ISSN2394-3777 (Print)
ISSN2394-3785 (Online)
Available online atwww.ijartet.com
International Journal of Advanced Research Trends in Engineering and Technology
(IJARTET) Vol. 5, Special Issue 14, April 2018

Attendance Monitoring System Using Efficient Secure Multimodal Biometrics

Chaithanya S, BTI, Bangalore, India. chethusrinivasa1995@gmail.com

Santosh Kumar K, BTI, Bangalore, India. santoshkumargc36@gmail.com

Anil S, BTI, Bangalore, India. anilreddyvkh35@gmail.com

Sachin R, BTI, Bangalore, India. sachinjayanth420@gmail.com

Prof. Puneeth H J BTI, Bangalore, India. puneethhj2008@gmail.com

ABSTRACT

In this working paper three biometric characteristics are used i.e. Fingerprint, Face and Iris at Feature level classification. For finger print images Gabor wavelet algorithm is used. For Iris recognition system Gabor wavelet is used for feature selection. For Face biometric system P.C.A. is used for feature selection. The match count of every trait is calculated. Then the generated result of match and non match is utilized for the sum feature selection. Then decision is find out for persons recognition, in this case we are using this multimodal biometrics in schools and collages for attendance monitoring purpose.

Keywords—Matlab; PCA,Gabor wavelet algorithm;

I. INTRODUCTION

"Biometrics" means "life measurement", but the term is usually associated with the use of unique physiological characteristics to identify an individual. One of the applications which most people associate with biometrics is security. However, biometric identification has eventually a much broader relevance as computer interface becomes more natural. It is an automated method of recognizing a person based on a physiological or behavioral characteristic. Among the features measured are; face fingerprints, hand geometry, handwriting, iris, retinal, vein, voice etc. Biometric technologies are becoming the foundation of an extensive array of highly secure identification and personal verification solutions. As the level of security breaches and transaction fraud increases, the need for highly secure identification and personal verification technologies is becoming apparent. In recent years, biometrics authentication has seen considerable improvements in reliability and accuracy, with some of the traits offering good performance. However, even the best biometric traits till date are facing numerous problems; some of them are inherent to the technology itself. In particular, biometric authentication systems generally suffer from enrollment problems due to non-universal biometric traits, susceptibility to biometric spoofing or insufficient accuracy caused by noisy data acquisition in certain environments.

Biometric system is developed with physiological characteristics as well as behavioral characteristics. These characteristics are Iris, face, ear; Etc .The Biometric system has the following requirements like Universality, Distinctiveness, Performance, and Collectivity. The biometric is generally categorized as single trait, Bimodal and multi trait. Unimodal uses one characteristic for the recognition purpose. Unimodal Biometric system has various application areas but it suffers from some drawbacks like Noise, Intra class dissimilarity, Inter class similarities, and Non universalities. In Bimodal two characteristics are used for the recognition purpose. The drawbacks of Unimodal biometric system is reduced by using bimodal biometric system. If we are using two or more characteristics for recognition then it is seemed as Multimodal Biometric system. This system uses two or more algorithms, multiple samples etc. Here we present the score level fusion by using Face, Fingerprint, and Iris. The feature vector is calculated from face, fingerprint and iris modality. For finger print images Gabor wavelet approach is used. For Iris recognition system Gabor wavelet is used for feature Extraction. For Face biometric system P.C.A. is used for feature Extraction. The feature vector is calculated from face, fingerprint and iris modality. For finger print images 2 methods are used i.e. Minutiae Extraction and Gabor filter approach. For Iris recognition system Gabor wavelet is used for feature Extraction. For Face

ISSN2394-3777 (Print)
ISSN2394-3785 (Online)
Available online atwww.ijartet.com
International Journal of Advanced Research Trends in Engineering and Technology
(IJARTET) Vol. 5, Special Issue 14, April 2018

biometric system P.C.A. is used for feature Extraction. The system is tested on std. database and KVK data set. The fusion is completed at different levels.It is generally classified as 1) Fusion earlier than matching 2) Fusion later than matching

II. Proposed System

In our system, we are implementing the biometrics approach in three levels. We are implementing Multimodal Fusion approach of Fingerprint Recognition, Face Recognition and Iris recognition.

In Fingerprint recognition system, the input image was enhanced using preprocessing approach. Then the feature values are extracted using shape feature measurement.

In Iris recognition system, the input image was enhanced using preprocessing approach. Then the localization of the iris portions is segmented using black-hole search method. The feature was extracted based on shape feature measurement method.

In Face recognition tends to be the most appealing biometric procedure as it is the most natural process for human identification, it is the least obtrusive method and yet it remains the most challenging modality. The first step in a biometric recognition or authentication system is face detection and feature extraction, which are necessary to locate the face position and obtain the face features in the image for further processing. The features obtained are then fed into the critical step of face recognition or authentication. The recognition or authentication process remains a challenging task for researchers due to the variability in the circumstances and ways under which the images of these faces are taken.

In multimodal biometric recognition system, the fingerprint, face and iris images of different persons were collected and trained using above methods. Then we will select a single fingerprint, face and iris image for testing. The feature values are extracted and finally we will compare our testing image feature with the trained images feature values. If it gets matched, it results as genuine person. If it not gets matched means, it results as fake one. The details of the person also displayed. If we select the fingerprint, face and iris image of same person, the designed system should tell that it was matched. If we select the fingerprint of one person and the face/iris of other person. the system should tell that it was not matched and not recognized. Hence the validation part should also be done.

III. Review

Dr. Rupali L.Telgad, Dr. Almas Siddiqui, Dr. Savita A. Lothe, Dr. P. D and Deshmukh, Dr. Gajanan Jadhao have developed the efficient secure multimodal biometric system which is combination of Iris,Face Recognition,Fingerprint.[1].Smart attendance was developed by Aditi Purohit; Kumar Gaurav; Chetan Bhati; Atul Oak.[2].Multimodal biometric identification system based on the face and iris was done by Basma Ammour; Toufik Bouden; Souad Amira[3].Automatic segmentation and recognition of iris images: With special reference to twins was developed by the Chelli N. Devi[4].

IV. Face Biometrics

For face recognition system we used appearance based method. Generally Linear Discriminate analysis and Principle component analysis methods are used. For our proposed system we used PCA Algorithm and Euclidean distance matcher.

STEPS FOR FACE RECOGNITION-PCA ALGORITHM

- Assigning Training and Testing path
- Database construction (2-D image into 1-D vector conversion)
- Computing Mean value.
- Subtracting mean image from the Database image
- Covariance matrix
- Eigen values and Eigen vectors
- Projection matrix (PCA output)
- Use Principle Component Analysis (PCA) to determine the most discriminating features between images of faces.
- Choosing single input image for testing.
- Projection matrix computation.
- Projecting centered image vectors into face-space
- Extracting the PCA features from test image

ISSN2394-3777 (Print)
ISSN2394-3785 (Online)
Available online atwww.ijartet.com
International Journal of Advanced Research Trends in Engineering and Technology (IJARTET) Vol. 5, Special Issue 14, April 2018

- Euclidean distance calculation Recognized output.

V. Iris Recognition

The images which are present in the Training images are trained with our proposed algorithm. Since, the low-resolution iris images taken for our system, we use Adaptive Histogram Equalization and Sharpening filter for enhancing the input image. Circular Hough Transform is used for detecting the iris region. The Binarization was done based on the thresholding. Local Binary Pattern (LBP) is used for extracting the features. The shape based properties are measured on the extracted feature image.

a. Local Binary Pattern (LBP)

Local Binary Pattern (LBP) is used for iris and finger texture image feature extraction. LBP is a type of feature used for Texture classification.

The LBP feature vector, in its simplest form, is created in the following manner:

- Divide the examined window into cells (e.g. 16x16 pixels for each cell).
- For each pixel in a cell, compare the pixel to each of its 8 neighbors (on its left-top, left-middle, left-bottom, right-top, etc.). Follow the pixels along a circle, i.e. clockwise or counter-clockwise.
- Where the center pixel's value is greater than the neighbor's value, write "0". Otherwise, write "1". This gives an 8-digit binary number (which is usually converted to decimal for convenience).
- Compute the histogram, over the cell, of the frequency of each "number" occurring (i.e., each combination of which pixels are smaller and which are greater than the center).
- Optionally normalize the histogram.
- Concatenate (normalized) histograms of all cells. This gives the feature vector for the window.

Given a center pixel in the image, LBP value is computed by comparing its gray value with its neighbors based on (1)

$$\mathrm{LBP}_{P,R} = \sum_{i=1}^{P} 2^{(i-1)} \times f_1(g_i|_R - g_c) \qquad (1)$$

$$f_1(x) = \begin{cases} 1 & x \geq 0 \\ 0 & \text{else} \end{cases} \qquad (2)$$

where *gc* is the gray value of the center pixel, *gi. R* is the gray value of neighbor at radius *R* from the center pixel (*gc*), *P* is the number of neighbors at a distance (radius) *R* form the center pixel (*gc*) in an image.

VI. Finger Print Recognition

The finger print biometric system is used for identification purpose. The image is scanned and then fingerprint detects ridge and valleys which is converted as zero and one. Then the minutiae points are extracted with the help of algorithms. It uses the images acquired by the sensors and calculates the features .These features can be calculated. These points are called as minute extraction. After minutiae extraction classification is done with the help of Euclidian distance matcher. We also used the second methodology for feature extraction with the help of filter bank approach. This method divides the image in terms of tracks and sectors. Then finger code is calculated foe feature selection. Match and non match is calculated for this system further it is used. We also used Gabor filter bank approach for minutiae extraction. Then ED (Euclidean Distance) calculates the distance for decision purpose. The match score is calculated which is used for fusion.

A. Techniques/Algorithm Used:

- Gabor wavelet Algorithm for IRIS and Fingerprint recognition.
- PCA (Principle Component Analysis) Algorithm for face recognition.

ISSN2394-3777 (Print)
ISSN2394-3785 (Online)
Available online atwww.ijartet.com
International Journal of Advanced Research Trends in Engineering and Technology (IJARTET) Vol. 5, Special Issue 14, April 2018

- ROI extraction for segmentation.
- Feature value extraction for all the multimodal templates.

B. Software Requirement:

- MATLAB 8.3 Version R2014a

C. Block diagram:

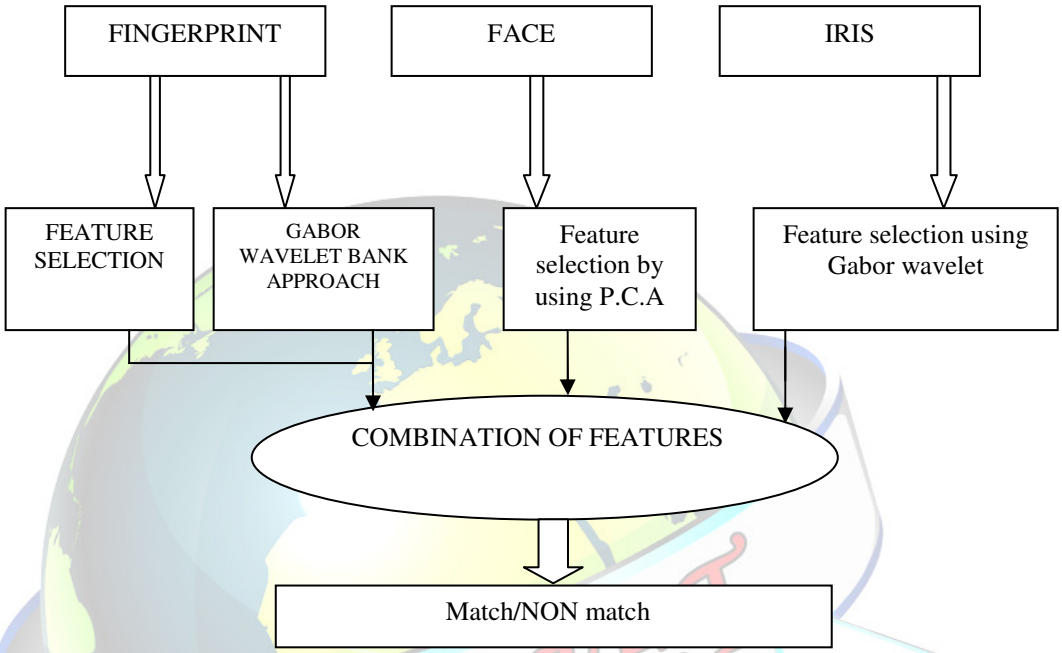

Figure 1: Flowchart of Multimodal Biometrics.

D. Principal Component Analysis (PCA):

PCA based face recognition system which is called the Eigen faces method. In this method, a given face image is transformed into the Eigen space to obtain a feature projection vector. The Euclidean Distance between the projection vector of a given face and the class projection vectors are used to determine a correct or false recognition

ISSN2394-3777 (Print)
ISSN2394-3785 (Online)

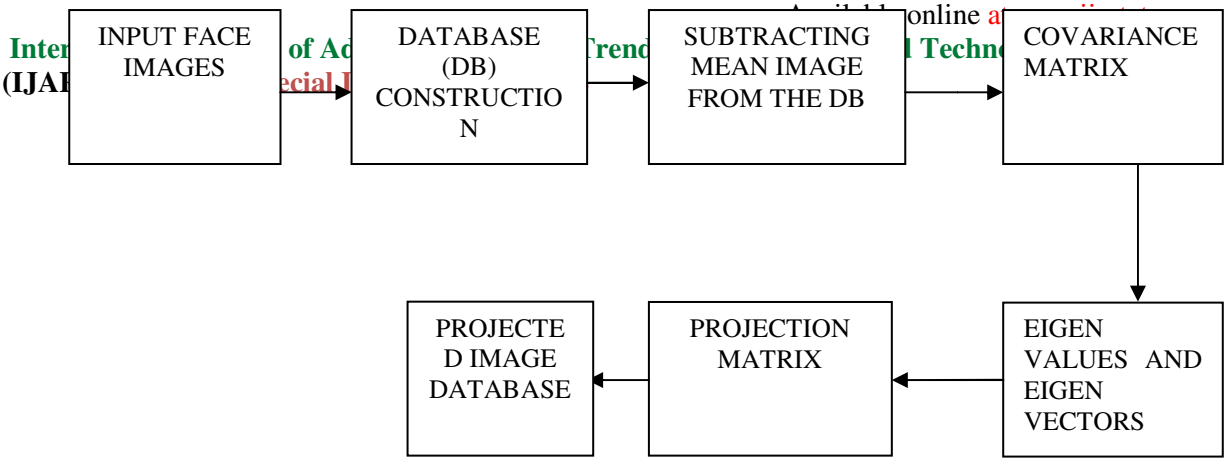

Figure 2: PCA testing

E. Gabor Wavelet

Gabor wavelets are wavelets invented by Dennis Gabor using complex functions constructed to serve as a basis for Fourier transforms in information theory applications. They are very similar to Morlet wavelets. They are also closely related to Gabor filters (see Gabor filter Wavelet space). The important property of the wavelet is that it minimizes the product of its standard deviations in the time and frequency domain. Put another way, the uncertainty in information carried by this wavelet is minimized. However they have the downside of being non-orthogonal, so efficient decomposition into the basis is difficult. Since their inception, various applications have appeared, from image processing to analyzing neurons in the human visual system.

Gabor wavelet is the Function for computing gabor features of a gray-scale image. This function calculates gabor features. Mean-squared energy & mean Amplitude for each scale and orientation is returned.

A Gabor filter can be viewed as a sinusoidal plane of particular frequency and orientation, modulated by a Gaussian envelope.

$$G(x,y) = s(x,y)\, g(x,y) \quad \ldots\ldots(1)$$

where $s(x,y)$ is complex sinusoid and $g(x,y)$ is 2D gaussian envelope

$$s(x,y) = \exp\left[-j2\pi\left(\mu_0 x + v_0 y\right)\right] \quad \ldots\ldots(2)$$

$$g(x,y) = \frac{1}{\sqrt{2\pi}\sigma_x\sigma_y}\exp\left[-\frac{1}{2}\left(\frac{x^2}{\sigma_x^2}+\frac{y^2}{\sigma_y^2}\right)\right] \quad \ldots\ldots(3)$$

$\boldsymbol{\sigma_x}$ and $\boldsymbol{\sigma_y}$ characterize the spatial extent and bandwidth of along the respective axes, $\boldsymbol{u_o}$ and $\boldsymbol{v_o}$ are the shifting frequency parameters in the frequency domain. Using $\boldsymbol{G(x,y)}$ as the mother wavelet, the Gabor wavelets, a class of self-similar functions can be obtained by appropriate dilations and rotations of $\boldsymbol{G(x,y)}$ through: $\boldsymbol{G_{m,n}(x,y)=a^{-m}G(x',y')}$, where $\boldsymbol{x' = a^{-m}(xcos\theta + ysin\theta) = a^{-m}}$(xsin$\boldsymbol{\theta + ycos\theta}$), $\boldsymbol{y' = a^{-m}(xsin\theta + ycos\theta)}$, a>1, $\boldsymbol{\theta = \frac{n\pi}{0}, m = 1 \ldots S\ n = 1 \ldots O.O}$ indicates the number of orientations, S the number of scales in the multi resolution decomposition and a is the scaling factor between different scales. These parameters can be set according to reduce the redundant information (caused by the Non orthogonality of the Gabor wavelets) in the filtered images.

Experimental Results

We also use the MMU database for 10 samples per modality for 20 users and face database of 20 users of 10 samples. For fingerprint biometric system we used FVC database. The following table shows the Individual and combined accuracy by using sum feature level extraction.

TABLE 1: Individual and Joint Accurateness

Modality	Algorithm	Accuracy (%)	FAR(%)	FRR(%)
Face	PCA and Euclidean distance matching	92.4	4.04	8.09

Fingerprint	Feature extraction by Using Gabor Wavelet and feature selection	94.9	1.21	5.01
Iris	Feature extraction by Using Gabor Wavelet	99.6	0.3	0.1
Feature extraction	PCA+ Gabor wavelet + Gabor wavelet	99.8	0.11	0.09

REFERENCES

[1]. Dr. Rupali L.Telgad, Dr. Almas Siddiqui, Dr. Savita A. Lothe, Dr. P. D. Deshmukh, Dr. Gajanan Jadhao, "Development of an efficient secure Biometric system by using Iris, Fingerprint, Face", IEEE 2017

[2]. Smart attendance Aditi Purohit; Kumar Gaurav; Chetan Bhati; Atul Oak 2017 International conference of Electronics, Communication and Aerospace Technology (ICECA)

[3]. Multimodal biometric identification system based on the face and iris ;Basma Ammour; Toufik Bouden; Souad Amira-Biad 2017 5th International Conference on Electrical Engineering - Boumerdes (ICEEB).

[4]. "Automatic segmentation and recognition of iris images: With special reference to twins "Chelli N. Devi 2017 Fourth International Conference on Signal Processing, Communication and Networking (ICSCN).

[5] Jain A.K., Ross A. (2004) Communications of the ACM, 47, 34-40.

[6] Mitchell H.B. (2007) Multi-Sensor Data Fusion, Springer, 281.

[7] E. Rood and A. K. Jain, "Biometric research agenda: Report of the NSF workshop," in Workshop for a Biometric Research Agenda, (Morgantown, WV), July 2003.

[8] Umut Uludaga, Arun Rossb, Anil Jaina, "Biometric template selection and update: a case study in fingerprints", Pattern Recognition 37 (2004) **1533 - 1542.**

[9] Dhanashree vaidhya, sheetal pawar, "Feature level fusion of palmprint and palm vein for personal authentication based on Entrophy technique", International Journal on Electronics and communication Technology, **Vol.5, Issue spl-1, 2014**

