Human Iris Authentication for Autonomous Vehicle

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Abstract

Security has been playing a key role in many places like offices, institutions, libraries, laboratories etc. in order to keep our information confidentially so that no unauthorized person could have an access on them. In modern era, security system doesn't stops with information alone but has extended to all fields of application viz., autonomous vehicles, machine authentication, automatic door system, etc. Finger print authentication and RFID are not used widely because they are still related to criminal identification. To overcome all the issues, this paper presents a design and implementation of a biometrically-controlled vehicle ignition system using iris recognition. Black iris is unique for every human and it can't be duplicated. Hence it is more efficient and reliable for authentication purpose. For providing perfect security and reliability this project takes help of three different technologies viz. embedded system, biometrics and image processing. Iris is sensed by sensor and is validated through image processing algorithms for authentication and the vehicle ignition is provided only for the authorized person.

Keyword: *SFTA, SVM, Curve Operator, IRIS, Anisotropic filter, Canny edge.*

I. INTRODUCTION

In today's world safety plays a major role in day to day life. The process of authentication portrays in many fields like military, navy, visa etc. Biometric, passport and card are the three major categories of authentication [1]-[3]. Biometrics is used to analysis and measure the statistical properties of human physical characteristics . This technology is mainly used for identification purposes and to provide security for important data and vehicle [4], [5]. The basic motto of biometric authentication is unique and it can't be duplicated [6]-[10]. Iris is one of the best methods among biometrics methods [11]-[13]. Behavioral qualities incorporate keystroke flow, signature design and physical attributes incorporate iris and confront acknowledgment [14], [15].

This paper presents IRIS detection and authentication verification through matlab software. Mat lab section in PC includes image acquirement, segmentation, feature extraction, classification and matching. In classification method live input image will compared with the database for finding the match. Segmentation is used for removing the unnecessary region from the acquired image. Further SIFT algorithm is used for feature extraction followed by classification through SVM. The paper is organized as follows. Section II discuss about the modeling of system with block diagram whereas section III explains about the results and discussion followed by conclusion in Section IV.

II. MODELING OF THE SYSTEM

The proposed system consists of raspberry pi microcontroller, PC, DC motor, LCD display and power supply module. PC is connected to microcontroller via RS232 serial cable. IRIS detection and authentication verification is done through matlab software. Matlab (PC section) includes image acquirement, segmentation, feature extraction, classification and matching. In database, the facial appearance of the eye is constructed. In the iris recognition system, accuracy of segmentation plays a major role. Hence the segmentation is performed to remove the iris part alone and its stored in database as region of interest. Image has to be smoothened to develop the accuracy and to remove the noise . Noise present in the image is to be removed by using Gaussian filter. Features of the iris are extracted by using feature extraction method and given for classification process. In classification method live input image will compared with the data base to find the match. If the input iris image is matched with the data base image then the ignition of the vehicle is achieved. Fig. 1 displays the block diagram of the proposed system with raspberry pi(B+) and Fig. 2 shows the matlab step-by-step processing of the iris image.

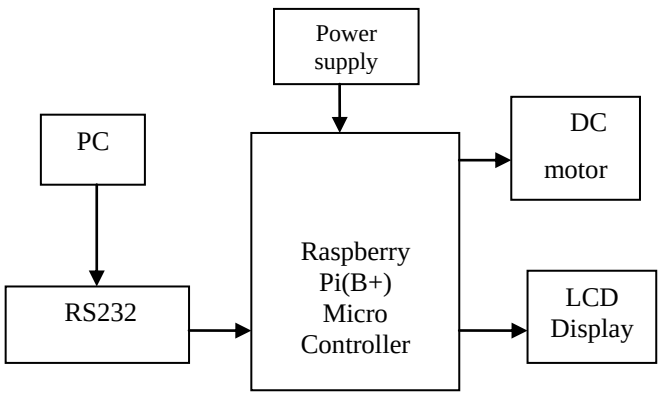

Fig. 1. Block Diagram of Proposed System

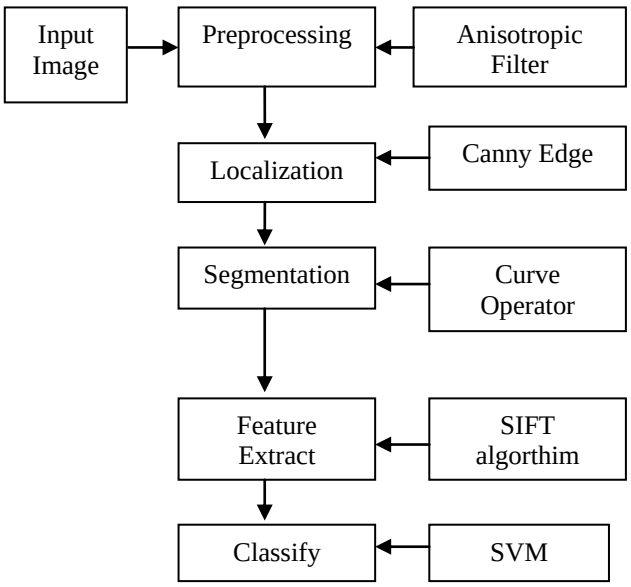

Fig. 2. Matlab Section

III. RESULTS AND DISCUSSION

Initially, Iris scanner is exploited for capturing the iris image of a person and the captured iris image is processed and stored in database. The dimension of the input image considered is 256*256 which is shown in Fig.3

A. Preprocessing with Anisotropic Filter

The aim of pre-processing is to improve the quality of the image data by suppressing undesired distortions. So that features of the image are enhanced and its relevant information is used for further processing and analysis task. Image preprocessing can be used for redundancy in images. If a distorted pixel is found in the image, then the pixel can be picked out from the image, it can be restored as an average value of neighboring pixels. This is known adaptive equalization which is shown in Fig.4 and Fig.5 represents the anisotropic filtered image.

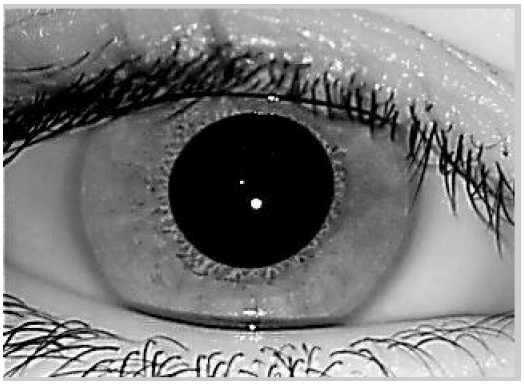

Fig. 3. Resized Iris Image

B. Localization-Canny Edge Method

The canny edge detection method is used to detect the edges around the iris area .In this method, first the Gaussian filter is used to remove the noise .Then compute gradient magnitude by partial derivatives and thin edges are detected by applying non suppression maxima.It is used to detect the edges of iris around the eye area by double thresholding .

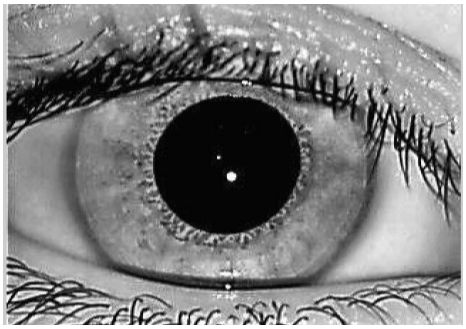

Fig. 4. Equalised image

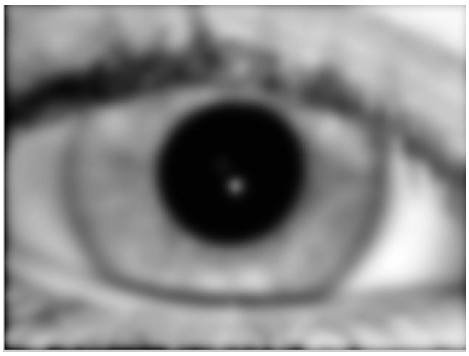

Fig. 5. Anisotropic Filtered image

C. Segmentation-Curve Operator

The segmentation is used to reduce the image. Segmentation is also useful in Image Analysis and Compression. In the proposed method, 'curve operator' is used to segmentation process of the image automatically. Curve operator is divided in two segments i.e. line and curve segment. This operator is also oriented with specific angles and pixel length. With the analysis of pixel intensity variation four points are predicted and furthermore validated to detect region. No background segmentation is used in this technique. From the input image we are going to segregate the region of interest, which is known as iris region. We are going to extract all this parameters by using siftwin32.exe software. The Fig.6&7 represents the segmented image and the region of interest respectively.

D. Feature Extraction-SFTA

Feature extraction a type of reduction in dimension and it is efficiently represents the features of the image. This approach is useful when the size of image is large or small. The reduced feature extraction can be used to compute for the image

retrieval.By using SFTA algorithm, from the image the parameters extracted are colour, texture, key point descriptor, shape, orientation and gradient.

E. Classifier-Support Vector Machine (SVM)

In SVM method, the decision boundary separates the authorized and unauthorized region .In the decision plane, the features are lie in the plane. If the more features matches with database image features then it will displays the authorized otherwise it displays as unauthorized .If the match is found ,Then the vehicle ignition is achieved .The SVM algorithm is used in supervised mode .

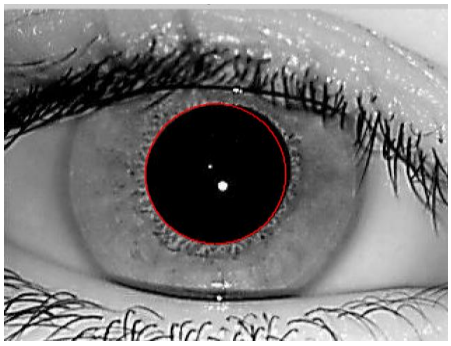

Fig. 6. Segmented Image

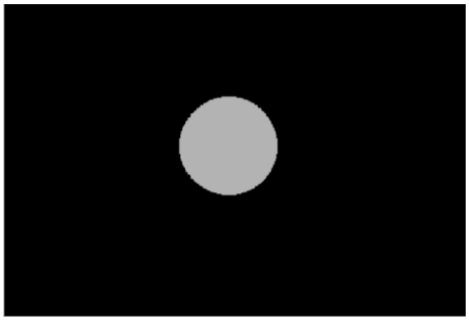

Fig. 7. Region of Interest

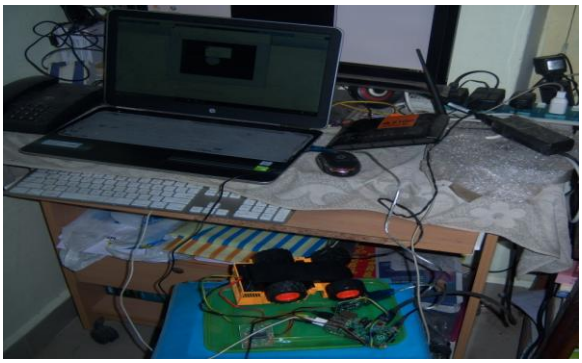

Fig. 8. Model Setup

IV. CONCLUSION

Generally available security systems such as palm verification, OTP, typing password through Keyboard and signature method are still related to criminal identification. Observations have revealed that the features of iris are unique as it never changes. The proposed system enhances the security of vehicle in a cost efficient way and can be implemented in low end vehicles. In this project, The iris image of user is stored in database. The anisotropic filter is used to remove the noise from the image, followed by canny edge detection method, curve operator and in feature extraction method,the SVM algorithm is used to match the input image with the database image.The ignition of the vehicle starts automatically for authorized person. In future the cost of iris sensor can be reduced and to improve the efficiency of the system with respect to different colours of retina.

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