

## AN EFFICIENT EDGE DETECTION AND TEMPLATE MATCHING BASED VEHICLE NUMBER PLATE RECOGNITION

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### *Abstract*

Vehicle number plate recognition is the most interesting and challenging research topic from past few years. It is shown that the number plates are different shape and size and also have different color in different countries. In India the most common vehicle number plate used yellow or white as background and black used as foreground color. In this paper we proposed a system to localization of number plate mainly for the vehicles in West Bengal (India) and segmented the numbers as to identify each number separately. This presents an approach based on simple and efficient morphological operation and sobel edge detection method, template matching. We also presents a simple approach to segmented all the letters and numbers used in the number plate. After reducing noise from the input image we try to enhance the contrast of the binarized image using histogram equalization. Character Recognition of the vehicle plate based on template matching. The simulation result shows that the location is more efficient and effective.

*Keywords: vehicle number plate recognition, character recognition.*

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## [I] INTRODUCTION

The automatic number plate recognition systems (ANPR) exist for a long time, but only in the late 90s it became an important application because of the large increase in the number of vehicles. The information extracted from the license plates is mainly used for traffic monitoring, access control, parking, motorway road tolling, and border control, making car logs for parking systems, journey time measurement etc. by the law enforcement agencies. The recognition problem is generally sub-divided into 5 parts: (1) image acquisition i.e. capturing the image of the license plate (2) pre-processing the image i.e. normalization, adjusting the brightness, skewness and contrast of the image (3) localizing the license plate (4) character segmentation i.e. locating & identifying the individual symbol images on the plate (5) character recognition using edge detection & template matching. There may be further refinements over these (like matching the vehicle license number with a particular database to track suspected vehicles etc) but the basic structure remains the same. A guiding parameter in this regard is country specific traffic norms & standards. This help to fine tune the system i.e. number of characters in the license plate, text luminance level (relative index i.e. dark text on light background or light text on dark background) etc. So the problem can then be narrowed down for application in a particular country. For example, in India the norm is printing the license plate numbers in black color on a white background for private vehicles & on a yellow background for commercial vehicles. The general format for the license plate is two letters (for state code) followed by distinct code, then a four digit code specific to a particular vehicle. In U.S.A. no strict guidelines have been set regarding the fonts that can be used for this purpose.

## [II] RELATED WORK

S.Roy, A. Choudhury, J. Mukherjee. [1] The proposed a system to localization of number plate mainly for the vehicles in West Bengal (India) and segmented the numbers as to identify each number separately. This paper presents an approach based on simple and efficient morphological operation and sobel edge detection method. He also presents a simple approach to segmented all the letters and numbers used in the number plate. After reducing noise from the input image we try to enhance the contrast of the binarized image using histogram equalization. We mainly

concentrate on two steps; one is to locate the number plate and second is to segment all the number and letters to identify each number separately.

S. Du, M. Shehata, W. Badawy [2] Describe a comprehensive survey on existing (Automatic License Plate Recognition) ALPR Techniques by categorizing them according to the features used in each stage. Comparisons of them in the terms of Pros, Cons, Recognition results, & Processing speeds were addressed. A future forecast for ALPR was also given at the end. The future research of ALPR should concentrate on multistyle plate recognition, video-based ALPR using temporal information, multiplates processing, high definition plate image processing, ambiguous-character recognition.

P.anishiya, prof. S. Mary joans [3] focused a number plate localization and recognition system for vehicles in Tamilnadu (India) is proposed. This system is developed based on digital images and can be easily applied to commercial car park systems for the use of documenting access of parking services, secure usage of parking houses and also to prevent car theft issues. The proposed algorithm is based on a combination of morphological operation with area criteria tests for number plate localization. Segmentation of the plate characters was achieved by the application of edge detectors, labeling and fill hole approach. The character recognition was accomplished with the aid of optical characters by the process of Template matching.

S. H. Kasaei., S. M. Kasaei [4] presented a novel method of identifying and recognizing of Iranian car license plates. Firstly we extracted the plate location, and then we separated the plate characters by segmentation and applied a correlation based template matching scheme for recognition of plate characters. This system is customized for the identification of Iranian license plates. The system is tested over a large number (more than 150) of images, where this algorithm performs well on different types of vehicles including Iranian car and motorcycle plates as well as diverse circumstances. Finally it is proved to be %97.3 correct in the extraction of plate region and %94 correct in the segmentation of the characters and %92 in the recognition of the characters. He believe that this system can be redesigned and tested for multinational car license plates in the future time regarding their own attributes.

D. Jiang, T. M. Mekonnen, T. E. Merkebu, A Gebrehiwot.[5] Discussed paper presents about car plate recognition system. It describes, design algorithm and future of implementation. The system has color image inputs of a car and the output has the registration number of that car. The system

has three main steps to get the desired information. Those are plate localization, character segmentation and

Character recognition. First, the number of plate is extracted from the original image, then the characters from it are isolated, and finally each character is recognized. The algorithms were developed using a set of training images. The final program is capable of extracting the desired information in a high percentage of the test images.

Z. Xu., H. Zhu.[6] Presented an efficient and robust method of locating license plate is presented. The method makes use of the rich corner information in the plate area and the edge information of license plates. It can deal with more difficult location problems, especially with a license plate existing in a complicated background.

### [III] PROPOSED METHODOLOGY

Number plate is a pattern with very high variations of contrast. If the number plate is very similar to background it's difficult to identify the location. Brightness and contrast is changes as light fall changes to it. The morphological operations are used to extract the contrast feature within the plate. The work is divided into several parts:

- A. Input raw image
- B. Input pre-processing
- C. Edge detection
- D. Plate region extraction
- E. Character segmentation
- F. Character recognition using template matching

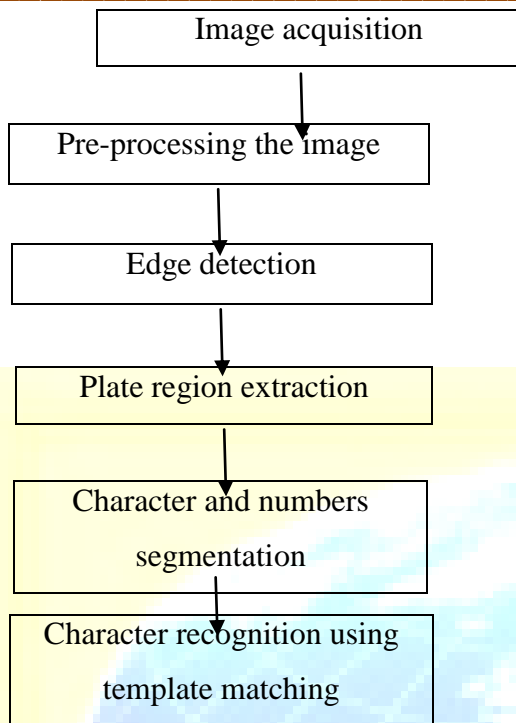


Fig.1. Block diagram of proposed approach.

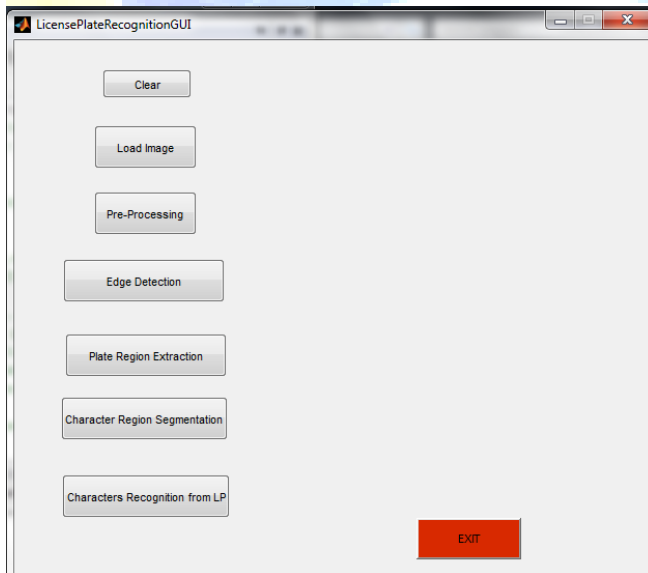


Fig 2. License plate recognition GUI

A. Input raw image:-

Input image taken from car.(Fig. 3) and displays the message “Image has been loaded”.



Fig 3. Load image

### B. Pre-processing the image:-

Preprocessing mostly is necessary to facilitate for high performance recognition. Firstly converted color image (RGB) into 256 gray image. Also(Fig. 4) shows message “image has been pre-processed”.

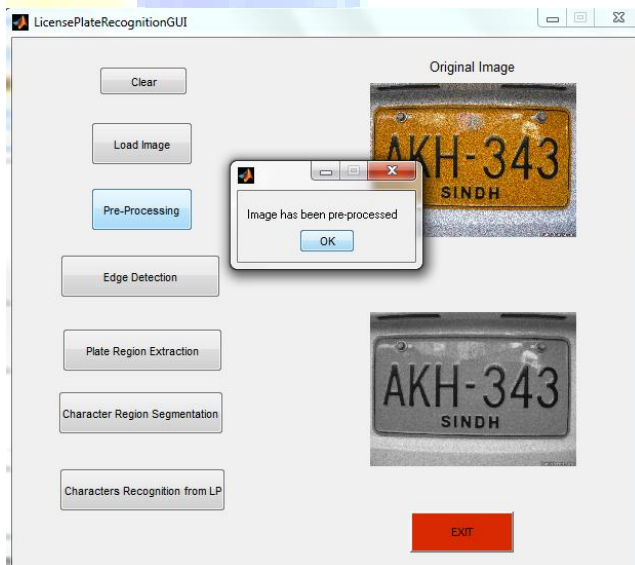


Fig 4. Image pre-processing

### C. Edge detection:-

Mathematical morphology will be used to detect the region. Using edge detector we used to high light regions with a high edge magnitude and high edge variance are identified. Depending upon the threshold value edge will be detected from the input image. There are four edge

detection techniques are available for detecting edge of number plate. Choose any one option of edge detection for further processing.



Fig 5. Edge detection method

D. Plate region extraction:-

After the preprocessing stage, a morphological operator is applied to the image for specifying the plate location. And shows the message “plate region is extracted”.

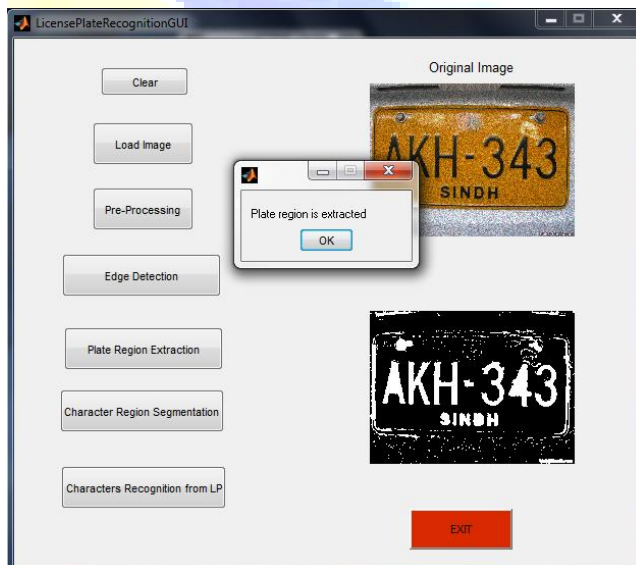


Fig 6. Plate region extraction

E. Character Segmentation:-

Character segmentation is an important stage in license plate recognition system. There are many factors that cause the character segmentation task difficult, such as image noise, plate

frame, and rotation and illumination variance. Preprocessing is very important for the good performance of character segmentation. Displays the message “character region is segmented”.

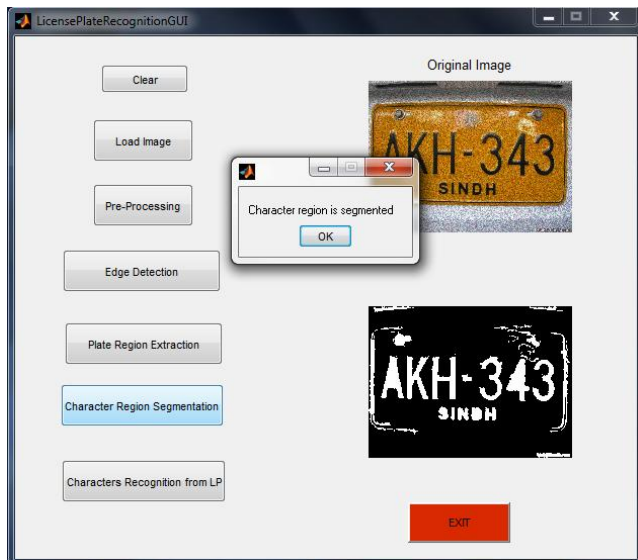


Fig. 7. Character region segmentation

#### F. Character recognition using template matching:-

Resultant image is compared with the original image in the database. Before employment of the recognition algorithm, the characters would be normalized. Normalization is to refine the characters into a block containing no extra white spaces(pixels) in all the borders of the characters Fitting approach is also necessary for template matching. For matching the characters with the database, input images must be equalizing to the database characters. 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 characters' image is compared to the ones in the database and the best similarity is considered. To measure the similarity and find the best match, a statistical method correlation based is used. Correlation is an effective technique for image recognition. This method measures the correlation coefficient between a number of known images with the same size unknown images or parts of an image with the highest correlation coefficient between the images producing the best match. Due to the similarities of some characters, there may be some errors during the recognition phase. Plate number display in the form of notpad file.



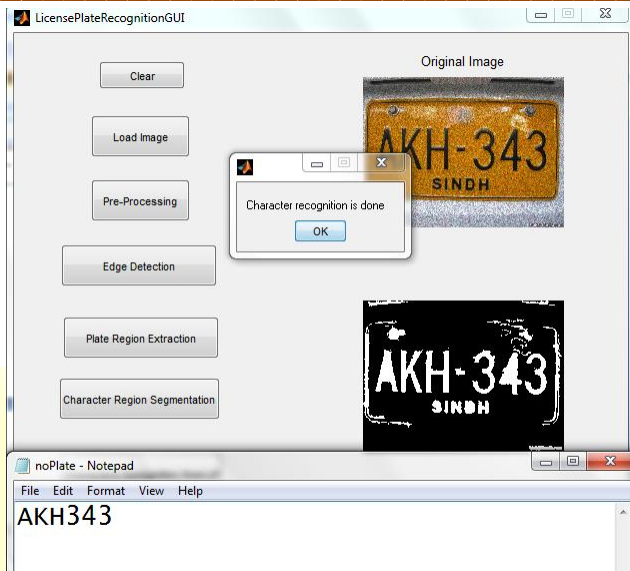


Fig 8. Character recognition

#### [IV] EXPERIMENTAL RESULTS

I have run proposed method on desktop computer with Core2 duo processor 2.53GHz with 4GB of RAM under MATLAB R2010a environment. Several vehicle images are captured. In the experiments, I test proposed method on the different type car image to identify the license number from car accurate.

#### [V] CONCLUSION

From review of various paper we conclude that there are different techniques are available for recognition of car number plate. Sobel edge detection method, Automatic license plate recognition, Novel method used for detects edge & fill holes less than 8 pixels only, categoring features in each stage, identifying & recognizing car license plate.

Therefore at this stage use of efficient edge detection & template matching to reduce effort required for recognizing vehicle license number plate. Try to Calculate improve result as compare to conventional method in turn of time require for convergence.

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