IMPROVED TECHNIQUE FOR CAR NUMBER PLATE RECOGNITION

[1]C.Kanitha, [2]Dr. Grasha Jacob, M.C.A.,M.Phil., Ph.D.,
[1]M.Phil. Scholar, [2]Associate Professor,
Department of Computer Science,
Rani Anna Government College for Women,
Affiliated to Manonmaniam Sundaranar University, Tirunelveli - 627012

Abstract: Car number plate recognition has been studied generally and the development in image capture technology helps to enhance novel methods to gain this objective. This technique is presented for actual time recognition and segmentation of car number plates based on image processing techniques. As different countries and states have different types of vehicles, algorithms need to identity and define what part of the vehicle is in fact the number plate. This variation requires algorithms to be general for such wide criteria. An improved technique is proposed for the recognition of car number plates based on K-means clustering.

Keywords: Segmentation, Optical Character Recognition (OCR), Number Plate Recognition.

Introduction

The car number plates are placed on the front and back of the car. A car number plate is attached to the car for identification purposes. The Number plate number is numeric or an alphanumeric code that uniquely identifies the vehicle within the issuing region's database. Number plate recognition is a mass surveillance method that uses Optical Character Recognition on images to read the Number plate on the car. The number plate recognition system consists of three major parts. They are Number plate location, Number plate segmentation and character recognition. The first step locates Number plate regions and extracts an image containing a plate. The next segmentation step separates the symbols or characters from every Number plate, and template matching approach is used in the recognition of numbers and characters. The recognition step finally uses templates matching for identify the characters. Recognition step refers to image analysis and pattern recognition. As the images captured at different time instances may offer different perspectives because they were captured at different angles in the field of view creates some trouble. To conquer this trouble single image of number plate is used with a new machine learning approach using K-Means clustering. In this paper, we first present an overview of the different approaches in image segmentation is represented and then K-means algorithm is proposed. It is applied in a real time Number Plate Recognition system. It can recognize the character areas in a car Number plate image and remove non character areas of Number plates correctly and efficiently.

I. LITERATURE REVIEW

Car Number plate identification has been used extensively in highway, port, airport gate monitoring, and so on. Experimentation of number plate detection has been carried for many years and it is still a challenging task. The Vehicle Number Plate Recognition (NPR) technology proposed by Ragini Bhat and BijenderMehandia [1] investigates an input image to identify some local patches containing number 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 and stored in database. Images captured at different time instances may provide different perspectives because they were captured at different angles in the field of view and the results were not accurate. To overcome this problem a single image of Number plate using a new machine learning approach using K-Means clustering was proposed by SanazAliyan and Ali Broumandnia [2]. The Number plate recognition system works in four steps Plate Localization, Preprocessing,

Segmentation, and Normalization as proposed by NuzulhaKhilwani Ibrahim, EmalianaKasmuri, Norazira A Jalil, MohdAdiliNorasikin, Sazilah Salam and Mohamad RiduwanMdNawawi [3]. The system will generate the value 0-9 and A - Z, and finally convert the value to string and displays it in edit box, and also stores the character in a text file in this code as proposed by Soma Mukherjee and Prof.Anoop Singh Poonia [4]. C N Paunwala and S Patnaik [5] proposed a methodology which finds ROI using morphological processing and directional segmentation. The ROI is the area which includes the number plate from which alphanumeric characters are recognized.

II. NUMBER PLATE RECOGNITION

Number plate recognition basically consists of three concrete steps namely:

1. Number Plate Extraction

2. Character Segmentation

3. Template Matching

3.1 PREPROCESSING

Preprocessing is very important for the good performance of character segmentation. It consists of:

- Resizing image

- RGB to gray

- Noise removal

3.2 NUMBER PLATE LOCALIZATION

Localization is an algorithmic function. It is used for identifying Number plate. Localization is used for locating the Number plate. Fig 1 Represent the Block Diagram of Number Plate Recognition.
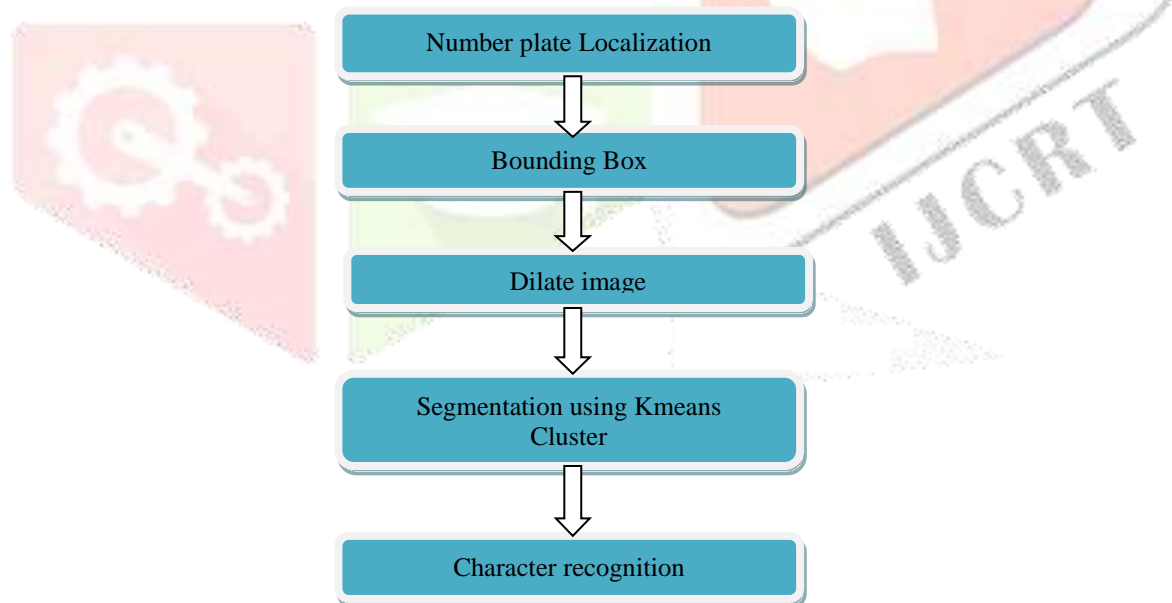
Fig 1: Block Diagram of Number Plate Recognition

The complexity of the algorithm lies in ascertain into what area of a vehicle constitutes a Number plate. For example, the algorithm must rule out a vehicle's mirror, grill, headlight, bumper, sticker, etc. Generally algorithms look for geometric shapes of rectangular proportion. Though vehicle can have many rectangular items preceding it, further algorithms are desired to validate that the identified object is definitely a Number plate. To complete this, key components of the algorithm look for characteristics that would indicate

whether that the object is a Number plate. The algorithm searches for a related background color of united proportion and contrast as a means to separate objects on a vehicle. The Pre-Processing Technique for Localization includes the following step.

- Conversion to gray scale
- Median Filtering
- Enhancing the Contrast

3.3 Convert a Captured Image into Gray Image

The algorithm described here is independent of the type of colors in image and relies mainly on the gray level of an image for processing and extracting the required information. The input image is a colored image signified by 3-dimensional array in MATLAB R2014a; it is adapted to a 2-dimensional gray image before further processing.

3.4 Edge Detection

An edge helps to characterize the boundaries while processing the image. Edges in images are the areas of strong Intensity contrast values present. Detecting edges help us to filter out the unwanted information.

3.5 Bounding Box

The minimum or the smallest bounding box can be set for N dimension with the smallest measure of area. The following Fig 2 represents the bounding boxes of the filtered image. Selecting the best Bounding Box consists of:
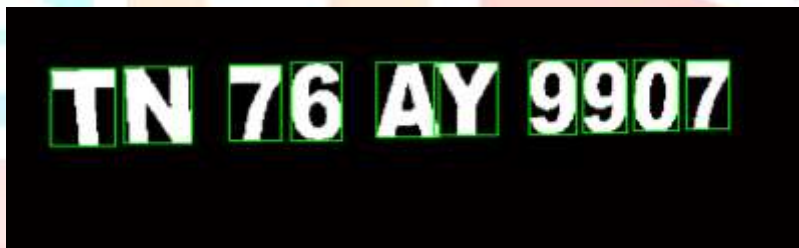
Fig 2: Bounding box of Number Plate

1. Contrast Present in the bounding box

As the Number plate consists of dark-colored numbers to the lighter background or vice versa. The box has the maximum changes in the contrast within the box is possible for the Number plate.

2. Aspect Ratio

The aspect ratio of an image is the ratio of the width of the image to its height. The inverse of the aspect ratio should be less than 1 for any Number plate. Hence all the regions which do not satisfy this property will be rejected.

3. The Width of the Plate

The width of the Number plate area also has a threshold limit; it cannot be other than some threshold value.

4. Total number of pixels

Another factor which affects the process is the total number of the pixel present in the image.

5. Cropping the Bounding box

After identifying the best possible bounding box the coordinates of the bounding box are noted and the box is cropped and sent to the character segmentation for the further process.

3.6 Dilate an Image:

Dilation is a process of inventing given image by satisfying holes in an image and sharping the edges of objects in an image, and joins the broken lines and increase the brightness of an image. Using dilation, the noise within an image can be removed. Using

constructing the edges sharper, the difference of gray value between bordering pixels at the edge of an object can be increased. This enhances the edge detection. In Number Plate Detection, the image of a car plate may not always contain the same brightness and shades. Therefore, the given image has to be altered from RGB to gray form. However, during this conversion, definite important parameters like a difference in color, lighter edges of an object, etc. may get lost. The process of dilation will help to nullify such losses.

III. SEGMENTATION

The following step is to find all the regions in an image that has high probability of having a Number plate. Co-ordinates of all such probable regions are stored in an array.

4.1 Region of Interest Extraction:

The output of segmentation process is all the regions that have maximum chance of containing a Number plate. Out of these regions, the one with the maximum histogram value is considered as the most probable candidate for number plate. All the regions are processed row-wiseand column-wise to find a common area having maximum vertical andhorizontal histogram value. This is the region having highest chance of containing a Number plate. The image detected Number plate is shown below: This algorithm was verified using several input images having resolution varying from 680 * 480 to 1600 * 1200. The images contained vehicles of different colors and varying intensity of light. With all such images, the algorithm correctly recognized the number plate. This algorithm was also tried on images having number plate aligned at certain angle (approximately 8-10 degree) to horizontal axis. Even with such images, the number plates were detected successfully.

4.2 Clustering Methods

The K-means algorithm is an iterative technique that is used to partition an image into K clusters. The basic algorithm is as follows:

Algorithm K means

1.   Choose K cluster centres, any at random or based on some heuristic method.

2.   Assign each pixel in the image to the cluster that minimizes the distance between the pixel and the cluster center.

3.   Re-compute the cluster centres by averaging all of the pixels in the cluster.

4.   Repeat steps 2 and 3 until convergence is attained (i.e. no pixels change clusters)

End K means.

In this case, distance is the squared or fixed difference between a pixel and a cluster center. The difference is typically based on pixel color, intensity, texture, and location, or a weighted combination of these factors. K can be selected manually, randomly, or by a heuristic. This algorithm is guaranteed to converge, but it may not return the optimal solution. The quality of the solution depends on the initial set of clusters and the value of K. Fig 3 represents the segmentation of Number plate.

Fig 3: Segmented Number plate

IV. CHARACTER RECOGNITION

It is employed for the purpose of conversion of images of text into characters. Number plate recognition is now used to compare the each individual character against the complete alphanumeric database using template matching. The matching process moves the template image to all possible locations in a larger source image and calculates a numerical index that shows how well the template matches the image in that position. Matching is done on a pixel by pixel source. Since the template size is fixed, it leads to correct recognition.

Matching

Matching is used for the recognition of characters. The numbers and alphabets are stored as matrices in the system. The recognition part uses the matrices for matching. Matching is done by scanning the rows and columns. The matched character is displayed in the text format.

VI. EXPERIMENTAL RESULTS

Digital image preprocessing is an initial step to image processing for improving the data image quality to be more suitable for visual perception or computational processing. Preprocessing removes unwanted data and enhances the image by removing background noise, normalizing the intensity of individual image particles, image deblur and remove image reflections. Preprocessing of car Number plate includes three common sub-processes, which are geometric operation, gray scaling process and binarization process. The output of the extracted number plate is used for labeling the components, and finding the length of the number plate, and searches in the database if both the values are same, the system will generate the value 0-9 and A - Z, and finally convert the value to string and displays it in edit box, and also stores the character in a text file. The character recognition is then used to compare each individual character with the character stored in the database. OCR uses the correlation method to match the characters. This method is tested on different database .The segmentation process has been implemented with k-means clustering to cluster similar particles for extracting the number plate region. As a vehicle can have many rectangular objects on it, it is necessary to validate that the identified object is indeed a number plate. To accomplish this, the algorithm searches for a similar background color of unified fraction and contrast as means to differentiate items on a vehicle. The proposed system looks for characters of equal color, equidistance, and similar font structures to break apart each individual character. Character Segmentation separates all letters and numbers where it is consequently processed by Optical Character Recognition (OCR) algorithms. Fig 4 represents the Captured Image and its Gray image. Fig 5 represents the Extracted Number Plate.

Fig 4: Captured Image and its Gray Image
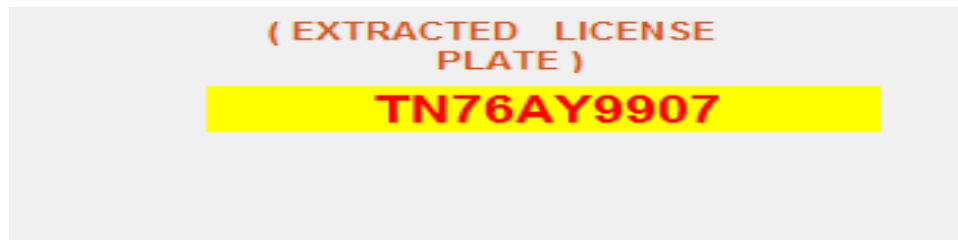
Fig 5: Extracted Number plate

VII. CONCLUSION

In India, as the Number plates are not yet standardized across different states, making localization and extraction are extremely difficult. The average time of recognition of each image is also different. The plate status, environmental conditions and the hardware used to catch the pictures are important factors for the proper functioning of the program.

REFERENCES

[1]   Ragini Bhat and BijenderMehandia , "Recognition Of Vehicle Number Plate Using Matlab", International Journal of Innovative Research in Electrical, Electronics, Instrumentation And Control Engineering, Vol. 2, Issue 8, August 2014.

[2]   SanazAliyan and Ali Broumandnia, "A New Machine Learning Approach to Deblurring Number Plate Using K-Means Clustering Method", International Journal of Advanced Research in Artificial Intelligence, Vol. 1, No. 2, 2012.

[3]   NuzulhaKhilwani Ibrahim, EmalianaKasmuri, Norazira A Jalil, MohdAdiliNorasikin, Sazilah Salam and Mohamad RiduwanMdNawawi," Number Plate Recognition (LPR): A Review with Experiments for Malaysia Case Study", The International Journal of Soft Computing and Software Engineering [JSCSE], Vol. 3, No. 3,March-2013.

 [4] Soma Mukherjee and Prof. Anoop Singh Poonia," MATLAB Based Vehicle Number Plate Recognition", International Journal for Research in Applied Science & Engineering Technology (IJRASET), Volume 3 Issue II, February 2015.

[5]   C N Paunwala and S Patnaik,"A novel multiple Number plate extraction technique for complex background in Indian traffic conditions," International Journal of Image processing, Vol-4, Issue-2, pp 106-118.

 [6]   Vaishali Gupta and Balraj Singh Sidhu," Number Plate Extraction Using K-means Clustering and Weighted Sum Method", International Journal of Scientific Research Engineering & Technology (IJSRET), ISSN 2278 – 0882, Volume 3, Issue 5, August 2014.

[7]   Dhanalakshmi.B, Yogasri.G and Mohanapriya.M, "Enhancing Accuracy Of Automatic Vehicle Number Plate Recognition System Using Template Matching Algorithm", International Research Journal of Engineering and Technology (IRJET), Volume: 05 Issue: 02 | Feb-2018.

[8]   IsackBulugu"Algorithm for Number Plate Localization and Recognition for Tanzania Car Plate Numbers", International Journal of Science and Research (IJSR), India Online ISSN: 2319-7064, Volume 2 Issue 5, May 2013.

 [9] Manisha Rathore and SarojKumari, "Tracking Number Plate From Vehicle Using Matlab", International Journal in Foundations of Computer Science & Technology (IJFCST), Vol.4, No.3, May 2014.