

AUTOMATIC NUMBER PLATE EXTRACTION

Pukar Acharya^[1], Yadav Nandakumar^[2], Gururaja H.S.^[3]

^{1,2} Students, Department of Information Science & Engineering, BMSCE, Bangalore

³ Assistant Professor, Department of Information Science & Engineering, BMSCE, Bangalore

ABSTRACT: *The Automatic Number Plate Extraction is an innovative system where characters are extracted from a number plate image. Many image processing steps are used in order to extract only text from number plate image. Since the image is more susceptible to noise and many other unwanted objects, noise is first removed from the image. Before image preprocessing steps, the RGB image is converted to a gray-scale image and the image is resized keeping aspect ratio same. Morphological processing is used to detect text more accurately. The image is converted to double. Edge detection method is used to detect edges and image intensity level is increased. Objects with gaps are filled. After edge detection, the image might contain many horizontal and vertical lines. These lines are removed from the image to extract only the text from the image. After applying these preprocessing steps, the image is left with few smaller unwanted objects. These unwanted objects are removed from the image, and the texts from number plate are extracted.*

KEYWORDS: *Vehicle Number plate, Natural Language Processing, Pattern Recognition*

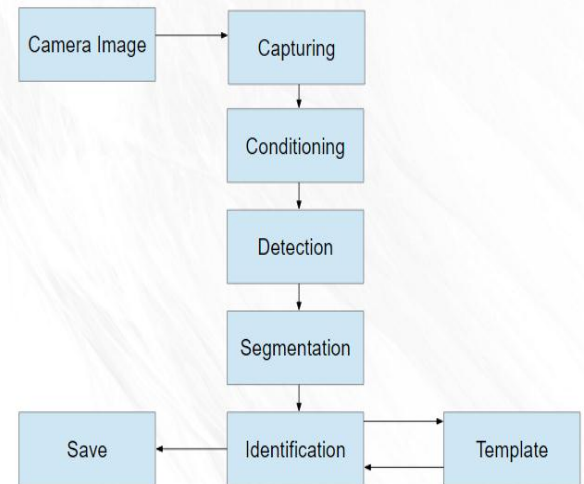


Fig 1: Basic working of the system

1. INTRODUCTION

Works related to image segmentation and useful survey resources can be found in plenty. From these surveys, the image segmentation techniques can be simply separated into three different classes:- (1) feature-space based method (2) image-domain based method and (3) edge-based method.

The feature space based method is composed of two steps, feature extraction and clustering. Feature extraction is the process of finding characteristics of each pixel or of the region around each pixel, for example, pixel value, pixel color component, windowed average pixel value, windowed variance, Law's filter feature, Tamura feature, etc. After we get some symbolic properties around each pixel, the clustering process is executed to separate the image into several "meaningful" parts based on these properties. There are also many kinds of clustering algorithms, for example, Gaussian mixture model, mean shift, and "normalized cut".

The third class is edge-based image segmentation method, which consists of edge detection and edge linking. Although many kinds of methods exist, common problems still cannot be solved. For class (1), the accurate boundaries between segments are difficult to determine because features take properties around but not exactly on each pixel. Class (2) only uses the pixel value information, which may result in over-segmentation on texture regions. Finally, the edge detection process makes class (3) always suffer from the over-segmentation problem.

In our project, we adopt a technique called "normalized cut framework" for image segmentation, which finds the best cutting path from the global view (the whole image view) rather than by local thresholds and is expected to have better segmentation results than other methods.

The step by step procedures can be listed as shown in Fig. 1 below:

1. Capturing

The image of a vehicle's entire license plate is simply captured from a web cam, a phone or a camera and then is uploaded on to our system to undergo the per-processing steps. Number plate recognition systems are used in various traffic and security applications, such as parking access and border control, tracking a list of stolen vehicles, etc.

2. Conditioning

On uploading of the image to our system, noise is first removed from the image using effective noise removal method since images are more susceptible to noise and many other unwanted objects.

3. Detection

Morphological processing is used which helps to detect text more accurately. The image is converted to double using library functions. Edge detection method is used to detect edges and image intensity level is increased. Objects with gaps are filled.

4. Segmentation

After edge detection, the image might contain many horizontal and vertical lines. These lines should be removed from the image which helps to extract just the text from the image. After applying these pre-processing steps, the image is left behind with few smaller unwanted objects. These unwanted objects are removed from the image, and the texts from number plate are extracted.

5. Identification and Saving

We create the template file from the stored template images. We re-size the image obtained from segmentation to the size of template. On comparing each character with the templates, the best matched character is stored. The character obtained from the number identification process is stored to text file in given format.

2. LITERATURE SURVEY

In this system, the image of an unidentified number-plate is captured from a web-cam and the captured image is stored into an image file for further processing. Adjustments to intensity are made before converting the image to binary which in turn gets converted into a gray scale image, as displayed in Fig 2 and Fig 3.



Fig 2: Number Plate while captured



Fig 3: Binarized Image

To find the plate region, firstly smearing algorithm is used. Smearing is a method for the extraction of text areas on a mixed image. The image is processed along vertical and horizontal runs (scan-lines) with the smearing algorithm. If the number of white pixels is less than a desired threshold or greater than any other desired threshold, white pixels are converted to black. In this system, threshold values are selected as 10 and 100 for both horizontal and vertical smearing, as explained in Fig 4 and Fig 5 respectively.

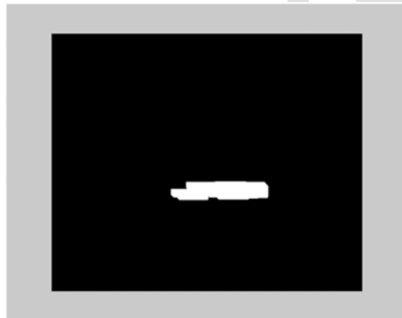


Fig 4: Plate Region

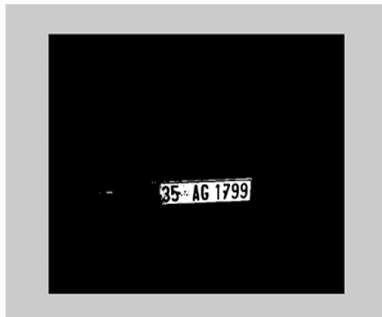


Fig 5: Image involving the number plate

The noise level present in the image is filtered and just the numbers are extracted from the image. This technique may result in

more than one area and if that is the case, certain criteria tests are used to determine the pertinent region. After obtaining plate location, region involving only plate is cropped giving the plate as shown in Fig 6 below.



Fig 6: Plate Image

In the segmentation of plate characters, the characters are obtained individually by segmenting the license plate into its constituent parts. The result of this segmentation is explained in Fig 7 as:



Fig 7: Location of plate characters

The plate characters are to be cut next. It is done by finding starting and end points of characters in horizontal direction. The individual characters cut from the plate are found as in Fig 8:



Fig 8: Individual characters

The characters are normalized before recognition algorithm. Normalization is needed 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 as in Fig 9:



Fig 9: Equal sized characters

For matching the characters with the database, input images must be equal-sized with the database characters. Here the characters are fit to 36*18. The extracted characters cut from plate and the characters on database are now equalized. 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.

3. EXPERIMENT AND RESULT

We tested our algorithm against 50 different images which were randomly downloaded from the Internet. 48 of those resulted in successful extraction of the characters, while 2 of them failed to do so, due to lack of proper visibility of characters, and with unusual usage of text font in number plates.

As it stands, the relative efficiency of the project remains at 94%.

Some of the number plates and their outcomes are listed below:



Results to AFR420



Results to AKH343



Results to KPT295



Results to AWR310

4. CONCLUSION

The process of extracting text from number plates consists of a number of sub processes. Each sub process has numerous implementations in existence. Further, many different combinations of sub processes exist, each combination having its own share of efficiencies and inefficiencies. In this system, an application software is designed for the detection of number plate of vehicles using their number plate. At first plate location is extracted using morphological operation then separated the plate characters individually by segmentation. Finally template matching is applied with the use of correlation for recognition of plate characters.

Some of possible difficulties encountered while extracting the characters are listed below:

1. Characters in number plates shouldn't be made with fancy fonts. Only some generic font types, which are provided under the character templates will be identified by the algorithm.
2. Blurry images don't give proper output. Characters in the number plates should be dominant, prominent and distinct.
3. Number plate should be within the legal specification. Say, some cities have 6 characters in the number plates, while some bear only 5 of them. Appropriate adjustment should be provided in the algorithm.
4. Clear distinction between characters like, 'Z' and '2' is needed in the number plate..

5. ACKNOWLEDGEMENT

Any achievement, be it scholastic or otherwise does not depend solely on the individual efforts but on the guidance, encouragement and cooperation of intellectuals, elders and friends. A number of personalities, in their own capacities have helped us in carrying out this project work. We would like to take this opportunity to thank them all.

We express profound gratitude to our respected Principal; Head of Department, Information Science and Engineering; our Project Guide, and all faculties from Information Science and Engineering Department for encouraging and providing us this opportunity to carry out the project in the department.

Last but not the least; we thank our family and friends, who through their valuable support has compelled us to maintain a high standard throughout our endeavor.

6. REFERENCES

- [1] R.Radha1 and C.P.Sumathi2, "A Novel approach to extract text from license plate of vehicle", Signal and Image Processing : An International Journal (SIPIJ) Vol.3, No.4, August 2012
- [2] Shen Zheng Wang & His-Jian Lee "Detection and Recognition of License Plate Characters with Different Appearances", IEEE Intelligent Transportation Systems, Proceedings 2003, vol.2, Page(s): 979 – 984.
- [3] Humayun Karim Sulehria, Ye Zhang, Danish Irfan, Atif Karim Sulehria, "Vehicle Number Plate Recognition Using Mathematical Morphology and Neural Networks", WSEAS TRANSACTIONS on COMPUTERS, Volume 7,ISSN: 1109-2750, Issue 6, June 2008.
- [4] Dr. P.K.Suri, Dr. Ekta Walia, Er. Amit Verma," Vehicle Number Plate Detection using Sobel Edge Detection Technique", International Journal of Computer Science and Technology, ISSN : 2229 – 4333, IJCST Vol. 1, Issue 2, December 2010.
- [5] Kumar Parasuraman and P.Vasantha Kumar, " An Efficient Method for Indian Vehicle License Plate Extraction and Character Segmentation", IEEE International Conference on Computational Intelligence and Computing Research,2010.