the nature of the light. Experimentation of number plate detection has been conducted from many years, it is still a challenging task .Number plate detection system investigates an input image to identify some local patches containing license plates. Since a plate can exist anywhere in an image with various sizes, it is infeasible to check every pixel of the image to locate it. In parking, number plates are used to calculate duration of the parking. When a vehicle enters an input gate, number plate is automatically recognized.

Massive integration of information technologies into all aspects of modern life caused demand for processing vehicles as conceptual resources in information systems. Because a standalone information system without any data has no sense, there was also a need to transform information about vehicles between the reality and information systems. This can be achieved by a human agent, or by special intelligent equipment which is be able to recognize vehicles by their number plates in a real environment and reflect it into conceptual resources. Because of this, various recognition techniques have been developed and number plate recognition systems are today used in various traffic and security applications, such as parking, access and border control, or tracking of stolen cars. In entrance gate, number plates are used to identify the vehicles. When a vehicle enters an input gate, number plate is automatically recognized and stored in database and black-listed number is not given permission. When a vehicle later exits the place through the gate, number plate is recognized again and paired with the first-one stored in

The database and it is taken a count. Automatic number plate recognition systems can be used in access control. For example, this technology is used in many companies to grant access only to vehicles of authorized personnel.

ALPR is also known as automatic vehicle identification, car plate recognition, automatic number plate recognition, and optical character recognition (OCR) for cars. The variations of the plate types or environments cause challenges in the detection and recognition of license plates. They are summarized as follows.

1) Plate variations: a) location: plates exist in different locations of an image) quantity: an image may contain no or many plates;c) size: plates may have different sizes due to the camera distance and the zoom factor;d) color: plates may have various characters and background colors due to different plate types or capturing devices; e) font: plates of different nations may be written in different

fonts and language;f) standard versus vanity.Vanity (or customized) license plates may have any number of characters without any regulations, h) inclination: plates may be tilted; i) other: in addition to characters, a plate may contain frames and screws.

2) Environment variations: a) illumination: input images may have different types of illumination, mainly due to environmental lighting and vehicle headlights;b) background: the image background may contain patterns similar to plates, such as numbers stamped on a vehicle, bumper with vertical patterns, and textured floors[1].

II. LITERATURE SURVEY

Chengpu Yu et al. [2] adopted the feature of characters' stroke width and color match of license plate to locate and segment the license plate. In the paper, author used color match feature and stroke width constraint to identify the character edges in the license plate. As the English and digital letter has only one connected region, they use the number of holes to represent the interior structure and peripheral profiles of the character to represent the exterior feature.

Jitendra Sharma et al. [3] proposed a license plate recognition technique that uses Wavelet Transform for the improvement of the recognition rate and time for character recognition. It is proposed a technique of Neural network for vehicle license plate recognition. It has analyzed the performance of the system using Radical Basis Function Network. The proposed methodology provides the better performance in comparison of correlation based method.

M. T. Qadri and M. Asif [4] implemented the Automatic Number Plate Recognition (ANPR) system on the entrance of highly restricted area. In this paper, the ANPR system is implemented in MATLAB, and its performance is tasted on real image.

K. Kaur and V. K. Banga [5] presented an algorithm for vehicle number identification using Optical Character Recognition (OCR) technique. In this paper, the first step is capturing the image approximately 1 meter from the number plate with camera. The purpose is to get a clear image without distortion. The second step is cropping the number plate from captured image. The cropped image is the input for the character recognition. The third step is character recognition. Then OCR technique is used to recognize an optically processed printed character number plate which is based on template matching. The template matching affects the accuracy of the number plate.

Zhao et al. [6] presented an algorithm based on morphology and Least Square Support Vector Machine (LS-SVM) in LPR system. It applies the improved Robert edge operator to detect the edge, dilates and erodes the edge image to Vol-1 Issue-2 2015 IJARIIE-ISSN(O)-2395-4396 1144 www.ijariie.com 67 locate the license plate. For segmentation, horizontal and vertical projection is used. Finally, construction of several classifiers applying LS-SVM to carry out the character recognition process is performed.

Kapil Bhosale et al. [7] developed a number plate recognition system for toll collection. This paper mainly focuses on Indian number plate. In this paper high resolution digital camera is used to acquire an image, preprocessing isused to improve contrast of an image and reduce the noise in the image. For binarization of an image, a binary method called Ostu's metod is used. Adaptive thresholding filter has been used to process segmentation.

T. D. Duan et al. [8] presented the boundary line-based that optimizes speed and accuracy by combining the Hough transform and Contour algorithm. The Contour algorithm is used to detect closed boundaries of objects. These contour lines are transformed to Hough coordinate to find two interacted parallel lines that are considered as a platecandidate. Since there are quite few pixels in the contour lines, the transformation of these points to Hough coordinate required much less computation. Therefore, the speed of the algorithm is improved without loss of accuracy.

V. Koval et al. [9] describes the Smart Vehicle Screening System for automated recognition of vehicle license plate information using a photograph of a vehicle. There are considered an approach to identify vehicle through recognizing of its license plate using image fusion, neural networks and threshold techniques. The neural network was used to successful recognition of license plate.

N. Vishwanath et al. [10] proposed a hybrid character segmentation algorithm that involves license plate normalization and object enhancement technique as an image preprocessing step, followed by Hough transformation based horizontal and vertical segmentation steps for Indian license plate character segmentation.

A new algorithm has been used to determine the edges of the image by A. M. Al-Ghaili, S. Mashohor, A. R. Ramli, and A. Ismail in "Vertical-Edge-Based Car-License-Plate Detection Method," [11]. To locate the number plate, at first noise is removed using the operation of erosion and dilation.

K. Deb, M. K. Hossen, M. I. Khan, and M. R. Alam proposed a method to recognize the location of the plate based on color intensity histogram [12].

P. Saiyadi proposed a novel approach using the combination of morphology, edge detection and the analysis of the histogram [13].

Halina Kwasnicka and Bartosz Wawrzyniakuse Hough Transform to identify the license plate by studying the variation between

dark and bright pixels in a line [14].

J. R. Parker and Pavol Federl proposed an alogorithm where threshold was applied on the objects extracted from the image at first according to the width, height, area, and width to height ratio [15].

The two dimensions of the bounding boxes of the objects are used to detect whether an object is a character belonging to a license plate or not.

In [9], Z.C. Zhang and Y.Y. Tangfirst takes the input image into a grayscale, then erosion and dilation morphological operations. The plate is extracted with use of vertical and horizontal projection among various candidates.

In the work of P. Kananiet al. [10], a 2-Level 2-D Haar wavelet decomposition of the image is used in validating the license plate co-ordinates in the image of car.Use of Hough transform is a very effective method of getting the directional analysis of the skew, however it involves large computational cost [11].

In [12] and [13] the two dimensions of the bounding boxes of the objects are used to detect whether an object is a character belonging to a license plate or not.

W. Jia et al. presents a region-based LP detection method in [14], which first applies a mean shift procedure in a spatialrange domain to segment a color vehicle image in order to get LP regions.

Fuzzy logic has been applied in detecting license plates in [15]. Sourav Roy et al. [16] present an approach based on simple and efficient morphological operation and Sobel edge detection method to locate the number plate.

III. PRE-PROCESSING

The general proposed pre-processing for vehicle number plate recognition system is as shown fig.1

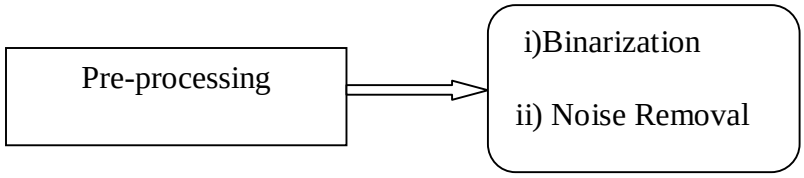


Fig.1 Pre-Processing

A. Binarization

The input image is initially processed to improve its quality and prepare it to next stages of the system. First, the system will convert RGB images to gray-level images.

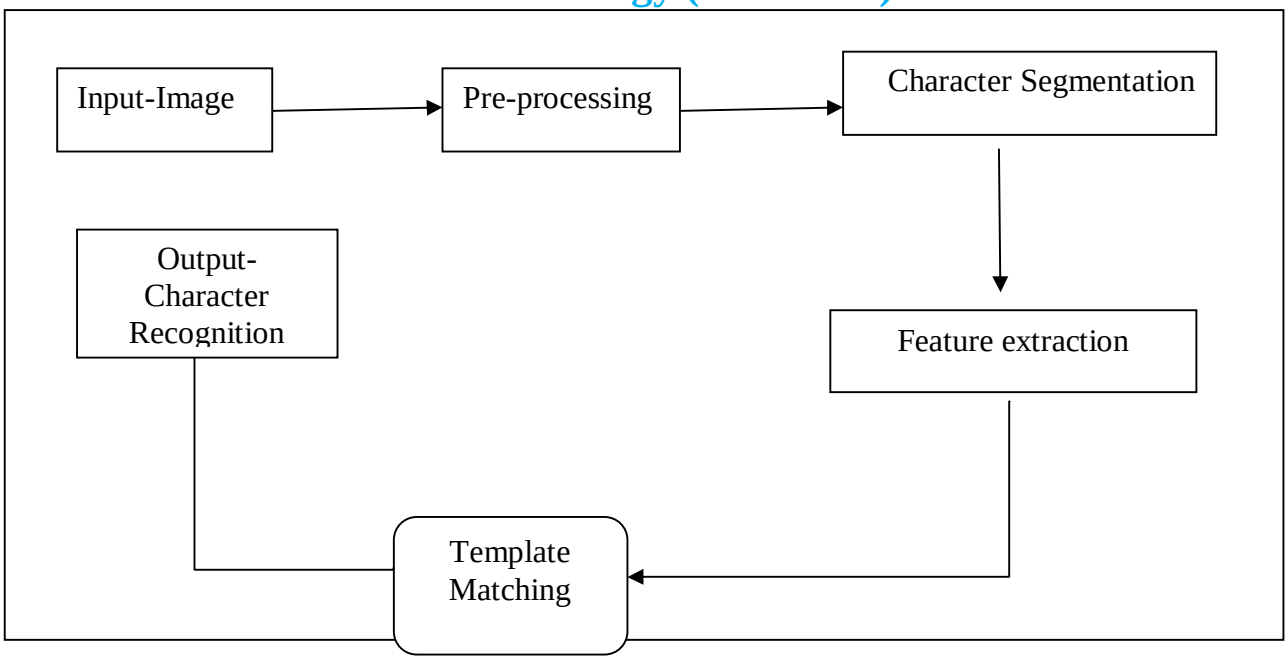
B. Noise Removal

In this noise removal stage we are going to remove the noise of the image i.e., while preserving the sharpness of the image. After the successful Localization of the Number Plate, we go on with Optical Character Recognition which involves the Segmentation, Feature extraction and Number plate Recognition.

IV. IMPLEMENTATION

The General proposed system for the pattern matching and analysis of Vehicle number plate recognition system as shown fig.2

Volume 4 Issue V, May 2016
ISSN: 2321-9653
International Journal for Research in Applied Science & Engineering Technology (IJRASET)



A. Input Image (Image Acquisition)

Image acquisition is the process of obtaining an image from the camera. This is the first step of any vision based systems. In our current research we acquire the images using a digital camera placed by the road side facing towards the incoming vehicles .Here our aim is to get the frontal image of vehicles which contains license plate. The remaining stages of the system works in offline mode. Grayscale image: After acquiring the image, the very next step is to derive the gray scale image. Pseudo code to convert an image to a grayscale:

STEP1: Load the image

STEP2: Retrieve the properties of image like width, height and nchannels

STEP3: Get the pointer to access image data

STEP4: For each height and for each width of the image, convert image to grayscale by

Calculating average of r,g,b channels of the image convert to grayscale manually

STEP5: Display the image after converting to grayscale.

B. Feature Extraction

is the key step in ANPR system, which influences the accuracy of the system significantly.

The goal of this phase, given an input image, is to produce a number of candidate regions, with high probability of containing number plate and validate for true number plate.

2.1 Image Acquisition and Pre-processing In this system a high resolution digital camera is used to acquire an image. Images are taken in different background, illumination conditions, and at various distances from the camera to vehicle. Images are resized to (648X 486). All the processing steps are executed on gray scale image. Pre-processing is mainly used to enhance

The processing speed, improve the contrast of the image, and to reduce the noise in the image. In order to reduce the problem of low quality and low contrast in car images, images are enhanced by using histogram equalization on gray scale image.

2.2 Vertical Edge detection the characters on number plate region contain abundant edges as compared to background area. This feature is employed for locating the candidate plate area from the input image. Sobel vertical edge detection is used to find

out the regions which have high pixel variance value [10]. To extract candidate number plate area from the entire image, threshold is used to select rows which are having particular white pixel density.

2.3 Candidate Plate Area Detection Morphological operations aim to remove unrelated objects in the image. Dilation and erosion are used to extract candidate plate areas from the entire image. Sometimes background areas may also get declared as candidate plate. Hence to remove the fake candidates, plate validation is done using the aspect ratio of the plate and horizontal cuts [11] in the number plate.

Volume 4 Issue V, May 2016
ISSN: 2321-9653
International Journal for Research in Applied Science & Engineering Technology (IJRASET)

2.4 True Number Plate Extraction After the detection of candidate number plate area, Bounding Box analysis is used to extract plate area from the original image. From the Bounding Box analysis, respective row and column indices of plate area are found out. Once the indices of number plate are known, the number plate is extracted from original gray scale image.

The goal of feature vector is to define distinguishing features of the characters. Selecting the most relevant feature of each character can not only facilitate data visualization and data understanding, but also reduce the measurement, storage requirements, training and utilization time, particularly when the features are redundant.

Initially, the centroid of the character image is determined. With respect to centroid, number of transitions along the axes, 0 to 1 and 1 to 0, up to the boundary of character are counted. Transitions are specified for axes with predetermined angles.

C. Character Segmentation

Segmentation is one of the most important processes in the automatic number plate recognition, because all further steps rely on it. If the segmentation fails, a character can be improperly divided into two pieces, or two characters can be improperly merged together. We can use a horizontal projection of a number plate for the segmentation, or one of the more sophisticated methods, such as segmentation using the neural networks. In this segmentation we use two types of segmentation: 1. Horizontal segmentation 2. Vertical segmentation. First we have performed vertical segmentation on the number plate then the characters are vertically segmented. After performing vertical segmentation we have to perform horizontal segmentation by doing this we get character from the plate.

D. Template Matching Algorithm

Template matching block is used for matching the template image within input image. The template image and the input image are of same orientation and resolution. Size of template image should be smaller than the input image. Template matching block belongs to Computer Vision System Toolbox, from analysis and enhancement library. Port one is used to input the input image and port two is used to input the template image. Output port gives the output as best match location as well as template metric value. Block looks like as shown in fig3.

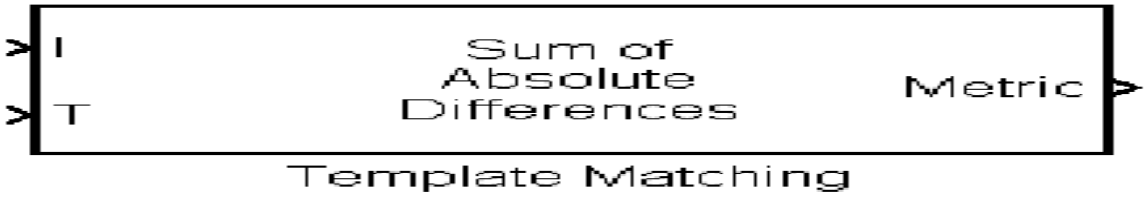


Fig.3 Template matching

Output:

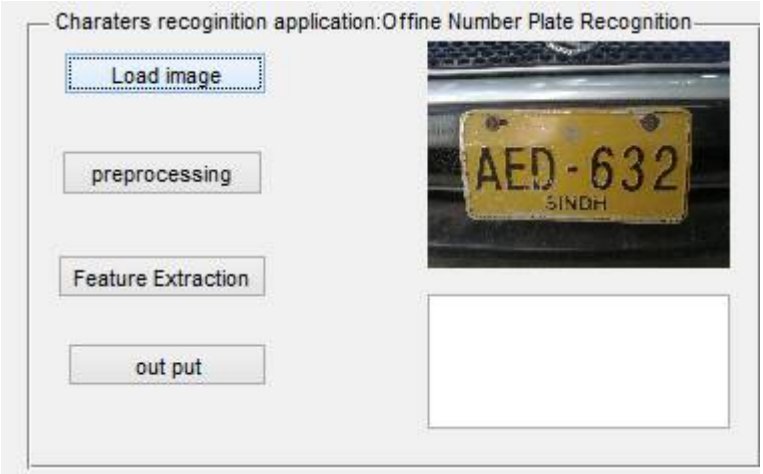


Fig.4 Load image

Volume 4 Issue V, May 2016
ISSN: 2321-9653
International Journal for Research in Applied Science & Engineering Technology (IJRASET)

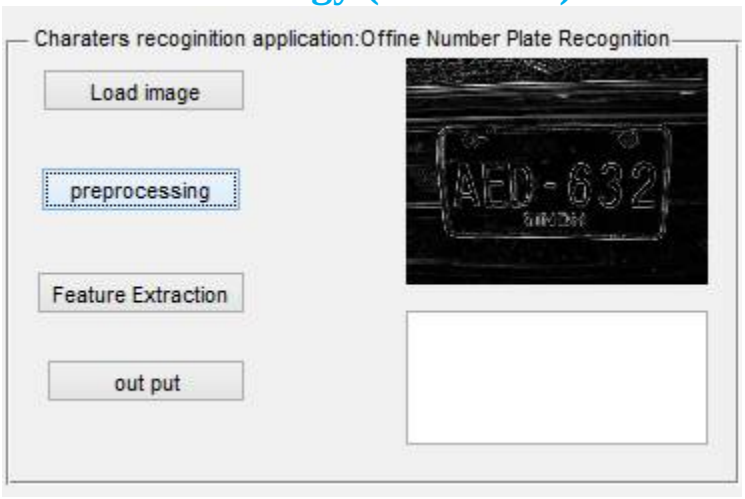


Fig.5 Pre-processing on load image of output

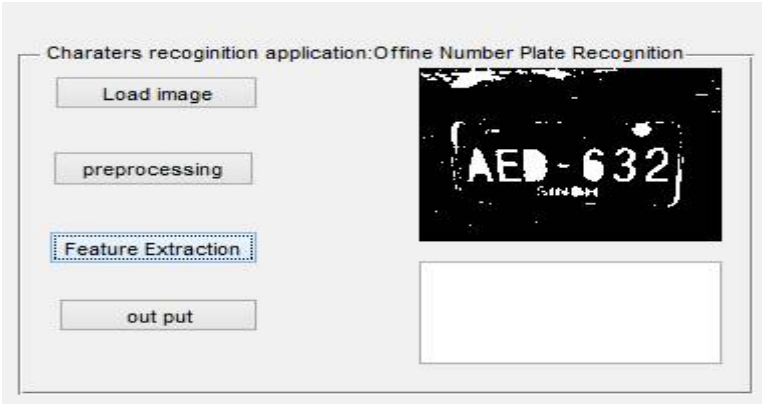


Fig.6 Feature extraction of number plate

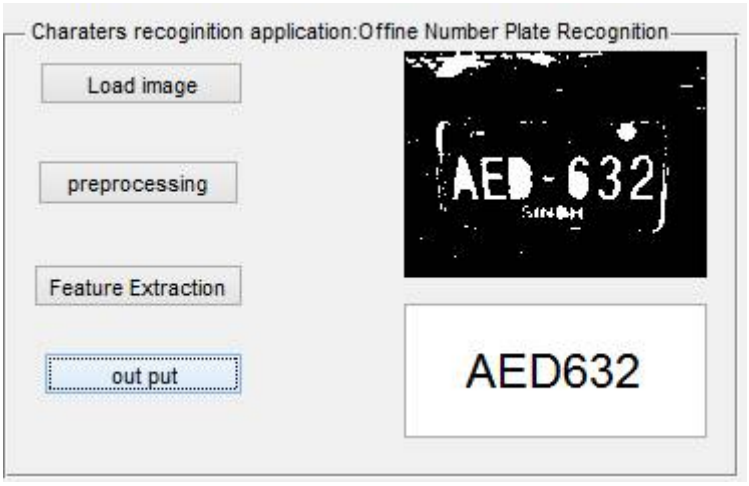


Fig.7 recognition of vehicle number plate.

As shown above figures pattern matching and analysis of vehicle plates recognition performed on various images and successfully recognition this system performed.

V. CONCLUSIONS

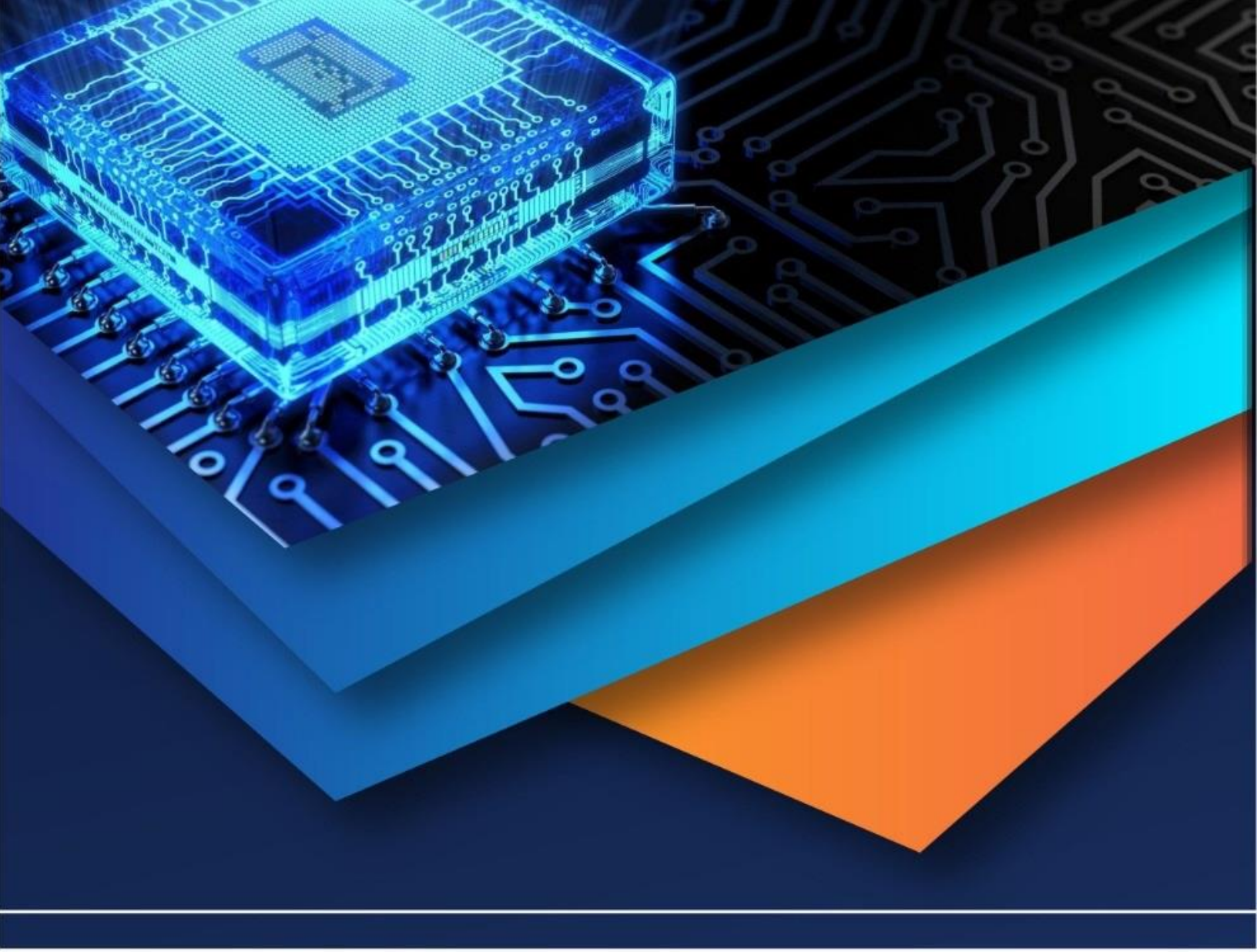
I have implemented number plate recognition. Our algorithm successfully detects the number plate region from the image which consists of vehicle number & then character segmentation, recognition .I have applied our algorithm on many images and found that

it successfully recognition. An algorithm for pattern matching and analysis of vehicle number plate recognition system a) input image b) preprocessing c) feature extraction d) segmentation e) output is presented. The recognition rate achieved using template matching 80%.The false recognition due to size, character shape, distance, camera angle etc.

IMAGE SIZE	ACCURACY	PERCENTAGE
648X 486	160/200	80%

REFERENCES

[1] Shan Du, Member, IEEE, Mahmoud Ibrahim, Mohamed Shehata, Senior Member, IEEE,and Wael Badawy, Senior Member, IEEE "Automatic License Plate Recognition (ALPR):A State-of-the-Art Review"IEEE TRANSACTIONS ON CIRCUITS AND SYSTEMS FOR VIDEO TECHNOLOGY, VOL. 23, NO. 2, FEBRUARY 2013.
[2] Chengpu Yu, Mei Xie, Jin Qi, “A Novel System Design of License Plate Recognition”, International Symposium on Computational Intelligence and Design , 2008.
[3] J. Sharma, A Mishra, K. Saxena and S. Kumar , “A Hybrid Technique for License Plate Recognition Based on Feature Selection of Wavelet Transform and Artificial Neural Network”, International Conference on Reliability, Optimization and Information Technology, 2014.
[4] Muhammad Tahir Qadri, Muhammad Asif, “Automatic Number Plate Recognition System for Vehicle Identification Using Optical Character Recognition”, International Conference on Education Technology and Computer, 2009.
[5] Er. Kavneet Kaur, Vijay Kumar Banga, “Number Plate Recognition Using OCR Technique”, International Journal of Research in Engineering and Technology, vol 2, Issue. 09, sep-2013.
[6] H.Zhao; C. Song; H. Zhao; S. Zhang, “License Plate Recognition System based on Morphology and LS-SVM”,IEEE International Conference, pp. 826-829, August 2008.
[7] Kapil Bhosale, Jigdish Jadav, Sumit Kalyankar, R. R. Bhambare, “Number Plate Recognition System for Toll Collection”, International Journal of Emerging Technology and Advanced Engineering , vol. 4, Issue. 4, April 2014.
[8] T. D. Duan, D. A. Duc, T. L. Du; “Combining Hough Transform and Contour Algorithm for Detecting Vehicles’ License-Plates”, International Symposium on Intelligent, Multimedia, Video and Speech Processing, October 2004.
[9] V. Koval, V. Turchenko, V. Kochan, A. Sachenko and G. Markowsky, “Smart License Plate Recognition System Based on Image Processing Using Neural Network”, IEEE International Workshop on Intelligent Data Acquisition and Advanced Computing System, September 2003.
[10] P. Ramasubramanian, R. Jerlin Emiliya, R. Janaki, B. Gifston Daniel and C. Anand, “Number Plate Recognition and Character Segmentation using Eight-Neighbors and Hybrid Binarization Techniques”,International Conference on Communication and Signal processing, April 2014.
[11] A new algorithm has been used to determine the edges of the image by A. M. Al-Ghaili, S. Mashohor, A. R. Ramli, and A.Ismail in “Vertical-Edge-Based Car-License-Plate Detection Method”.
[12] To locate the number plate, at first noise is removed using the operation of erosion and dilation. K. Deb, M. K. Hossen, M. I.Khan, and M. R. Alam proposed a method to recognize the location of the plate based on color intensity histogram.
[13] P. Saiyadi proposed a novel approach using the combination of morphology, edge detection and the analysis of the histogram.
[14] Halina Kwasnicka and Bartosz Wawrzyniakuse Hough Transform to identify the license plate by studying the variation between dark and bright pixels in a line.
[15] J. R. Parker and Pavol Federl proposed an alogorithm where threshold was applied on the objects extracted from the image at first according to the width, height, area, and width to height ratio.



10.22214/IJRASET

45.98

IMPACT FACTOR: 7.129

IMPACT FACTOR: 7.429

INTERNATIONAL JOURNAL FOR RESEARCH

IN APPLIED SCIENCE & ENGINEERING TECHNOLOGY