



PATTERN MATCHING AND ANALYSIS OF VEHICLE NUMBER PLATE IMAGES FOR NUMBER EXTRACTION USING TEMPLATE MATCHING AND NEURAL NETWORK AS HYBRID METHOD

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Abstract

In this research work main aim is to focus on to pattern matching and analysis of image for vehicle's number plate recognition using template matching and neural network as hybrid method. In this research work car images was tested by applying template matching algorithm neural network as hybrid method out of many images of vehicle's number plate recognition done correctly. Some of images are wrong result due to distance, image size, angle of view, condition of weather or illumination condition etc. pattern matching and analysis of number plate recognition system have many applications like payment of parking fees; toll fee on the highway; traffic monitoring system; border security system; signal system etc.

Keywords: Introduction, Proposed system, Experimental result and analysis

I. INTRODUCTION

Vehicle Number plates have been used for identification of vehicles all over the worlds. Vehicles have been identifying either not only manually but also automatically. Automatic vehicle identification is pattern matching technique of identify vehicles by their number plates. Automatic vehicle identification systems are used not only effective traffic control but also security applications such as access control to restricted areas of parking and tracking of wanted vehicles at various place. Number plate recognition is best method for Vehicle identification. Number plate recognition system is difficult compared to the over other than Indian license plate as there is no standard

followed for the aspect ratio of license plate.

The pattern matching and analysis of number plate task is challenging because of the nature of the light. Experimentation of pattern matching and analysis of number plate detection has been conducted from last seen year; it is still a challenging task. Number plate detection system passes an input image to identify some local patches of images containing license plates. Since a plate can present anywhere in an image with various sizes, it is used to check every pixel of the image to locate it. In parking area, number plates are used to calculate duration of the parking at various places across world. When a vehicle enters an input gate, number plate is automatically recognition by various methods.

II. LETURATURE SURVAY

There are various methods to pattern matching and analysis of image for number plate recognition system as Shan Du. [1] proposed a car number plate recognition system. This system has different color image inputs of a car and the output given the registration number of that car. The system has three main steps to get output as desired information. Those are categories as plate localization, character segmentation and character recognition. First step is the input number of plate is extracted from the original image, and then the characters from it are isolated, and finally output as each character is recognized. The algorithms was developed using a set of training images. This system uses edge detection technique to detect the „region of interest“, where the number plate can be occurred. Then some morphological operators are applied to detect the number plate.

Chengpu Yu [2] presents input as vehicle license plate extraction algorithm on basis improved Roberts's detector and morphological operation. In Roberts's operator added two direction template was compensate not only the breaks of the edge but also make it fully connected together. Then detect edge by using selecting the appropriate threshold for Roberts's operator was utilize morphological analysis of input image to obtain candidate regions of license plate, performed analyze candidate regions on connected component, finally position plate region. The experimental results was that algorithm can well suppress the impact of noise on the detection of the target area in the image, but also required shorten the time of license plate location, valid license plate positioning along with valid output.

III. EXISTING METHOD

Proposed method was extract Korean license plate based on different color of the plate. In this method neural network was used for extracting color of a pixel by HLS values of eight neighboring pixels and a node of maximum value is chosen as a representative color. Comelli et. al. [3] proposed a method which first applies two neural network-based filters to input color image, it was used a post-processor to combine the two filtered images in order to locate license plates. Kim et. al. [4] was presented a vehicle number plate recognition system. It consists of three modules, each of which is an integration of different vision technologies. One of is the car extraction module which detects car in given image sequence. Tianding Chen [5] proposed a character localization method for color images. The method operates directly on the compressed image used discrete wavelet transforms, neural networks. new and fast vertical edge detection algorithm (VEDA) is proposed for license plate extraction. VEDA given that it is faster than Sobel operator by about seven to nine times. The block-based method was presented in the literature. In [6], blocks with high edge magnitudes are identified as possible license plate areas. Since block processing does not depend on the edges of the license plate. ALPR recognizes a vehicle's license plate number from an image or images taken by either a color, black and white, infrared camera. It was fulfilled by the combination of a lot of techniques, such as object detection, image vision, and pattern recognition. ALPR of number plate is also known as

automatic

IV. PROPOSED SYSTEM

Pattern matching and analysis of image for Indian vehicle's number plate recognition using template matching method. Template matching is a method that compares portions of images to one other image. Sample of image may be used to recognize similar objects in the source image. The matching process moves the template image to all possible position in a larger source image to all possible positions in a larger source image. Matching is done on a pixel by pixel basis. Template size is fixed and it leads to inaccurate recognition. The ALPR system that extracts a license plate number from input given image has been composed of four stages [7]. The first stage is to acquire the car image using a camera. The parameters of the camera, such as the type of camera, camera resolution, shutter speed, orientation, and light. The second stage of proposed research work to extract the license plate from the image based on some features like boundary, different color, and the existence of the characters. The third stage is to segment the license plate and extract the characters by using their color information, labeling them, or matching their positions with templates. The fourth stage is to recognize the extracted characters by template matching or using different classifiers, such as neural networks, fuzzy classifiers.etc. Fig. 1 shows the structure of the ALPR process. The performance of an ALPR system depends on each individual stage. The purpose of this paper is to provide researchers with a systematic survey of last work done by other people ALPR research by categorizing existing methods according to the features they used, analyzing not only pros but also cons of these features, and comparing them in terms of recognition performance and processing speed.

Input Image (Image acquisition): Image acquisition is the process of obtaining an image from the mobile camera or scanner. This is the first step of any vision based systems. In my research i acquire the images using a digital camera. my aim is to get the frontal input image of vehicles which presents license plate. The remaining stages of the system works in offline mode. Gray scale image: After acquiring the image, the very next step is to derive the gray scale image. Binary image code to convert an image to a gray scale:

STEP1: Load input image as vehicle number plate

STEP2: Retrieve the properties of image

STEP3: Get access image data of vehicle number plate

STEP4: For each height and for each width of the image, convert image to gray scale by using average of r,g,b values of the image convert to gray scale manually

STEP5: Display output image after converting to gray scale.

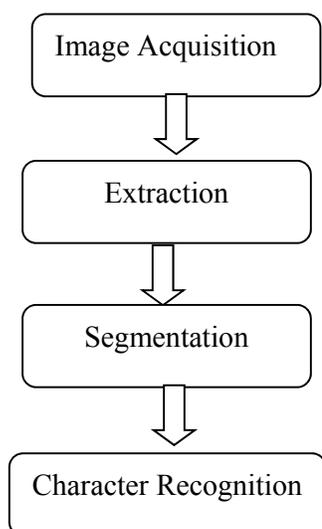
A) Preprocessing: Preprocessing is one of the most fundamental step to carry out on the image preorder to develop higher order algorithms. The image was transformed to gray scale and resized to 480 x 640 pixels to increase the speed of execution. **Gray scale Conversion:**

For every (i,j)th 24 bit RGB pixel, 8 bit Grayscale pixel is calculated by using R,G and B values and using the formula:

$$\text{gray}(i,j)=0.59*R(i,j)+0.30*G(i,j)+0.11*B(i,j)$$

Median Filter: Median filter is a non-linear digital filter used for removing salt and pepper noise from an image. It replaces the gray value of a pixel by using median of the gray values of its neighbours. We have used a 4x4 mask.

Fig 1 Proposed System



Proposed Algorithm:

Input: Vehicle number plate image

Output: Recognition of vehicle number plate

Step1: Input vehicle number plate image in RGB

Step2: Convert RGB to Binary image

Step3: Convert Binary image to Gray scale

Step4: Extraction

Step5: Segmentation

Step7: Neural network

Step8: Template matching method

Step9: Recognition of vehicle number plate

Comparison and Recognition

Pattern matching and analysis of number plate recognition system in which the segmented number or characters will recognize and converted into text for further processing. Pattern matching and analysis of number plate recognition involves different process like image as i/p, feature extraction, segmentation and template matching algorithm. Here the numbers or characters are normalized to as per standard number plate. Templates for numbers and characters are not only prepared but also normalized into blocks with no borders or white spaces that surround the characters as shown Fig.2 as per standard template of English alphabets and numerals. Similar process was used to segmentation the characters from i/p image. Each character OR number is matched with the according standard template using correlation method to measure the equality between images. Correlation coefficient value ranges from 0 to 1. The value 0 says minimum match and value 1 says maximum match. Feature extraction is the key step in ANPR system, which includes the correctness of the system significantly. The aim of in this phase, given an input image, is to produce a number of present regions, with high correct output of containing number plate and validate for true number plate.

Image Acquisition and Pre-processing In this system a high resolution of digital camera images are used to acquire an image. Images are resized to (648X 486). All the processing steps are executed on gray scale image. Pre-processing is mainly used to enhance to reduce the noise in the image. In order to solve the problem of input image as low quality but also low contrast in car images. Images of number plate as input are converted by using method gray scale image.

As given input of vertical edge detection the numbers or characters on given number plate region contain abundant edges as compared to background area of image. This feature is given for locating the plate area from the input image. Sobel vertical edge detection is used to find out the regions of image which have may present high pixel variance value [8]. To extract candidate number plate area from the entire image, threshold has been used to select rows which are having particular white pixel density.

Plate Area selection morphological operations used to remove unrelated objects in the image. Dilation and morphological are used to extract given plate areas from the total image. Many times background areas of number plate may also get declared as plate for recognition. So to remove the fake number plate validation is done using the aspect ratio of the plate and horizontal cuts [09] in the number plate.

Given number plate extraction after the detection of candidate number plate area, Bounding Box used to extract input plate area from the original image. From the Bounding Box analysis, respective row and column represents of plate area are found out. Once the indices of number plate are seen, the given number plate is extracted from original gray scale image.

The aim of feature vector of image is to define compare features of the characters or numbers. taking the most correct feature of each character can not only facilitate data visualization and data knowing, reduce the measurement of value , storage requirements for image, training, method and utilization time, particularly when the features of image are redundant.

Initially stage, the centroid of the character image is determined. With respect to centroid, number of operations along the axes, 0 to 1 and 1 to 0, up to the boundary of character or number have been counted. Transitions are specified according to axes with predetermined angles.

Character Segmentation: Segmentation is most important processes in the given input number plate recognition, so all further steps rely on it. If the segmentation fails, a character may be incorrectly divided into two pieces, or two characters can be improperly merged together. We can use a horizontal forecast of a number plate for the segmentation, or one of the more sophisticated methods, such as segmentation using the template matching. In this segmentation i use two types of segmentation: a. Horizontal segmentation b. Vertical segmentation. First i have been performed vertical segmentation on the number plate then the characters or numbers are vertically segmented. After performing vertical segmentation we have to perform horizontal segmentation by performing this i get character from the number plate.

Template matching algorithm: Template matching method block is used for matching the template image for process performed on with given image as input. The template image and the input image for pattern matching and analysis of number plate recognition for images are of same orientation and resolution. Size of template image must smaller than the input image. Template matching method belongs to Computer Vision System Toolbox, from analysis and enhancement library stored in disk. Port one of is used to input the input image and port two is used to input the template image. Output port deals the output as best not only match location but also template metric value.

A neural network is an information-processing capability that is influenced by the same way as the biological nervous system, like brain. ANN is composed of large amount of highly interconnected processing element and neurons. Every neuron has their local memory and the output of each neuron depends only upon input signal arriving at the neuron. The basic architecture of neuron layers are: input layer, hidden layer and output

layer. The information flows from input units to output units, strictly in a feed-forward manner. There is no feedback connection and data can be processed using multiple layers of units. The dynamical properties in feed forward of the network are important. In other applications, the significant changes due to output neurons activation, such that the transient behavior constitutes the output of the neural network. Some other artificial neural network architectures are adaptive resonance theory maps, Elman network, competitive networks, etc. depending on the properties and necessary condition of the application. [13] Individual weight is multiplied with every input neuron at the entrance. Intermediate section of neuron is a sum function which sums all weighted inputs and bias. At output side, transfer function is calculated using the summation of previously weighted inputs and bias is passed via activation function.

V EXPERIMENTAL RESULTS AND ANALYSIS

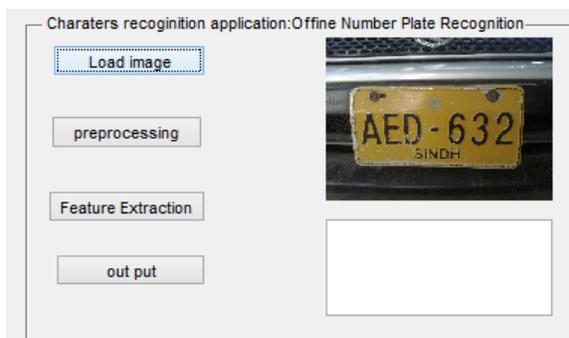


Fig.2 Load image

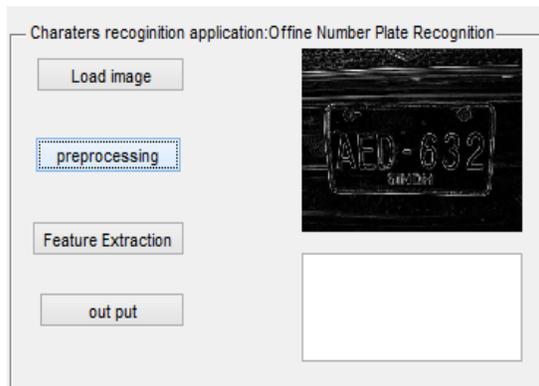


Fig.3 Pre-processing on load image of output

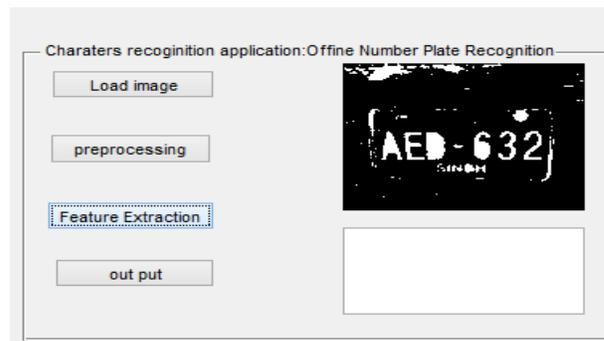


Fig.4 Feature extraction of number plate

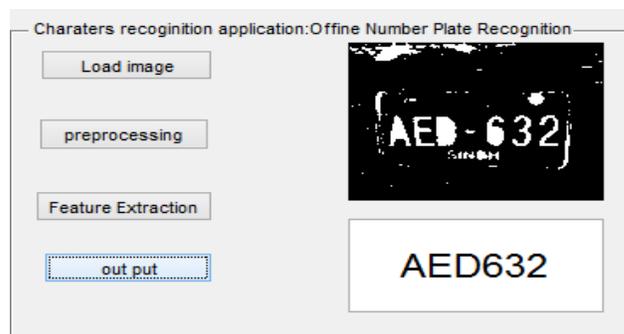


Fig.5 recognition of vehicle number plate.

As shown above figures pattern matching and analysis of vehicle plates recognition performed on various images and successfully recognition this system performed using template matching method.

Application of Number plate Recognition:

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.
5. Traffic Control :- The vehicles can be directed to different lanes according to their entry permits. The system reduces the traffic congestions and number of attendants.
6. Airport Parking :- In order to reduce ticket frauds or mistakes, the NPR unit is used to capture the number plate and image of the car [15].

VI CONCLUSIONS

I have implemented number plate recognition. Our algorithm successfully detects the number

plate region from the image which consists of vehicle number & then character segmentation, recognition. I have applied our algorithm on many images and found that it successfully recognition. An algorithm for pattern matching and analysis of vehicle number plate recognition system a) input image b) preprocessing c) feature extraction d) segmentation e) output is presented. The recognition rate achieved using neural network and template matching 100%.The false may recognition due to size, character shape, distance, camera angle etc.

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