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An Efficient Model to Identify A Vehicle by Recognizing the Alphanumeric Characters in an Engine Image and in Chassis Image

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ABSTRACT

Automatic Engine Number Recognition (AENR) is the digital image processing and an important aspect/ role to identify the theft vehicles by recognizing characters, digits and special symbols. There is increase in the theft of vehicles, so to identify these theft vehicles, the proposed system is introduced. The proposed system controls the theft vehicles by recognizing a digits and characters in the number plate and chassis region and stores in the database in ASCII format to check the theft vehicles are registered or unregistered. Both system consists of 4 common phases: - Preprocessing, Character Extraction (ROI), Character Segmentation, and Character Recognition. This paper proposes a new scheme for engine number and chassis number extraction from the pre-processed image of the vehicle's engine and chassis region using preprocess techniques, Region of Interest(ROI), Binarization, thresholding, template matching.

KEYWORDS: *Automatic Engine Number Recognition, preprocessing technique, ROI, thresholding, template matching*

I. INTRODUCTION

Every country uses their own standard for licence plate, engine number, and chassis number. In the Intelligent Traffic System, the Engine Number Recognition plays an important role. Now a days, vehicles play important role in transportation and the use of vehicles is also increasing due to population growth and human needs. Automatic Engine Number Recognition system is used for the effective control of these vehicles.

The basic model of Automatic Engine Number Recognition (AENR) processing stage is shown below and it includes 4 stages at the processing part: - 1) Preprocess the image 2) Engine number Extraction 3) Character Segmentation 4) Character Recognition.

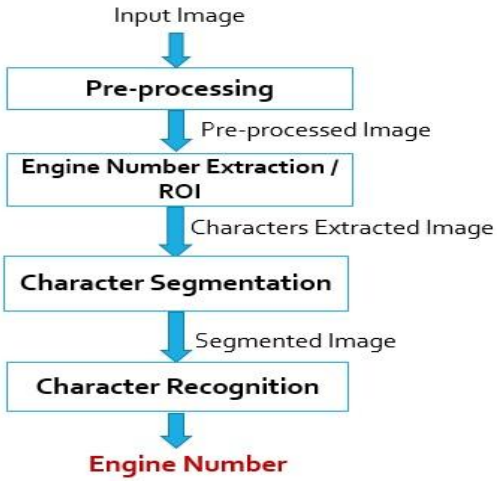


Figure (1) Basic working model of AENR's processing stage

Here, the first stage is preprocessing the image means that the captured image is pre-processed for better quality input image. There are many

techniques available in image processing to pre-process an image. I.e., Grayscale Model, HSV Model, Histogram processing, Mask processing. In the second stage, the extract the exact location of engine number is detected from whole vehicle image. In the third stage, the characters will be segmented from extracted region. And in the last stage, the segmented characters will be recognized using template matching technique.

II. Literature Survey

Christos-Nikolaos E. Anagnostopoulos [1] presented different methods used to extract the alphanumeric characters from license plate. Shan Du [2] presented a survey on existing ANPR methods and categorizing them into number of features used in each stage and compares them in terms pros, cons, accuracy, and processing speed. Sahil Shaikh [3] proposed method for number plate recognition. For plate localization, several traditional images processing techniques such as image enhancement, edge detection, filtering and component analysis are used. Norizam Sulaiman [4] presented the development of automatic vehicle plate detection system in which after pre-processing the candidate plate is detected by means of feature extraction method, character segmentation is done by boundary box and character recognition is done by template matching. Reza Azad [5] proposed a fast and real time method in which has an appropriate application to find tilt and poor quality licence plates. In the proposed method, the image is converted into binary mode/grayscale using adaptive threshold. Ronak P Patel [6] proposed new algorithm for recognition number plate using Thresholding operation, Morphological operation, Edge detection, boundary box analysis for licence plate extraction. Najeem Owamoyo [7] proposed Automatic Number recognition for Nigerian vehicles. Number plate extraction is done using Sobel edge detection filter, morphological operations and connected component analysis. Character segmentation is done by connected component and vertical projection analysis. Sourav Roy [8] proposed algorithm for localization of number plate for the vehicles in West Bengal (India) and segmented the numbers as to identify each number separately. This approach is based on morphological operation and sobel edge detection. After reducing noise from the input image the enhancement of image is done using histogram equalization. Divya Gilly [9] proposed an efficient method for LPR. LPR system mainly consists of three main phases 1) plate detection 2) character segmentation 3) character recognition. This method utilizes a template matching technique for character recognition. This method is suitable for both Indian number plates and foreign license plates.

This paper presents an efficient approach for the extraction of alphanumeric characters in an engine number from the vehicle based on image acquisition, complementing the image, preprocessing, ROI, noise removal (salt pepper), binarization, thresholding, sobel edge detection and the template matching technique for recognition. Firstly the input image is pre-processed into grayscale image.

III. Proposed Technique for Engine Number Extraction

The proposed approach for engine number extraction is represented in this section. Input to this model/approach is vehicle's engine image that is captured through digital camera and output is the actual engine numbers and characters presented in engine region. Images are acquired in different illumination conditions and in different background.

The flowchart diagram of proposed method is shown in Fig. 2 consists of following main steps:

1. Image Capturing
2. RGB to Grayscale conversion

3. 2D median filtering
4. ROI and Conversion of grayscale image to binary image based on graythresh value
5. Removes small objects from converted binary image
6. Suppress the light structures connected to image border.
7. Label connected components in 2D binary image.
8. Measure properties of image regions
9. Crop each characters in segmented image.
10. Create the templates of all characters and digits in 42x24 dimension in .bmp format
11. Match them
12. Returns ASCII value of recognized characters

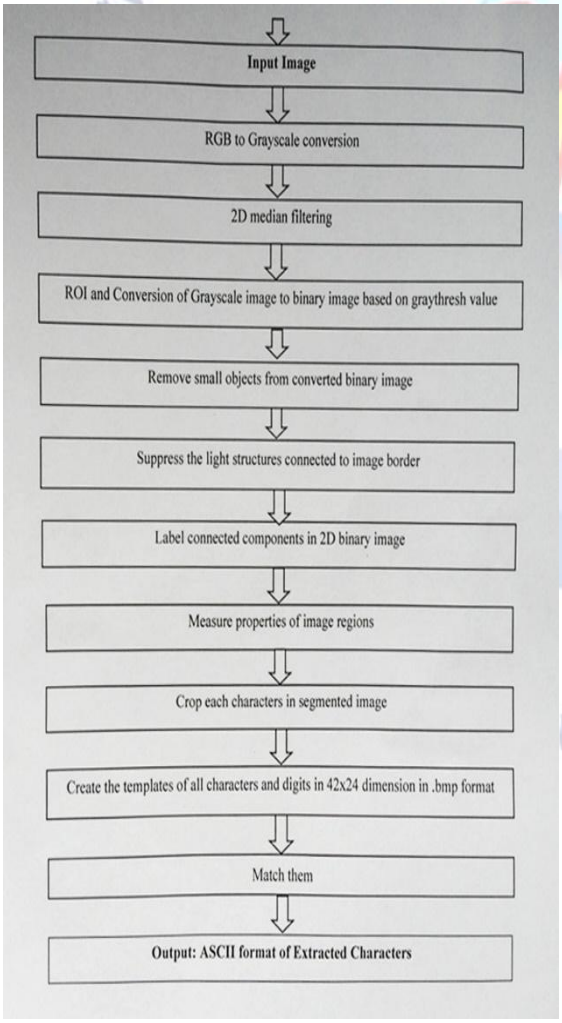


Figure 2:- Flowchart diagram of proposed system

IV. System Architecture

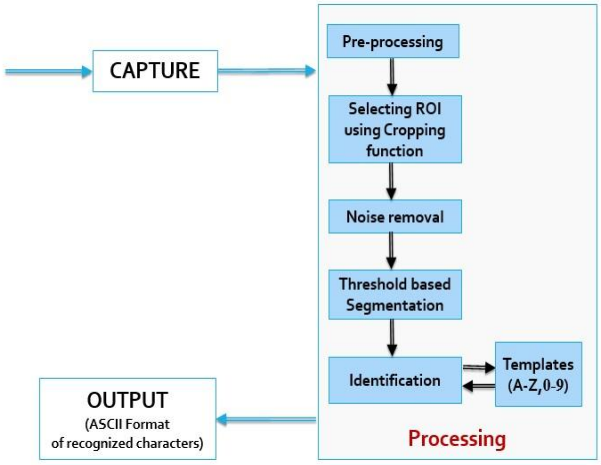


Figure 3: Architecture of the proposed system

A. Image Capturing

The first step of the proposed system is the capturing of an image. Image can be captured using digital camera, smartphones. Load the captured image to Processing part of the system. The image is captured at 2 to 3 meters distance and in straight angle.

Figure (4) shows an Image Captured through smartphones

B. ROI Extraction

In this step, we will going to extract only the selected part using cropping function. In other words, some irrelevant parts of the image can be removed and the image region of interest is focused. The extracted part will be processed to Binarization. In this operation the subtracted grayscale image is converted into binary image. Firstly threshold level is calculated by Otsu's method. In MATLAB *graythresh* function is used to find the threshold level of image and then according to the calculated threshold the subtracted grayscale image is converted into black

and white image by using function *im2bw*. Figure (5) shows the Extraction of ROI

Figure (5) ROI Extraction

C. Pre-processing

Image pre-processing is the name for operations on images at the lowest level of abstraction whose aim is an improvement of the image data that suppress undesired distortions or enhances some image features important for further processing. It does not increase image information content [10]. In the Pre-processing step, the captured image that is RGB image is converted to grayscale image. The main aim of the preprocessing is to reduce the noise present in the taken image to improve the processing speed. It improves the contrast level of the input image.

Figure (6) shows the pre-processed image

D. Noise Filtering/Removal

Noise filtering is used to filter the unnecessary information from an image. The noise will be removed which present in the loaded image. Later, suppress the light structure in the binarized image.

Figure (7) shows the binarized noise removed image.

E. Threshold based Character Segmentation

Segmenting the each character and digits is based on the threshold value of binary image after supressing the light structures. Here the segmentation will be done using MATLAB function *regionprops* with property ALL and BOUNDING BOX.

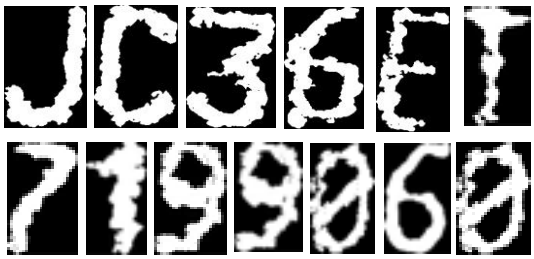
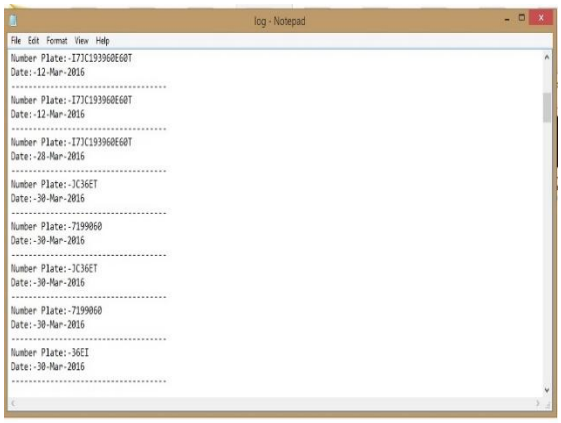


Figure (8) shows the segmented image

F. Character Recognition/Identification

Here, the recognition is done using Template Matching Approach. Basically, Template Matching Approach is based on matching the stored data against the character to be recognized. The matching operation determines the degree of similarity between two vectors i.e. group of pixels, shapes curvature etc. a gray level or binary input character is compared to a standard set of stored data set [11]. The templates have been created in the dimension of 24 x 42 pixels and in .bmp (bitmap) format.

The recognized characters, digits will be saved in a text file i.e. log.txt file.



V. Results and Future Work

Engine number and Chassis number Recognition process requires a very high degree of accuracy when we have to capture image from different angle, different distance, low light etc. These types of anomalies are needed to consider for getting better accuracy. In this paper, we have discussed the Engine Image taken straightly and from 2 to 3 meters distance. So in our approach some Engine image and Charsey image may not detect properly and there is some conflict between the digits and alphabets. In future we will work on it to test different images from far distance and various angles. We will also try to include more character samples of various shape and size into our database so that to achieve a higher level accuracy in recognition.

Captured Engine Image	Recognized Properly	Accuracy
25	23	92%
Captured Charsey Image	Recognized Properly	Accuracy
10	8	80%

The above table shows the results of testing the images using proposed approach.

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