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Automated Number Plate Verification System based on Video Analytics

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Abstract - *In almost all the place traffic surveillance is done in a wider range, it is a technology that is used in order to provide more safety to the people along with providing smooth management of traffic. In this paper, the focus was on the surveillance recording to extract number plate of a vehicle from a live video and process the obtained result. In this paper Templates matching algorithm is used. In this algorithm as and when the image is passed for obtaining the number plate the image is filtered, after this the image is converted to grayscale. MATLAB works very fast with grayscale images as compared to RGB image; it performs region-based operations to draw the boundary boxes around the characters. Further, it tries to record the characters regions in a processed binary image and with the help of template matching the output is obtained as a set of string. Once the string is achieved the obtained string is further matched with the set of stored number plate to check the valid registration of the vehicle.*

Key Words: Vehicle number plate, Image Acquisition, optical character recognition, Gray Processing, Template Matching.

1. INTRODUCTION

Increasing number of vehicle on road each day made us think about the possible way of monitoring and handling the huge moving traffic in a proper way to avoid long queues. There were many technologies that were developed as the need arises to reduce the human effort. With the evolution of atomizing the services there evolved the need for reducing the time taken to stop a vehicle either at tollgate, car parking or at tunnels. Since all over the globe each vehicle has been provided with the unique number that has to be displayed on the number plate and this makes it easy to obtain the further more information about the vehicle.

There are several methods proposed to detect, extract, or match the number plate of a vehicle. Pattern matching is a technique of checking and locating of specific sequences of data of some pattern among raw data. The pattern matching is one of the most fundamental and important technique in several programming languages. Many applications make use of pattern matching as a major part of their tasks. In this paper number plate extraction and pattern matching technique has been used to extract the information from the number plate image. The extracted information is converted to text format and stored in a database. Automated number plate verification system (ANPVS) are used for the purpose of effective traffic control and security applications such as access control to restricted areas and tracking of wanted vehicles can also be performed.

ANPVS is an easier method for Vehicle identification. Experimentation of number plate detection has been conducted from many years; it is still a challenging task. Number plate detection system investigates an input image of vehicle number plate and extracting that number plate number from the character region and later we store the obtained string in a database. In parking, with the help of number plates, we can calculate the duration of parking. When a vehicle enters an input gate, the number plate is automatically recognized and stored in the database. In this paper, templates matching algorithm have been used. The algorithm takes an input image of the number plate and performs region based operations on it after filtering the image for noise. Further, it tries to capture the characters regions in a processed binary image and with the aid of template matching outputs the string of number plate

2. LITERATURE SURVEY

S. Kranthi, K. Pranathi, A. Srisaila, [2] proposed two algorithms that are Edge Finding Method and Window Filtering Method for number plate detection system. Image of vehicle number plate is captured and processed. A drawback in this algorithm is that it is very slow and cannot detect if number plate colour matches with vehicle color. Bo Li, Bin Tian, Ye Li, and Ding Wen [3] proposed Novel algorithm for license plate detection in the complex scenario, specifically for the traffic surveillance environment throughout the day. Their work mainly focused on component-based models for object detection. The drawback of their paper was that the detection was possible only during daytime. Chitode J.S [4] proposed an algorithm which is based on morphological operations and area criteria test used for number plate recognition. Recognition of characters in number plate is done with the optical character. Ronak P Patel [5] proposed an algorithm for recognition number plate using algorithms such as Thresholding operation and Morphological operation. To extraction number plate Edge detection and boundary, box analysis was used. The drawback of the design was that it used a lot of algorithms which made the whole system slow and yet not able to detect different colors of number plates. Rupali Kate [6] proposed an algorithm based on morphological operation with a number of area criteria tests for the number plate recognition. Character segmentation was used and Template matching was used for character recognition. Sarbjit Kaur,

Sukhvir Kaur,[7] proposed an algorithm based on morphological operations for number plate recognition, thresholding was used to detect the text region, Sobel vertical edge detection and connected component analysis was used to identify the characters. The input image is firstly preprocessed using an iterative bilateral filter and adaptive histogram equalization is done to achieve the threshold value.

3. SYSTEM DESIGN

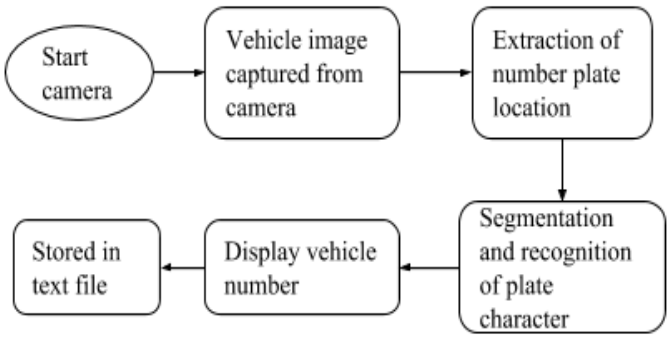

Fig -1: Block Diagram of Automated Number Plate Verification System

4. PROPOSED METHODOLGY

4.1 Image Acquisition

Capture the image from the digital camera or the surveillance camera which is stored in the form of JPEG in storage.

Fig – 2: Database

4.2 Pre-processing:

The next step after capturing the image is the preprocessing of the image. When the image is captured there is lot of disturbances and noises present in the image for which the image can't be used properly. So in this step the noises from the image are required to be cleared to obtain an accurate result.

- **Gray Image:** this step involves the conversion of image in to Gray levels. Color images are converted in to Gray image. According to the 'RGB' value in the image, it calculates the value of gray value, and obtains the gray image at the same time.

Fig -3: Grey Scale Image

- **De-Nosing:** media filtering is the step to remove the noises from the image. Gray level cannot remove the noises. So to make image free from noise media filtering is used.

- **Dilated image:** Using dilation extra portions of the image is removed or dilated. Pixels those are beyond the image border should be removed and are assigned the minimum value that is supported by the data type. For binary images, the same pixels are set to 0. For grayscale images, the minimum value for uint8 images is 0. To dilate an image, use the imdilate function. The imdilate function accepts two primary arguments:

  - The input image to be processed (grayscale, binary, or packed binary image)
  - A structuring element object, returned by the strel function, or a binary matrix defining the neighbourhood of a structuring element. In this paper, a grayscale image is dilated.

Fig - 4: Dilated Image

- **Image Binarization:** An image containing only black and white pixels. Converted to binary format from grey scale image for getting more accurate results in the feature extraction stage

Fig -5: Binarized Image

4.3 NUMBER PLATE IDENTIFICATION

- **Number Plate region extraction:** The most important stage is the extraction of number plate from eroded image significantly. The extraction[16] can be done by using image segmentation method. There are numerous image segmentation methods available in various literatures. In most of the methods image binarization is used.

- **Character segmentation:** In this step get the o/p of extracted number plate using labelling components, and then separate each character and split the each and every character in the number plate image by using split and also find the length of the number plate, [17] then find the correlation and database if both the value is same means it will generate the value 0-9 and A - Z, and finally convert the value to string and display it in edit box, and also store the character in some text file in this code. Segmentation algorithm.

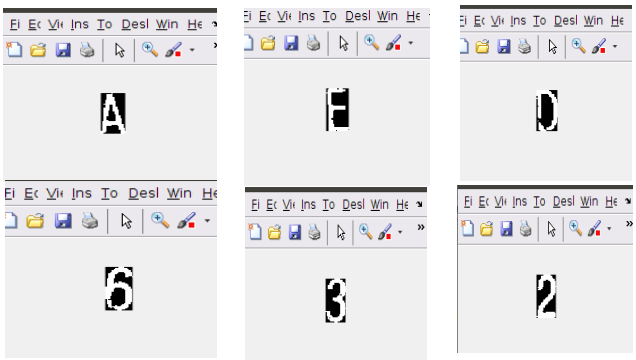

Fig -6: Character Segmentation

- **Extraction of character location:** At this stage, number plate area is extracted from the entire preprocessed image. This step reduces the processing burden on next stage of identification of numbers from license plate area.

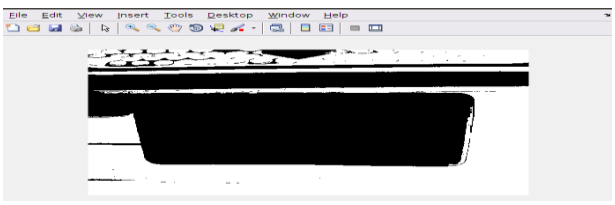

Fig -7: ROI for Character Location

- **Bounding box, unwanted small objects removal and character segmentation:** Segmentation is an important process in recognizing the number plate because all the steps that are to be executed depend on it. If the segmentation fails, a character can be wrongly divided into multiple pieces or multiple characters. The unique solution to this problem is to use bounding box technique. The bounding box is used to measure the properties of the image region. Once a bounding box created over each character and numbers presented on the number plate, each character & number is separate out for recognition of number plate The result of the operation is shown in below figure.

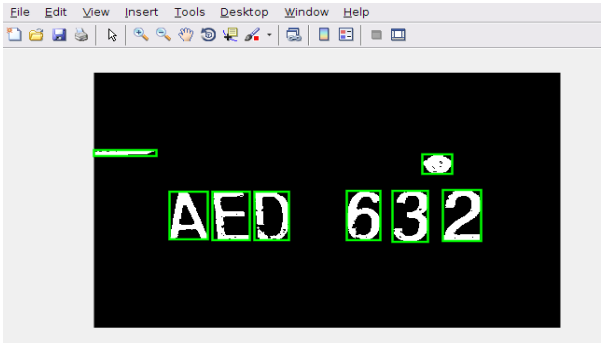

Fig -8: Bounding Box for Characters

- **Character recognition and Store the result:** After formulation of boundary boxes, each character in a boundary box is selected using Optical character recognition (OCR). The OCR actually uses correlation method to match the individual character on the number plate. The selected character is used to compare each individual character against the complete alphanumeric database using template matching. The matching process moves the template image to all possible positions in a larger source image and computes a numerical index that indicates how well the template matches the image in that position. Matching is done on a pixel by pixel basis. The template is of size 42 × 24 as shown in Fig. Since the template size is fixed, it leads to accurate recognition. After each character has matched a string is formed that is stored in string format in a database.

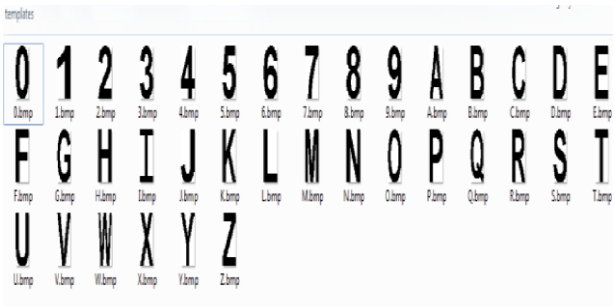

Fig -9: Database for Character Recognition

4.4 NUMBER PLATE VERIFICATION

- **Test Matching:** The string is then compared with the stored database for the vehicle authorization. The recognized number plate string is compared with the authenticated database file, if both values are same means it will display the vehicle is registered otherwise it will display vehicle is not registered

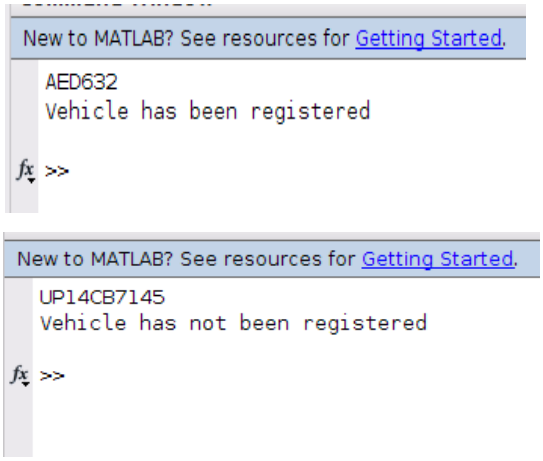

Fig -10: Number Plate Verification System

5. CONCLUSIONS

In this system, a thorough analysis of identification and verification of the number system is done and the results found to be promising. Application software is designed for the detection of the number plate of vehicles using their number plate. At first Number, plate location is identified and then extracted character is matched using template matching algorithm.

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