License Plate Detection Method For Yellow Plate Of Indian Vehicle

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ABSTRACT: In India the vehicles have two types of license plates Black character with white background and yellow background. The localization of plate has been important in every Intelligent Transport System (ITS). The license plates are present at the two sides; i.e. front and back of vehicle. Various methods have been implemented for detection of the plate area. But these have been tested in controlled conditions; the present work has been targeted towards detection of license plate from color image taken by camera in real environment. Initial assumptions have been made for vehicle distance and angle between vehicle and camera. After making initial preprocessing on the image taken by camera, by using yellow color detection method the required plate area has been detected. The area of the plate is fixed for each vehicle. The plate may contain single line or double line characters and numbers. The method used has up to 92% accurate results for given images.
KEYWORDS *ITS, Yellow plate, Image Extraction*

I. INTRODUCTION:

The rate of populations in the world as well as in India is increasing and thus the needs of human beings are also increasing, resulting in increasing transportation. To satisfy the requirements of transportation, the number of vehicles has been increasing day by day. For the intelligent transport system proper detection of vehicle's license information has been necessary. The vehicle's license plate consists of information related with the vehicle and the owner. Different countries use different standards for providing vehicle number plate. In several countries the size of plate area is fixed. Also the method adopted for registration of vehicle is related with number plate. The plate consists of script containing characters or numbers or both.

In India according to motor vehicle act 1989 rule 50 & 51 the plates for different vehicle is different. These license plates must be present on at least two sides of vehicle front and back. The basically two types of plates are available: i) white background with black character, for private vehicles, and ii) yellow background with black character, for commercial and transport vehicles. According to Indian motor vehicle act the size of license plate for four wheeler and above must be 340mm X 200mm or   500mm X 120mm. This size must be used for one line or two line representation of registration mark known as license plate or number plate. After registration of vehicle the transport office (TO) gives unique number which consist of characters & numbers. The initial two characters represent the state to which the vehicle belongs. After two character two digits are provided which are used by district code or code used by Regional Transport Office (RTO). The next four digits consist of registration made by RTO along with owner information[1]. (http://www.htp.gov.in/)

In developed countries the license plate attributes are strictly followed. Such as color of plate, size of license plate, character font size, color and spacing between characters and numbers. Sometimes if laws related to plate are not followed strictly, then detection and recognition becomes difficult. For proper detection the localization of plate is very important.

II: Literature survey

Many ALPR techniques have been proposed. This task has been studied by many researchers. The brief explanation of previous work given as follows. The methods mostly depend on edge detection applied for detection of plate area of vehicle [2-4]. The white background with high brightness is used as background for Greece[2]. W. Jia and et. al. uses mean shift algorithm for detection of plate, it gives better result for license plate having different color from vehicle color [5]. Location of license plate has been done by using Wavelet Transform [6-7]. Feature based method implemented for Iranian license plate by H. Mahini et al [8]. The method of Wavelet transformation and projection method implemented for location of license plate [6]. The Spanish license plate detection implemented by Sobel edge detection method [9]. This method limited to one

line license plate system. Satadal Saha et al. gives multi stage edge based approach for detection of license plate [10]. Instead of using RGB color image the detection of plate has been done for HSV image [11]. The implementation done for Tanzanian Vehicles. The plate may be containing seven character arranged in one or two row. The Sobel edge detection used for detection of region of interest (ROI) [12]. The result will be good and up to 95%. Manisha Rathore et al used the method of horizontal and vertical edge for getting license plate area [13]. The method uses histogram method and low pass filter for plate area. Khalid W. Maglad represented method of Sobel edge detection for primary detection of plate area. The method of Radial Basis Function(RBF) Neural Network(NN) implemented for getting exact location of plate area[14].

III: Experimental Work

For the experimental work the dataset (images of vehicle) captured from various regions for demonstration of research work only. The images have been obtained from various regions and at different time. Total of 200 images have been collected for current work taken from digital camera or mobile camera from specific distance. It is necessary to locate proper license plate for appropriate recognition of character and number on plate.

The flow chart represents work of project.
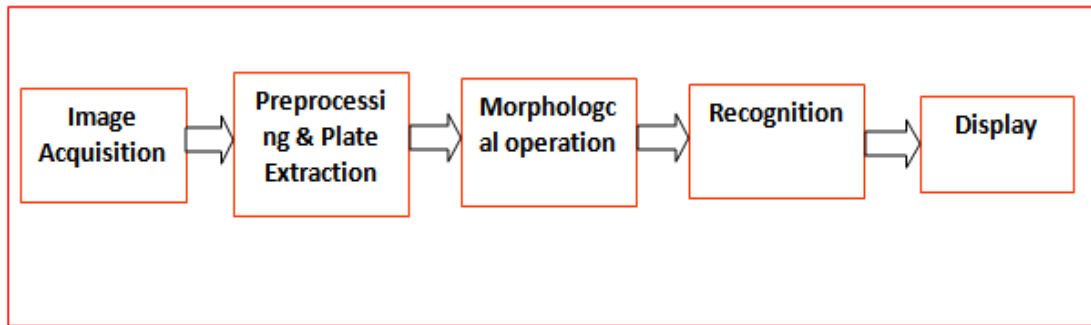
A) Image Acquisition

The image has been taken from digital camera or mobile phone camera works as input image. The image taken from approximately 2.5m to 6m distance. The license plate of vehicle must be present at least 1 meter above from ground surface[14]. It may be yellow plate or white plate. The yellow plate has been considered for detection in this work.

B) Preprocessing & Plate Extraction

In the image consisting of vehicle number plate the upper part of vehicle image is cropped, because plate area location will be at the bottom of the image i.e. 1 meter above the ground surface. Also the yellow color region might be present in above part of vehicle and has to be cropped. By use of yellow color equation the required plate area will be extracted from image. The yellow color is basically combination of red and green colors.

a)   b)

c)

d)

e)

Fig.1 Images for different vehicles.

a) Plate with one line script   b) Plate with two line script
c) Extraction of plate using crop function   d) Plate with two line script
e) Plate extracted from yellow color vehicle

The value of yellow filter designed is as follows,
r=map(:,1)>0.46;
g=map(:,2)>0.3;
b=map(:,3)<0.19;
y=r.*g.*b;

C) Morphological Operation
The region containing license plate part is represented as region of interest (ROI). With the help of morphological operation the unwanted component from ROI must be eliminated, so as to retain license plate only (characters & numbers). The required region containing plate area obtained with biggest size test. This can be also done with aspect ratio (width to height) relation, which can be adjusted from 1.5 to 4. Also if such form of number of regions is available in the image, to crop the required ROI having specific size the method of size test can be used. This test also obtained to get exact rectangular area of plate. If any mismatch is found in plate area, then the false condition will be represented.

Fig. 2 Vehicle containing two yellow regions.

The plate containing yellow background contains single line or two line representation of license plate. The image of license plate will be converted to gray and binary for further pre processing. With the help of character height and first pixel of character bounding box of characters are represented as one line character. If two lines are present on the license plate, similar procedure will be implemented for another line. These two lines are separated and represented with green and red color bounding boxes respectively, as shown in fig 3.

Fig. 3 Extracted script from yellow plate for one line and two line.

D) Recognition

The characters and numbers from plate are separated using object extraction method. These characters can be adjusted to fix size by resizing each character and number. Using correlation between obtained data and given data the recognition of each character and data has been obtained. This data can then be stored in notepad or exported to Excel for further processing. If the plate cannot have proper angle and the script on plate does not have same size then there may fault in recognition of script character and number. Also if the spacing between characters is not same, in that case the proper recognition of character fails to display as seen in fig. 4(a) and 4(b).
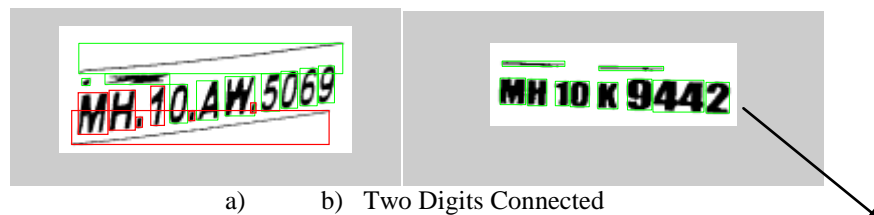

a)   b)   Two Digits Connected

Fig.4 The examples where extraction method fails to detect character and number.

II. RESULT

The method used only on yellow plate for detection and recognition. The method of extraction gives better result for commercial vehicle and yellow colored vehicle also. The method tested on about 200 vehicles, and the extraction of yellow plate area detection worked for about 92% successfully. During recognition of each character and digit the technique gave accuracy of about 85%. The system does not work for tilted plates and if separation between each digit not consistent.

III. CONCLUSION

The detection of yellow plate worked with high accuracy for images taken from various distances between vehicle and camera. During recognition there will be poor detection of script if the character height is not consistent throughout the script. Also the distance (space) between characters must be uniform. For both one line and two line script the recognition works well. Different character/number fonts and sizes have been recognized properly.

Detection accuracy can be increased by implementing suitable method for scripts containing different character sizes in same license plate.

REFERENCES:

[1].   http://www.htp.gov.in/
[2].   H. Kawasnicka and B. Wawrzyniak, "License Plate Localization and Recognition in Camera Pictures", AIMETH 2002, Poland, November 2002
[3].   Erik Bergenudd, "Low-Cost Real-Time License Plate Recognision for a Vehicle PC", Master's Degree Project, KTH Electrical Engineering, Sweden, December 2006.
[4].   O. Martinsky, "Algorithmic and Mathematical Principles of Automatic Number Plate Recognition System", B. Sc. Thesis, BRNO University of Technology, 2007.
[5].   W. Jia, H. Zhang, X. He and M. Piccardi, "Mean Shift for Accurate License Plate Localization", Proceedings of 8th International IEEE Conference on Intelligent Transportation Systems, Vienna, Austria, Sept. 2005.
[6].   Hung, K. M., Chuang, H. L. and Hsieh, C. T., "License Plate Detection Based on Expanded Haar Wavelet Transform," 4th International Conference on Fuzzy Systems and Knowledge Discovery (FSKD'07), Haikou, China, pp. 415-419 (2007).
[7].   A Real-Time Mobile Vehicle License Plate Detection and Recognition Kuo-Ming Hung1,2 and Ching-Tang Hsieh Tamkang, Journal of Science and Engineering, Vol. 13, No. 4, pp. 433-442 (2010)
[8].   H. Mahini, S. Kasaei, F. Dorri and F. Dorri, "An Efficient Features-Based License Plate Localization Method", Proceedings of 18th International Conference on Pattern Recognition, 2006.
[9].   Cesar Garcia-Osorio, Jose-Francsico Diez-Pastor, J. J. Rodriguez, J. Maudes, "License Plate NumberRecognition New Heuristics and a comparative study of classifier", cibrg.org/documents/Garcia08ICINCO.pdf.
[10].   Satadal Saha, Subhadip Basu, Mita Nasipuri, Dipak Kumar Basu " License Plate Localization from Vehicle Images: An Edge Based Multi-stage Approach", International Journal of Recent Trends in Engineering, Vol 1, No. 1, May 2009.
[11].   Cosmo H. Munuo, Dr Michael. Kisangiri, Eng. Prof. Nerey H. Nvungi "Vehicle Plate Number Detection and Recognition Using Improved Algorithm" Computer Engineering and Intelligent Systems,I SSN 2222-1719 (Paper) ISSN 2222-2863 (Online), Vol.5, No.10, 2014.
[12].   Sarbjit Kaur, Sukhvir Kaur " An Efficient Approach for Number Plate Extraction from Vehicles Image under Image Processing", International Journal of Computer Science and Information Technologies, 2954-2959, Vol. 5(3), 2014.
[13].   Manisha Rathore and Saroj Kumari "TRACKING NUMBER PLATE FROM VEHICLE USING MATLAB", International Journal in Foundations of Computer Science & Technology (IJFCST), Vol.4, No.3, May 2014.
[14].   Khalid W. Maglad, "A Vehicle License Plate Detection and Recognition System", Journal of Computer Science, ISSN 1549-3636, 8 (3), 310-315, 2012.