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Ear Identification Using Pattern Matching Algorithm based Features and Angles

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Abstract -In this project I am going to develop a biometric authentication system using the ear. The image was acquired using a digital camera. The photo is then processed, stored and used for the identification process. For every individual, there are some distinct features that can be used for identification. The portion or segment that contains these unique features is known as the Region of Interest. After the raw data is obtained, the Region of Interest (ROI) which is the area containing the ear image is chosen. Feature extraction filters the uniqueness data out of the raw data and combines them into the biometric feature the method applied for this is Edge detection. Canny edge detection techniques used to find out the boundaries of the 2D ear image then find out the angle of the curve and stored into the database. Using pattern matching algorithm to compare the match template and the reference template, based on the threshold value to identify valid user.

Keywords: ***Image processing, canny edge detection, Biometrics, Physiological Characteristics, Behavioral Characteristics, Active Biometrics, Passive Biometrics; Identification; Verification.***

I. INTRODUCTION

Image processing is a method to perform some operations on an image, in order to get an enhanced image or to extract some useful information from it. It is a type of signal processing in which input is an image and output may be image or characteristics/features associated with that image. There are two types of methods used for image processing namely, analogue and digital image processing. Digital image processing techniques help in manipulation of the digital images by using computers. The three general phases that all types of data have to undergo while using digital technique are pre-processing, enhancement, and display, information extraction. Image processing is important process in modern data storage and data transmission, especially in progressive transmission of images, video coding (teleconferencing), digital libraries, and image database, remote sensing. Biometrics is the measurement and statistical analysis of human physical and behavioral characteristics. The technology is mainly used for identification and access control, or for identifying individuals that are under surveillance. The basic principle of biometric authentication is that everyone is unique and an individual can be identified by his or her intrinsic physical or behavioral qualities. Examples for biometric authentication include fingerprints, face, hand, retina and odor. Behavioral characteristics are related to the pattern of the behavior of a person, such as entering rhythm, manner, gestures and voice. Biometric security is mainly implemented in environments with critical physical security requirements or that are highly prone to identity of theft. Biometric security-based systems or engines store human body characteristics that do not change over an individual's lifetime. In my proposed system I have using canny edge detection algorithm in this edge detection operator that uses a multi-stage algorithm to detect a wide range of edges in images. it extract useful structural information from different vision object and intensely reduce the amount of data to be processed.

II. EXISTING SYSTEM

In this existing system using Principle component analysis (PCA) algorithm it is a statistical procedure concerned with explaining the covariance structure of a set of variables. In particular, it allows the identification of the principal directions in which the data varies. The main goal of PCA is to reduce the dimensionality of the data while retaining as much as possible of the variation present in the original dataset. PCA allows computing a linear transformation that maps data from a high dimensional space to a lower dimensional sub-space .PCA projects the data along the directions where the data varies the most. These directions are determined by the eigenvectors of the covariance matrix corresponding to the largest Eigen values. Process of PCA, thus the first step are acquiring image of ear and improved by subtracting the mean of the particular dimension then calculating the covariance matrix it represents the relations between two dimension and finally calculate the eigenvector and eigenvalues from the covariance matrix thus the eigenvectors are on the basis of descending eigenvalues and usually the top

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few eigenvectors are chosen as principle components. After the processing of ear image and the result is scalar multiplication of the matrix with the matrix comprising of the principle components in the weight matrix it can be stored into the database. Now, compare the two images one is the reference image(database) and other one is match image and find the Euclidean distance between two weight matrices of the image is calculated in this

process is known as score similarities between two images. Thus the final process is based on the threshold value, if the score similarities is achieved it is valid user to access the system. Disadvantage of this system is difficult to find out the covariance matrix to be evaluated in an accurate manner. When the simple invariance not to be captured by the PCA unless the training data explicitly gives the information.

III.PROPOSED SYSTEM

The proposed system aims to improve the accuracy of the Ear identification using pattern matching algorithm. The purpose of pattern matching algorithm is an important tool for finding alike objects in different basis. In image processing, the pattern matching is used for locating a lesser image in a target images. For examining text, regular expressions are commonly used. The simple method to move the model in a target image and then find the comparison in each position of the image. Thus the position of the image with the highest value of the similarity will be accepted as result. The common method of similarity is normalized correlation. Images are taken within a distance of 15-20 cms between the ear and camera thus the image can be converted into gray scale image and then feature extraction is applied to reducing the amount of resources required to describe a large set of data to get result of only interested data only. After the feature extraction to get the particular features of the image and the next process is edge detection it is techniques for determining the boundaries of the curves within the ear in this project canny edge detection algorithm is used find out the boundaries of the image.

a) Canny edge detection algorithm

In this technique to extract useful structural information from different vision of the object and dramatically reduces the amount of data to be processed.it is based on several steps

1) Apply Gaussian filter to smooth the image in order to remove the noise:

Optimizes the trade-off between noise filtering and edge localization.

2) Find the intensity gradients of the image:

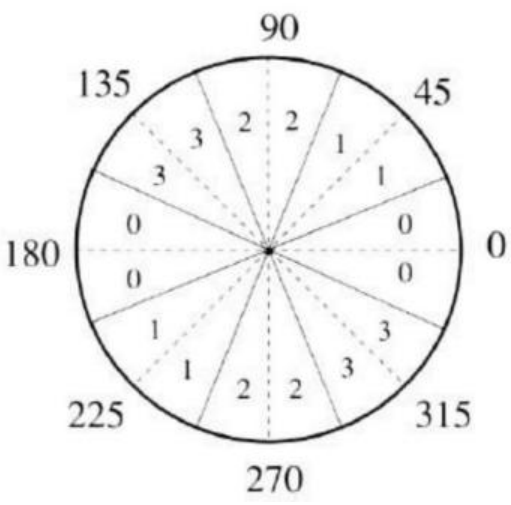
At each point convolve with

$$Gx=\begin{bmatrix}-1 & 1\\ -1 & 1\end{bmatrix} \qquad Gy=\begin{bmatrix}1 & 1\\ -1 & -1\end{bmatrix}$$

Magnitude and orientation of the Gradient are computed as $\Theta [i, j] = \tan (Q [i, j], P [i, j])$
Avoid floating point arithmetic for fast computation.

3) Thin edges by applying non-maxima Suppression to the gradient magnitude.Thin edges by keeping large values of Gradient.

Reduce angle of Gradient θ[i,j] to one of the 4 sectors Check the 3x3 region of each M[i,j] If the value at the center is not greater than the 2 values along the gradient, then M[i,j] is set to 0



4) Detect edges by double thresholding Reduce number of false edges by applying a threshold T , all values below T are changed to 0, selecting a good values for T is difficult ,some false edges will remain if T is too low, some edges will disappear if T is too high ,some edges will disappear due to softening of the edge contrast by shadows. After the edge

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detection to find the starting and end point and plot the graph and then determine angle using Euclidean distance formula.

The Euclidean distance between points p and q is the length of the line segment connecting them (pq).In Cartesian coordinates, if p = (p_1, p_2,..., p_n) and q = (q_1, q_2,..., q_n) are two points in Euclidean n- space, then the distance (d) from p to q, or from q to p is given by the Pythagorean formula

$$dist((x, y), (a, b)) = \sqrt{(x - a)^2 + (y - b)^2}$$

then the result of the euclidean and their angle can be stored into the database and then the query images tested to the database image if both the image are similar thus the result is valid user. Thus the process can be showed in the Figure 1.

IV.PROPOSED SYSTEM ARCHITECTURE

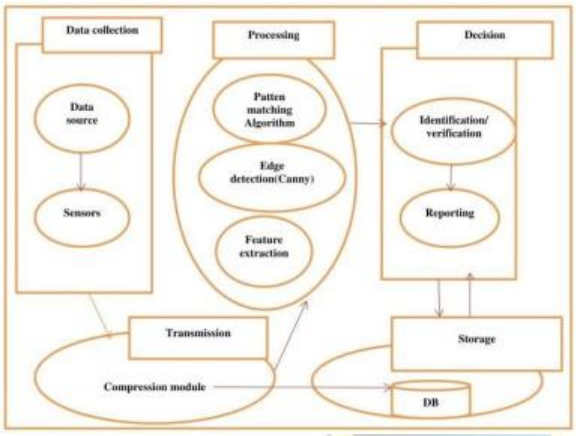

Figure 1

V.MODULES AND METHODOLOGY

In this work, there are three modules have been takes place.

a. Enrolment Phase

Enrolment (or registration) in a reflex biometric system is the process of detecting and isolating the area of interest. The enrolment data record comprises of one or many biometric references and other non- biometric data such as a unique password. In sub sequent uses, biometric information is detected and compared with the information stored at the time of enrolment. It consists of the two steps: Pre- processing and Localization using image transform. Thus the ear image is converted into gray scale image

and the feature extraction is applied to the image then the canny edge detection is used in the image for calculating start point and end point. Finally find out the angle and stored into the database.

b. Pattern Matching Phase

First, in matching mode the system performs a one- to-one comparison of captured ear image with that of the claimed identity template stored in an ear image database in order to verify the individual is the person they claim to be. If the length of the Hough line of both the query image and the enrolled image is same, then the person is authenticated. If the difference between the enrolled image and query image is less than the threshold then the person is authenticated. Initially the varying thresholds were applied for calculating the error rates. From that , the EER was taken as the threshold value to authenticate the person.

c. Authentication Phase

In this phase the user query image is first tested against all the image in the database using pattern matching algorithm to find the similarity between the two images thus the comparison should satisfied the threshold value and the output will be a valid user.

VI.CONCLUSION

This project helps to improve the accuracy of the ear identification and find out the valid authenticators. Advantage of my proposed system is identified only valid user with the maximum threshold value and it can use in real time application. The future work is to use the color image of the ear and advanced technology are used to improve more accuracy and also useful in criminal case investigation. Ear authentication system is static a very unique field. Many of the problem issues are yet not been touched, especially the problem related to the sealing of ear due to hair.

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