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Real Time Vechicle Security System through Number Plate and Fingerprint Recognition

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ABSTACT: The use of vehicle is a must for everyone. In the same way, safeguarding the vehicle against theft is also very essential. Impediment of vehicle theft can be done remotely by an authorized person. A competent automotive security system is implemented using Number plate recognition and Fingerprint Recognition. The NPR (Number Plate Recognition) technique in a system design helps in recognition of number plate of vehicles. This system is based on the image processing technique. The objective is to design an efficient automatic authorized vehicle identification system by using the vehicle number plate and fingerprint recognition. The system is implemented on the entrance of a company parking area for security control. The developed system first captures the vehicle image. Vehicle number plate region is extracted using the image segmentation. Several techniques are used for Number recognition. The system is implemented and simulated in Matlab. There are two types of fingerprint systems: fingerprint verification and identification. We are going to use fingerprint verification system. Fingerprint verification is the process of accepting and rejecting the identity claim of a person using his/her fingerprint. If the fingerprint does not matches the one which is stored in the database means an alert message is sent to the security. This makes security for vehicle from unauthorized user.

I. INTRODUCTION

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. In imaging science, image processing is processing of images using mathematical operations by using any form of signal processing for which the input is an image, such as a photograph or video frame. The common steps in image processing are image scanning, storing, enhancing and interpretation. In this modern age there is rapid increase in number of vehicles and so Is the number of vehicle theft attempts, locally and internationally? With the invention of strong stealing techniques, security are in fear of having their vehicles being stolen from common parking area or from outside their home. Thus the protection of vehicles from theft becomes important due to insecure environment. Real time vehicle security system based on computer vision provides a solution to this problem. The proposed vehicle security system performs image processing based real time user authentication using fingerprint as well as number plate recognition techniques. The use of vehicle becomes important everywhere in the world and also preventing it from theft is required. Vehicle manufacturers are attaining the security features of their products by introducing advanced automated technologies to avoid the thefts particularly in case of vehicles.

In the proposed vehicle security system, the objective is to prevent the theft of vehicle using fingerprint

Number Plate Identification:

Number plates are used for identification of vehicles all over the nations. Vehicles are identifying either manually or automatically. Automatic vehicle identification is an image processing technique of identify vehicles by their number plates. Automatic vehicle identification systems are used for the purpose of effective traffic control and security applications such as access control to restricted areas and tracking of wanted vehicles. Number plate recognition (NPR) is easier method for Vehicle identification. NPR system for Indian license plate is difficult compared to the foreign license plate as there is no standard followed for the aspect ratio of license plate.

The identification task is challenging because of the nature of the light. 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 to identify some local patches containing license plates. Since a plate can exist anywhere in an image with various sizes, it is infeasible to check every pixel of the image to locate it. In parking, number plates are used to calculate duration of the parking. When a vehicle enters an input gate, number plate is automatically recognized and

stored in database. In NPR system spectral analysis approach is used were acquiring the image, extract the region of interest, character segmentation using SVM feature extraction techniques.

The advantage of this approach is success full recognition of a moving vehicle[1].It is difficult to detect the boundary of the Number plate from the input car images in outdoors scene due to colour of characters of the number plate and Background of the Number plate the gradients of the original image is adopted to detect candidate number plate regions.[2]. There are also algorithms which are based on a combination of morphological operation, segmentation and Canny edge detector. License plate location algorithm consist of steps like as Edge Detection, Morphological operation like dilation and erosion, Smoothing, segmentation of characters and recognition of plate characters are described.

Fingerprint Introduction

Biometric systems operate on behavioral and physiological biometric data to identify a person. The behavioral biometric parameters are signature, gait, speech and keystroke, these parameters changes with age and environment. However physiological characteristics such as face, fingerprint, palm print, and iris remains unchanged throughout the lifetime of a person.

The biometric system operates as verification mode or identification mode depending on the requirement of an application. The verification mode validates a person's identity by comparing captured biometric data with readymade template. The identification mode recognizes a person's identity by performing matches against multiple fingerprint biometric templates. Fingerprints are widely used in daily life for more than 100 years due to its feasibility, distinctiveness, permanence, accuracy, reliability, and acceptability.

II. LITERATURE SURVEY

Fingerprint-based access control and identification apparatus

This paper concentrates on the authentication based on fingerprint access. Though it serves and helps in many applications, it has shortcomings as other security system based on biometrics. The fingerprint can be easily hacked using scratch or glass cards. By hacking the fingerprint can easily access the system or the owner's properties. If there is any problem or change in biometric, it fails to authenticate. So, we are proposing a paper by overcoming the problems in finger-print authentication. Automatic Number Plate Recognition (ANPR) is an image processing technology which uses number (license) plate to identify the vehicle. The objective is to design an efficient automatic authorized vehicle identification system by using the vehicle number plate. The system is implemented on the entrance for securitycontrol of a highly restricted area like military zones or area around top government offices e.g. Parliament, Supreme Court etc. A PC based number plate recognition system is presented. Digital gray-level images of cars are thresholded using the Niblack algorithm, which was found to outperform all binarization techniques previously used in similar systems. A simple yet highly effective rule-based algorithm detects the position and size of number plates. Characters are segmented from the thresholded plate using blob-colouring, and passed as 15/spl times/15 pixel bitmaps to a neural network based optical character recognition (OCR) system.

Chaotic hash-based fingerprint biometric remote user authentication scheme on mobile devices

This paper presents an efficient and practical chaotic hash-based fingerprint biometric remote user authentication scheme on mobile devices e.g. cell phone and PDA. Our scheme is completely based on the new family of one-way collision free chaotic hash functions, which are much efficient than modular exponentiation-based authentication schemes e.g. RSA. computational costs and efficiency are not suitable for the practical implementation in the real environment. It has more problems in user authentication.

III. EXISTING SYSTEM

3.1. NUMBER PLATE RECOGNITION

The car number plate detection is given briefly in this section. In car number plate was detected in various types. There are seven primary algorithms that the software requires for identifying a license plate:

1. Plate localization – responsible for finding and isolating the plate on the picture.
2. Plate orientation and sizing – compensates for the skew of the plate and adjusts the dimensions to the required size.
3. Normalization – adjusts the brightness and contrast of the image.
4. Character segmentation – finds the individual characters on the plates.
5. Optical character recognition.
6. Syntactical/Geometrical analysis – check characters and positions against country-specific rules.

7. The averaging of the recognized value over multiple fields/images to produce a more reliable or confident result. Especially since any single image may contain a reflected light flare, be partially obscured or other temporary effect.

Steps 2, 3 and 4: The license plate is normalized for brightness and contrast, and then the characters are segmented to be ready for OCR.
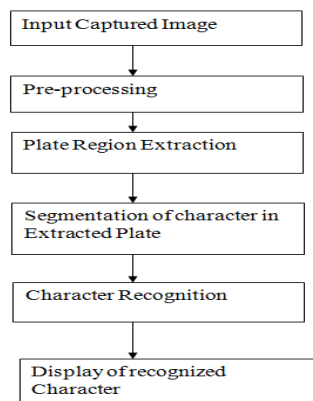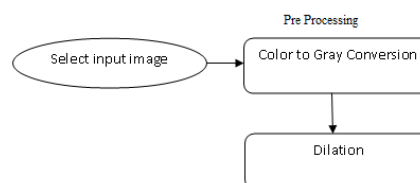
NUMBER PLATE RECOGNITION

Fig. 3.1 Flowchart showing license plate detection algorithm in MATLAB.

IV. PROPOSED SYSTEM

The step by step process of car plate detection and fingerprint recognition are given below:

IMPLEMENTATION OF LICENSE PLATE DETECTION AND FINGERPRINT RECOGNITION

Initial stage, to kept car plate image from the camera. Then this image are given to the preprocessing stage.

The preprocessing stage consists of two methods. It is given below:

4.1Pre-processing Image

To increase the performance of the system preprocessing of the input image is required. This phase involves two steps:

     1.RGB to gray scale conversion
     2.Noise reduction

4.1.1. RGB to gray scale conversion:

Gray scale conversion technique is used to convert the color image captured by the digital camera to the gray scale image. The function used for gray scale conversion is rgb2gray ().


Fig.4.1a. Grayscale

4.1.2. Noise reduction:

The noises in the original image are unavoidable. To eliminate the noises the filter used here is the median filter as shown in fig.6. The vehicle license plate presents the salt and pepper characteristics. To remove such noise the median filter is the best choice. The function used ismedfilt2 ().

Fig.4.1b. Image after applying median filter

4.2. PLATE REGION EXTRACTION AND SEGMENTATION
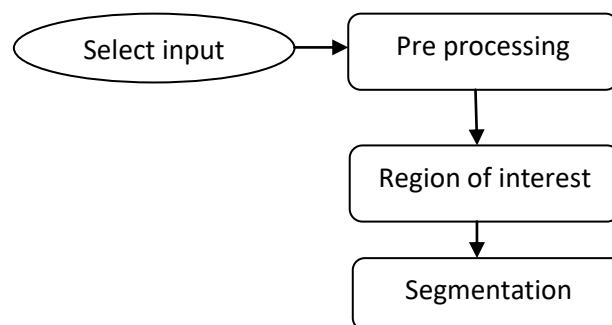
4.2.1. LICENCE PLATE DETECTION

The detection is the most challenging task as the license plate is incorporated in a small region of the whole image and can resist anywhere in the image. Color, rectangular shape and presence of characters are some such features. Given an input image, the main target of the detection is to mark an area with maximum probability of having number plate and validate for true number plate. This phase involves two steps:

    i.   Edge detection
    ii.   Plate extraction

Edge detection:

Canny edge detection method is applied to the preprocessed image which highlights all the edges from the image. The resultant image after applying canny edge detection method is a binary image with edges highlighted. Matlab inbuilt function for this by, Y=edge (x,'canny'); Where: x is the image on which canny method is applied is the edge detected image. The fig.5 shows the image obtained after applying canny edge detection method.

Fig.4.2.a.1. Image after canny edge detection.

PLATE EXTRACTION

In this step, we will extract all the connected components in the image and fill all the holes in the image. A hole is the connected component whichcannot be reached by filling the image with background color. All the holes are filled with white color. The Matlab in-built function used is:

$$y = imfill(x,'holes');$$

Use the connectivity property to obtain the exact position of the number plate. Matlab has a function regionprops() using which the desired component with the area (say >2000 pixel) can extracted. The function used to extract the plate region is y=regionprops (x,'Area','PixelList')

(a)   (b)

Fig.4.2.a.ii: (a) Filled image   (b)Detected license plate

4.2.2. Character Segmentation
The most important and difficult phase of the plate recognition system is the character segmentation. The character segmentation task is difficult to some extend due to some factors such as noisy image, frame of a plate and illumination variance. The most essential task in computer vision and object recognitions is object segmentation. Usually the objects in the image having the same texture or color are grouped together.

Algorithm is as follows:
   a).Apply morphological operation imerode() and imdilate().
   b).Subtract eroded image from dilated image using function imsubtract().
   c).Fill the holes in the image obtained from step 2.
   d).Use the function bwreopen() to extract the desired component.
   e).Finally use bounding box property of regionprops() function to place bounding boxes on the characters as
       shown in fig.7.

Fig.5.2.b. Segmented characters
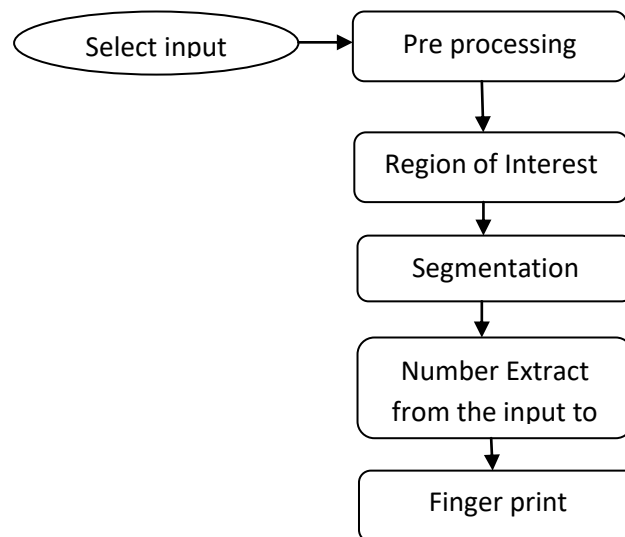
4.3. FINGERPRINT REGISTRATION

Fig.5.2. Fingerprint registration

After the character segmentation process, the characters are ready to store the database. Then the fingerprint reader asks to a person fingerprint for the registration. If a person give him fingerprint then finally segment characters, which means car numbers and the person fingerprints are stored in database.
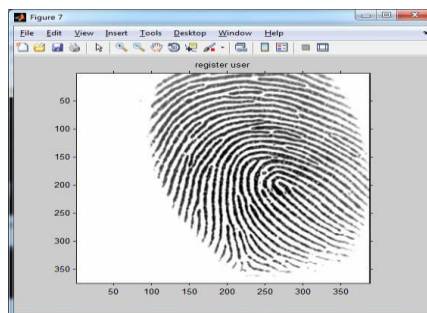

Fig.5.3. Fingerprint registration

4.4. VERIFICATION:

The OCR is now used to compare the each individual character against the complete alphanumeric database. The OCR actually uses correlation method to match individual character and finally the number is identified and stored in string format in a variable.
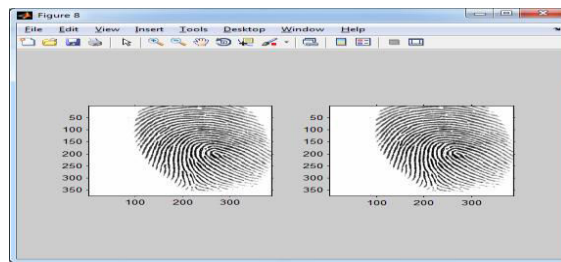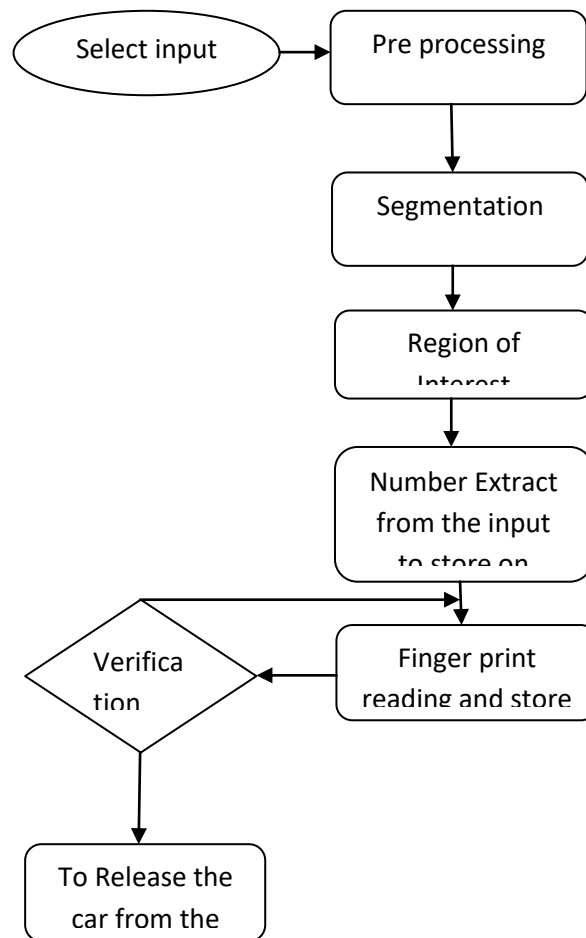
Fig.4.4. verification process

BLOCK DIAGRAM:

- The string is then compared with the stored database for the vehicle authorization then recognized number plate string is compare with authenticated database file, if the both value is same means it will display the authorized otherwise it will display the unauthorized.
- The resulting data is then used to compare with the records on a database. The system is implemented and simulated in Matlab .Next technique used by us for the vehicle security system is fingerprint recognition.

If the fingerprint does not matches the one which is stored in the database means an alert message is sent to the security. This enables the security to respond it by ringing the alarm which is fixed in the vehicle. This makes security for vehicle from unauthorized user.

4.5. Advantages:

- Vehicle number plate is extracted by using the image segmentation and Optical character recognition technique which is used for the recognizing the character.

- The system use series of image processing techniques for identifying the vehicle from the database stored in the PC.
- The MATLAB results shows that the system robustly detect and recognize the vehicle using license plate against different lightening conditions and can be implemented on the entrance of a highly restricted areas.
- The implementation works quite well and thus there is still room for improvement. The camera used in sensitive to vibration and fast changing targets due to the shutter long time.
- The system can be used on the entrance of restricted area like military zones, area around top government offices e.g. Parliament, Supreme Court etc.
- The system speed and robustness can be increase if high resolution camera is used.
- The OCR methods used in this project for the recognition is sensitive to misalignment and to the sizes, affine transformation can be used to improve the OCR recognition from different angles and size.
- The statistical analysis can also be used to define the probability of detection and recognition of the vehicle number plate

V. CONCLUSION

The task of recognizing some object in an image is none of the most difficult in the field of embedded systems. Car license plate detection is also a very interesting, finding license plate image from vehicle image. This chapter contains the output results of Car License Plate Detection algorithm and provides security for vehicle using fingerprint recognition .

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