

Vehicle Tracking using Number Plate Recognition System

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Abstract: *It is observed that the vehicle's number plate consists of many a times some special characters. In order to get the correct texts from the number plate, the special characters should be extracted out and rejected while retrieving the owner's information. This kind of problem is often observed on Indian roads. This is one of the important cares that should be taken while designing the algorithm. Another important part regarding the textual information on number plate, the text style or font is not many times uniform on all plates. Therefore, the vehicle's no. plate identification system should be capable of identifying the texts written in any style and at any angular position. Even the size should not bother much. Further, the system should respond at a fast speed just after clicking of the image. Otherwise the objective is lost. In the presented approach, the design of speedy algorithm is stressed out.*

I INTRODUCTION

In Intelligent Transportation System (ITS) the automatic number plate recognition (ANPR) system plays important role. In current days vehicles play important role in transportation and the use of vehicles is also increasing due to population growth and human needs. Automatic number plate recognition system is used for the effective control of these vehicles. Automatic number plate recognition system is an image processing technology that identifies vehicles by tracking their number plate without direct human intervention. ANPR is also known by various other terms as automatic license plate recognition, automatic license plate reader, number plate tracking, car plate recognition, vehicle number plate recognition, automatic vehicle identification etc.

The attributes of the number plates are maintained strictly in all almost all developed and developing countries. The attributes of number plate are background color of number plate, character color, character size, aspect ratio of number plate; font style, script etc. are maintained strictly. The aspect ratio is very important factor and in all developed and developing country vehicles number plate has same aspect ratio where aspect ratio of a region is calculated as ratio of length to width of that region as

Aspect Ratio=Width/Height

The extraction of Indian number plate is difficult compared to the foreign number plate as in India there is no standard followed for the aspect ratio of Indian number plate. This factor makes the detection and extraction of number plate and also segmentation and recognition of characters on the number plates very difficult.

There are two types of number plates used for two categories of vehicles in India. In case of commercial vehicles, the number plate has yellow background with black characters on it. In case of private vehicles, they have white background with black character on it. The current vehicle registration scheme in India consists of two -letter code that indicate the state in which the vehicle is registered followed by two-digit numeric code that indicate the district followed by series code. This is followed by four digits actual registration number that uniquely identifies the vehicle.

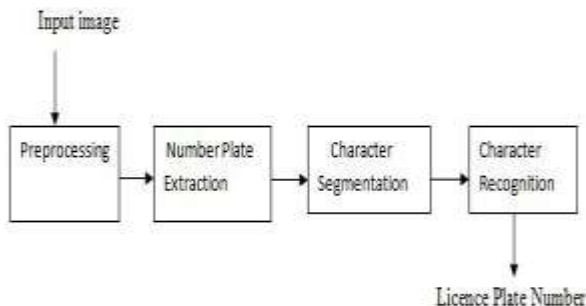


Fig.1ANPR system

The ANPR work is generally framed into the 4 stages: First stage is to acquire the image and performing some pre-processing on it; Second stage is extraction of number plate from whole body of vehicle image; Third Stage is segmentation or isolation of characters from the extracted number plate and fourth stage is to recognize the segmented characters and to display the output result. From the entire input image, only the number plate is detected and processed further in character segmentation. From the extracted number plate each character is isolated by segmentation in the character segmentation phase. After the segmentation of character the recognition is done in last character recognition phase.

ANPR system as shown in figure 2 consists of four phases:-

- 1) Image Acquisition and Pre-processing
- 2) Extraction of Number Plate
- 3) Character Segmentation
- 4) Character Recognition

The first phase is image acquisition in which input image is acquired through camera and then some pre-processing done on it to enhance the visibility of image. Pre-processing is mainly used to improve the contrast of the image, enhance the processing speed, and to reduce the noise in the image. In order to reduce the problem of low contrast and low quality in vehicles input images, images are enhanced by using histogram equalization on gray scale image. After pre-processing the number plate area is detected and extracted in the number plate extraction phase. From the entire input vehicle image, only the number plate area is extracted after detection and processed further in character segmentation.

From the extracted number plate each character is isolated in character segmentation phase. After this the segmented characters are recognized in the character recognition phase. Extraction of number plate is a difficult task. Before the extraction of number plate area we have to detect that particular area from the whole vehicle body and when that area becomes visible we extract that portion. For a human being it is very easy to detect the number plate but for a machine it is really a difficult task and all further phases are also depending on the output of this phase. Therefore there should be accurate detection and extraction of number plate area from whole body of vehicle image.

II LITERATURE SURVEY

Ronak P Patel [1] proposed new algorithm for recognition number plate using Morphological operation and bounding box analysis for number plate extraction. Shan Du [2] presented a comprehensive survey on existing ANPR techniques by categorizing them according to the features used in each stage and compare them in terms accuracy, and processing speed. NajeemOwamoyo [3] proposed method for number plate extraction using Sobel filter and morphological operations. DivyaGilly [4] presented an efficient method for license plate detection by connected component analysis. IsackBulugu [5] has proposed edge finding method to find the location of the plate. Rupali Kate [10] proposed algorithm based on a combination of morphological operation with area criteria tests for number plate localization. HadiSharifi [14] has study and evaluates some most important license plate detection algorithms and compared them in terms of accuracy, performance, complexity, and their usefulness in different environmental condition. This evaluation gives views to the developers or end-users to choose the most appropriate technique for their applications. The study and investigation show that the dynamic programming algorithm is the fastest and the Gabor transform is the most accuracy algorithm compared to other algorithms. Kumar Parasuraman and P.Vasanth Kumar [15] proposed algorithm for extracting the Plate region using edge detection algorithm and vertical projection method. P.MohanKumar [12] proposed method for real time vehicle licenseplate identification. Kumar Parasuraman [14] hasproposed an algorithm consist

of 3 parts. Edge detection algorithm and vertical projection method are used for extracting the Plate region. In segmentation part, filtering and vertical and horizontal projection are used. Chain code concept is used for character recognition. S. Hamidreza Kasaei [15] presented a real time and robust method of license plate detection based on the morphology and template matching.

III PROPOSED SYSTEM

The proposed presents an approach based on simple but efficient morphological operation and Sobel edge detection method. This approach is simplified to segmented all the letters and numbers used in the number plate by using bounding box method.

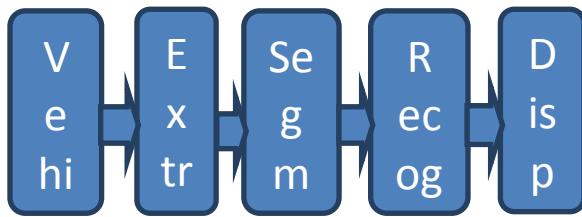


Fig. Proposed block diagram

Image Acquisition

The first step is to acquire the image of vehicle. Image is acquired by a high resolution digital camera. Images are acquired in different illumination conditions and in different background. Figure 4 shows the input vehicle image.



Fig. input vehicle image

Pre-Processing

In basic aim of pre-processing is to improve the contrast of the input image, to reduce the noise in

the image, hence to enhance the processing speed. In pre-processing RGB image is converted into gray level image and then into binary image. The contrast enhancement is done by histogram equalization, contrast stretching etc. Various filters are used to remove noise from the input image. In the proposed approach for number plate extraction, the input image is enhanced by applying adaptive histogram equalization technique and noise is removed by iterative bilateral filtering.

1) *RGB to Gray Scale Conversion:* The captured input image is RGB format. The first step of preprocessing is to convert RGB image into grayscale image. The basic purpose of applying color conversion is to reduce the number of colors. The R, G and B components are separated from 24-bit color value of each pixel (i, j) and 8-bit gray value is calculated. Fig. shows the gray scale image.

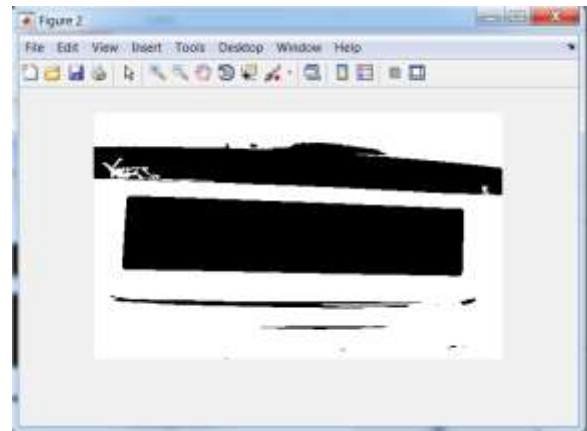


Fig.2 Grey image

Image Binarization

In this operation the subtracted gray scale 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 gray scale image is converted into black and white image by using function *im2bw*.

Edge Detection by Sobel Operator

Vertical edge is detected by sobel operator and result of applying sobel operator to binarized

image is shown in Fig. In this step firstly dilation operation is used and after this holes are filled by using MATLAB toolbox imfill function. The result of dilation operation and after filling holes function

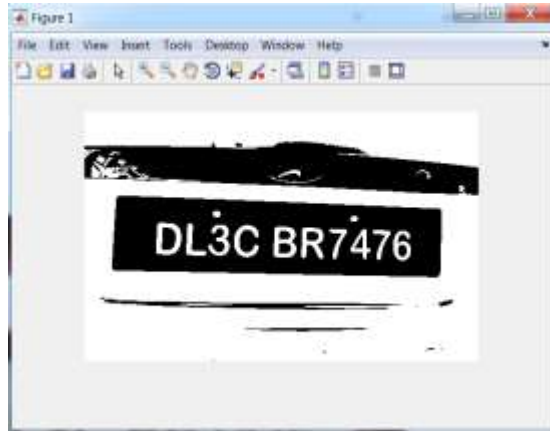


Fig. number extraction

The extracted number plate may consist of various noise or unwanted holes. So enhancement of plate region is done.

IV CONCLUSION

A simple and efficient number plate extraction method is presented in this paper. The proposed method is mainly designed for real-time Indian vehicles number plate but it also works well for foreign number plates. By using method we have extracted number plate area from image of vehicle. This extraction process is tested over more than one number plates of vehicles under different illumination and various weather conditions i.e. daytime, night time, rainy days, cloudy, sunny etc and success rate achieved by using this method is good. In future, the extraction of number plate is done in video-based ANPR.

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