Vehicle Number Plate Recognition Using OCR Techinique

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Abstract- Number Plate Recognition (NPR) is a special form of Optical Character Recognition (OCR). ANPR is an image processing technology which identifies the vehicle from its number plate automatically by digital pictures. In this paper we have presented an algorithm for vehicle number identification based on Optical Character Recognition (OCR). OCR is used to recognize an optically processed printed character number plate which is based on template matching. This algorithm is tested on different ambient illumination vehicle images. OCR is the last stage in vehicle number plate recognition. In recognition stage the characters on the number plate are converted into texts. The characters are then recognized using the template matching algorithm.

I. INTRODUCTION

Number plate recognition is a form of automatic vehicle identification. A number plate is the unique identification of vehicle. It is an image processing technology used to identify vehicles by their own number plates. Real time number plate recognition plays an important role in maintaining law enforcement and maintaining traffic rules. It has wide applications areas such as toll plaza, parking area, highly security areas, boarder's areas etc. Number plate recognition is designed to identify the number plate and then recognize the vehicle number plate from a moving vehicle automatically. Automatic number plate recognition has three major parts: vehicle number plate extraction, character segmentation and Optical Character Recognition (OCR). Number plate extraction is that stage where vehicle number plate is detected. The detected number plate is pre-processed to remove the noise and then the result is passed to the segmentation part to segment the individually characters from the extracted number plate. The segmented characters are normalized and passed to an OCR algorithm. At last the optical character information will be converted into encoded text. The characters are recognized using Template matching. The final output must be in the form of string of characters.

II. DIGITAL IMAGE PROCESSING

Image processing is a method to convert an image into digital form and perform some operations on it, in order to get an enhanced image or to extract some useful information from it. It is a type of signal dispensation in which input is image, like video frame or photograph and output may be image or characteristics associated with that image. Usually Image Processing system includes treating images as two dimensional signals while applying already set signal processing methods to them Information carrying function of time is called signal. Real time signals can be audio or video (image) signals. Still video is called an image. Moving image is called a video. Difference between digital image processing and signals and systems is that time graph is not there in DIP. X and Y coordinates in DIP are spatial coordinates. Time graph is not there because photo doesn't change with time.
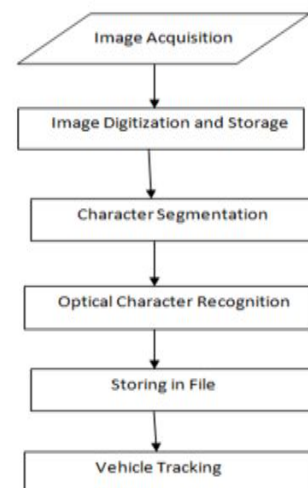
OCR MODEL FLOW CHART

Figure . OCR Model

OPTICAL   CHARACTER   RECOGNITION TECHNIQUES

Various techniques are determined that have been proposed to realize the center of character recognition in an optical character recognition system. Optical character recognition is a process where the computer understands automatically the image of handwritten script and transfer into classify character.Pattern recognition has three main steps: observation, pattern segmentation, and pattern classification. Optical Character Recognition (OCR) systems is transforming large amount of documents, either printed alphabet or handwritten into machine encoded text without any

transformation, noise, resolution variations and other factors.

Off-line handwriting recognition is more difficult, as different people have different handwriting styles. But, in the on-line system, On-line character recognition deals with a data stream which comes from a transducer while the user is writing. The typical hardware to collect data is a digitizing tablet which is electromagnetic or pressure sensitive. When the user writes on the tablet, the successive movements of the pen are transformed to a series of electronic signal which is memorized and analyzed by the computer.
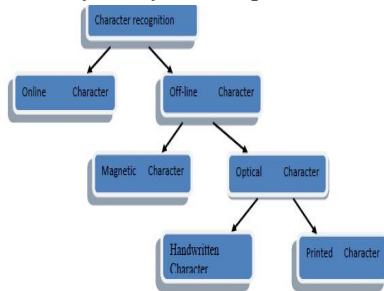

Fig. OCR Techniques

Optical Character Recognition (OCR) is a field of research in pattern recognition, artificial intelligence and machine vision, signal processing. Optical character recognition (OCR) is usually referred to as an off-line character recognition process to mean that the system scans and recognizes static images of the characters. It refers to the mechanical or electronic translation of images of handwritten character or printed text into machine code without any variation.
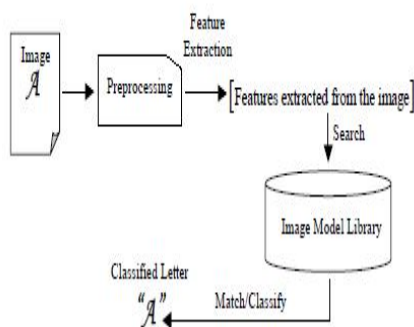

Fig. Block Diagram Of OCR Process

III. PROPOSED APPROACH

The methodology for this study consists of three major stages. The stages are pre-processing, segmentations and matching process. The pre-processing stage includes the processing of the raw image which is captured by using digital camera until obtaining the specific part of an image. Next step is the segmentations process where the process used for detecting characters on the image of plate number. Finally,

matching process is applied to recognize the character from the extracted image with the real characters. The basic process of image processing technique is depicted by block diagram in Fig.
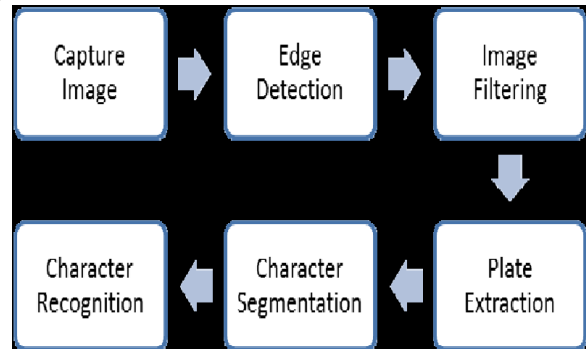

Fig Block Diagram of Proposed approach

COLLECTION OF IMAGE

In this study, 50 samples of image captured using digital camera will be collected and checked for the quality of the samples such as clear image, less disturbance and good view of image. Then, the images were divided into two groups; 35 images of black background of vehicle plate, meanwhile, 15 images of white background of vehicle plate as illustrated by Fig 1and Fig 2 If the image is accepted, the image will be analyzed in MATLAB by applying image processing technique. If the image is rejected, a new image will be taken. The process will be continuous until obtaining a good image before proceeding to the next steps. In order to process image, image processing toolbox will be used for pre-processing and filtering image.

Fig. The vehicle plate number with black background

Figure .The vehicle plate number with white background

PRE-PROCESSING OF IMAGE

The image originally in RGB format of colour will be converted to black and white format. It will help in identifying the selected region of vehicle plate and minimize the number of colour used in the image. After filtering the image, the plate number will be identified byve using segmentation technique. The purpose of this step is to recognize the character of vehicle plate. Some features will be extracted to obtain accurate character recognition. In pre-processing digital image, the colour (RGB) image was converted to gray code first before converting the image into black and white in order to minimize the number of colours used for each image. Next, the black pixel of number plate image will be searched. Then, image will be filtered against noise distortion. In the preprocessing stage, the purpose of applying colour conversion is to reduce the number of range of the colour scale from (0-255) to (0-1). The pixel size of digital image is 640 x 480 pixels.

FILTERING OF IMAGE

After converting the colour image to binary image, the filtering technique is implemented to the black and white (BW) images. Mexican Hat filtering is selected to filter and remove noise and distortion on the images. Here, the size of the filter is set to 9 x 9 since size of samples is 640 x 480 .The Mexican Hat filter was also known as Laplacian of Gaussian (LoG) to a 2-D image or to 3-D volume. The fast implementation was employed. It is a perfect tool to enhance spots, like spherical particles, in noisy images. This module is easy to tune, only by selecting the standard deviations in X, Y and Z directions.

EXTRACTION OF IMAGE

Then, an image extraction of vehicle plate is performed to extract the desire features from the filtered image. In order to implement it, the cropping method in MATLAB is employed.

CHARACTER SEGMENTATION

In character segmentation, bounding box technique is applied to detect any characters in the images. Each segment in the plate is counted and represented one by one in the different figure.

TEMPLATE MATCHING

A list of templates is stored in the databases. There are two databases, one for alphabet, and the other for numeric characters. These templates are chosen from the isolated characters. There are two to three templates for each character. They are in high quality and have outstanding features. The first two isolated characters are compared with the templates stored in the alphabet database the last three to four isolated characters are compared with the templates stored in the numeric database. We measure the degrees of matching between the isolated character and each of the stored templates, and select the highest degree of match. The maximum value of 2D correlation is equal to 1.

The template matching in character recognition is applied to recognize each letters in the figure. The method is called OCR. It is the mechanical or electronic conversion of scanned images of handwritten, typewritten or printed text into machine-encoded text. The results are displayed in notepad in term of text.

Fig.Templates Used for Template Matching

IV. EXPERIMENTAL RESULTS

The following figure shows the experimental results of the project "VEHICLE PLATE RECOGNITION USING OCR TECHNIQUE". The input image taken for the experiment is colored number as shown in the figure.This image is now converted into grayscale image as shown in

figure.To eliminate the noise and to acquire the required image median filter is used and resultant is as shown in figure.

To recognize the number plate of the vehicle the edges are to be detected by performing various edge detection methods we will get the image as shown in figure. later on for proper detection of alphanumeric symbols the edges and holes are filled and resultant images are as shown in figures. Thus these alphanumeric codes are compared with the templates and number plate is recognized as shown in fig .

Fig . Input Image Used

Fig. Grayscale Image Of The Input
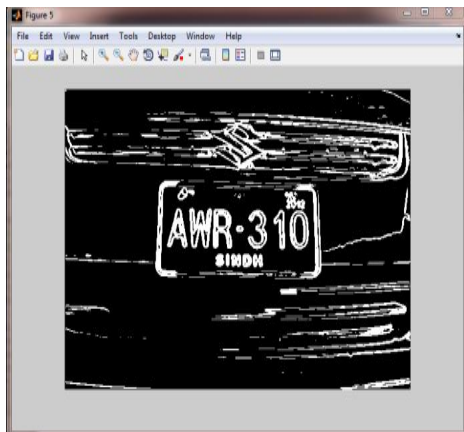

Fig.Image After Morphological Operations

Fig.Image High Lighting The Edges

Fig.Image After Thinning the input to ensure character isolation

The final result of vehicle plate recognition system is shown in Fig. below:

APPLICATIONS

1. Parking:-The NPR is used to automatically enter prepaid members and calculate parking fee for nonmembers.
2. Access control:-A gate automatically opens for authorized members in a secured area, thus replacing or assisting the security guard.
3. Tolling:-The car number is used to calculate the travel fee in a toll-road or used to double check the ticket.
4. Border Security:-The car number is registered in the entry or exits to the country and used to monitor the border crossings.

V. CONCLUSION

In this project, the accuracy of the OCR technique is checked and evaluated. At first plate location is extracted using morphological operation then separated the plate characters individually by segmentation. The Template matching affects the accuracy of number plate recognition. It is found that there are some factors which affect the effectiveness of template matching based on OCR technique i.e. font type, noise in image, tilting etc. In future the work can be done on these factors and efficiency may be increased further for better results.

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