

Automatic Vehicle's Number Plate Identification using Image Segmentation and Comparison Techniques

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Abstract : *This paper deals with extraction of textual information from the number plate of vehicles moving on roads based on image processing techniques and retrieval of details of the vehicle from the data base management system. The image of the moving vehicles number plate is grabbed by either using CCD cameras installed on traffic light points or portable/hand held digital cameras with traffic cops. The grabbed image is thresholded to give binary image with white as background and black as textual content. Using segmentation techniques, the text characters are extracted one-by-one. Finally, the characters are compared with the standard shape of the character for its confirmatory test. After, all the characters are identified from the number plate; a text file of the same is generated and fed as input to the data base management system for retrieval of the details of the vehicle under monitor.*

Keywords: Image Segmentation, Image Processing

1. Introduction

In the transport and traffic management system, tracking or surveillance of vehicles on road is of prime importance. Vehicles are identified by reading their number plate and then retrieving the information from the record based on the number plate contents. The system becomes complicated when there is large number of vehicles being traced at different locations. In that case, manual reading of number plates and then retrieval becomes very tedious job and time consuming too. Therefore, an automatic visual vehicle number plate identification and management system is required that can grab the image of the moving/stationary vehicle's number plate, extract the contents from the same and then retrieve the details of the vehicle under surveillance. The image can be grabbed using CCD camera installed on traffic lights or by portable/hand held CCD cameras with traffic cops. Besides tracking or surveillance of vehicles, the same can be used to facilitate the operations at the toll collection booths.

2. Brief Literature Survey

Combinations of edge statistics and mathematical morphology offer fair results while identifying characters. [6]. However, edge based methods has disadvantage that alone cannot be applied to complex images because of sensitivity towards unwanted edges. When combined with morphological steps that eliminate unwanted edges in the processed images, the LP extraction rate becomes relatively high and fast. In [7], the conceptual model given by the

algorithm is based on the morphological operation known "top-hat transformation", which is able to locate small objects of significantly different brightness [8].

3. Methodology

The objective of the proposed thesis work is to extract the textual information regarding the registration no. of the vehicle from the number plate of the same automatically by taking the image of the same. The image is captured by using CCD or web camera. The captured image is then processed to convert it to binary image. The binary image is then subjected to character identification algorithm and the extracted text is stored in a text file.

A license plate identification system can be used for numerous applications such as unattended parking lots, security control of restricted areas, traffic law enforcement and automatic toll collection. Such a system captures images of vehicles and identifies license plate numbers automatically. Here we present results of a system in identifying the vehicle license plate through digitized photographic images based on image processing techniques.

The proposed algorithm is based on two basic processing stages; locating the license plate, and, identifying the individual digits and characters in the license plate. The algorithm takes a raster image of the rear view of a vehicle as input and yields the recognized numbers and characters in the number plate as the output. The performance of the

developed algorithm has been tested on a set of real images of vehicles.

The basic method for extracting the plate region can be described by the following steps.

- Image Acquisition
- RGB to gray scale conversion
- Finding the license plate region
- Extraction of the plate region (RGB) image for number recognition

4. Image Acquisition

The moving vehicle number plate is grabbed using CCD camera installed on traffic lights or by portable/hand held CCD cameras with traffic cops.



Figure 1: Acquired Image

The acquired image is now converted to gray scale image using rgb2gray command in matlab software. Below is the image after gray scale conversion.

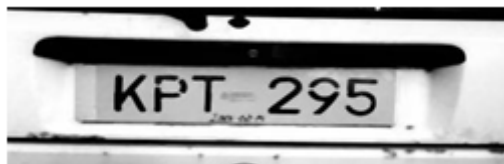


Figure 2: Gray Image

5. Image Thresholding and Noise Removal

The grabbed image is first converted to gray image in bit mapped (bmp) format (256 gray shades format). A threshold is applied using the Otsu's method [1]. The Otsu algorithm works well for vehicle's number plate images. This is because the number plate images are normally of plain texts with primarily of two colours, however, with some noisy input like dirt or blurring due to grabbing of image of a moving vehicle. Otsu's thresholding method is used for thresholding the number plate image so that the numbers/characters are displayed in black with respect to black as background.

Salt and Paper noise is removed by the following algorithm:

If (P0 = BLACK) & P1= P2 = P3 = P4 = P5 P6 = P7 = P8 = WHITE

Then P0 is the Background Pixel.

If (P0 = WHITE) & P1= P2 = P3 = P4 = P5 P6 = P7 = P8 = BLACK

Then P0 is the Object Pixel. [10]

| | | |
|----------------|----------------|----------------|
| P ₈ | P ₁ | P ₂ |
| P ₇ | P ₀ | P ₃ |
| P ₆ | P ₅ | P ₄ |

Below is the image after noise removal and thresholding



Figure 3: Thresholded Image

6. Image Segmentation

Once, the image is binarized. It is subjected to segmentation process. Here, the characters are segmented and grouped in one to one block with known access pointer.

The characters are segmented using the bwareaopen command in MATLAB. The objects below pixel counts 50 are left on account of noise or unwanted characters in the number plate. This enables to get the segmented characters image in each individual image frame. Below are the segmented characters images in individual image frames:

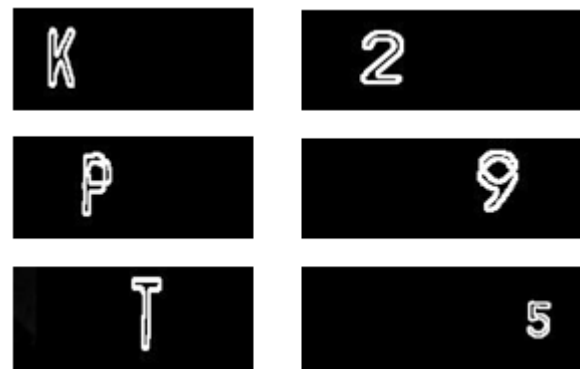


Figure 4: Segmented Images

7. Size Normalization

The segmented characters (patterns) are normalized with respect to their size taking in consideration the size or figure aspect of original characters stored for comparison purposes.

8. Character Identification

Characters are identified based on comparison result. A text file is generated after the complete number plate is scanned and characters are identified. The text file can be used for querying a data base for identification of owner of the vehicle.

9. Results and Conclusion

The proposed algorithm has been tested on vehicle's number plate as given in earlier section of the paper. The segmented images are also shown. The characters are very well segmented and recognized based on comparison method, thus giving the good result of identification. The algorithm has been tried using matlab version 7.5. The system can be implemented on a roadways transport authority data base system for on road tracking of vehicles at a fair speed.

References

- [1] R.C. Gonzalez, R.E. Woods, "Digital Image Processing", PHI, second edd, pp: 519:560 (2006)
- [2] B. Hongliang and L. Changping. "A Hybrid License Plate Extraction Method Based on Edge Statistics and Morphology," in Proc. ICPR, pp. 831–834, 2004.
- [3] W. Wen, X. Huang, L. Yang, Z. Yang and P. Zhang, "The Vehicle License Plate Location Method Based-on Wavelet Transform", International Joint Conference on Computational Sciences and Optimization, pp:381-384, 2009
- [4] P. V. Suryanarayana, S. K. Mitra, A. Banerjee and A. K. Roy, "A Morphology Based Approach for Car License Plate Extraction", IEEE Indicon, vol.-1, pp: 24-27, 11 - 13 Dec.2005
- [5] H. Mahini, S. Kasaei, F. Dorri, and F. Dorri, "An efficient features-based license plate localization method," in Proc. 18th ICPR, Hong Kong, vol. 2, pp. 841–844, 2006.
- [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, pp: 126-131, 2002.
- [7] C. Wu, L. C. On, C. H. Weng, T. S. Kuan, and K. Ng, "A Macao License Plate Recognition system," in Proc. 4th Int. Conf. Mach. Learn. Cybern., China, pp. 4506–4510, 2005.
- [8] Feng Yang, Fan Yang. "Detecting License Plate Based on Top-hat Transform and Wavelet Transform", ICALIP, pp: 998-2003, 2008
- [9] Feng Yang, Zheng Ma. "Vehicle License Plate Location Based on Histogramming and Mathematical Morphology", Automatic Identification Advanced Technologies, 2005. pp: 89 –94, 2005
- [10] Harpreet Kaur, Jatinder Kaur, Robinder Kaur, Simranjit Kaur / IOSR Journal of Engineering (IOSRJEN) ISSN: 2250—3021 www.iosrjen.org Vol. 1, Issue 1, pp. 058-060 www.iosrjen.org 58 | Page Geometric Pattern Recognition System based on Statistical Parameters using Image Processing