International Research Journal of Engineering and Technology (IRJET) e-ISSN: 2395 -0056
Volume: 04 Issue: 05 | May -2017 www.irjet.net p-ISSN: 2395-0072

INTEGRATING FACE AND IRIS BIOMETRICS FOR SECURITY MOTIVE BY CHANGE DETECTION MECHANISM

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Abstract *- Security is predominant and prerogative to everybody who deserves it. Biometric authentication plays a pivotal role in security systems in the fields of commercial, banking, social and law enforcement area. In order to extirpate disorders and chaos, it is mandatory to have a strong biometric security system. Face and Iris recognition have been employed in various security systems. Besides improving performances, the fusion of both biometrics has several other advantages such as increasing user population coverage and reducing enrolment failure. Face and iris recognition is a challenging and interesting research topic in the field of pattern recognition. The thoroughgoing process of recognition is involved in three stages detection, feature extraction, recognition. Various techniques are required in these three stages so as to deal with the surrounding factors. The main notion of this project is to increase the performance of the face and iris recognition system by providing strong algorithm. This work is based on the concept of Change detection in order to handle the rare cases.*

Keywords: Face recognition, Iris recognition, Change detection, classifiers

1. INTRODUCTION

Whenever people log onto computers, access an ATM, pass through airport security, use credit cards, or enter high-security areas, they need to verify their identities. People typically use user names, passwords, and identification cards to prove that they are who they claim to be. However, passwords can be forgotten, and identification cards `can be lost or stolen. Thus, there is tremendous interest in improved methods of reliable and secure identification of people. Biometric methods, which identify people based on physical or behavioral characteristics, are of interest because people cannot forget or lose their physical characteristics in the way that they can lose passwords or identity cards. Biometric methods based on the spatial pattern of face and the iris is believed to allow very high accuracy, and there has been an explosion of interest in iris biometrics in recent years. This paper justifies the novelty of combining face and iris recognition based on several techniques used in different processes.

Due to physical obscures such as hair growth or loss, age, scares, lighting, glasses, masks and injury at the iris or face may lead to the security system failure. As the user population increases the demand of storing all the data also increases that require large memory space. In order to address these two limitations the Change detection method can be used. Change detection is a statistical analysis used for comparing two images taken in different period of time. Classification is the process of identifying to which of a set of categories a new observation is belonged to. There are several algorithms used in classification process. Classifiers play a pivotal role in recognition process. The process of incorporating change detection into classifiers is expected to increase the reliability and performance likely.

2. PROBLEM DEFINITION

Change is the only thing constant. Due to that fact everything in the atmosphere changes with respect to time. The biometric systems that employ a vital role in security systems relied and respond if and only if the input image is convincible. But in general, irrespective of any biometric security process the system gets confused by many physical obscures such as hair, age, scars, lighting, glasses, masks, background, and injury at the iris or at the face. If In case the input image is not matching with the image already stored in the database due some minor physical changes the permission is not provided even for the person who deserve it. This is the fascination behind this the work. To address this problem Change detection method is being used. Change detection is the statistical analysis used for comparing a pair of images of the same area taken at different time instances to measure the change by defining the basic thresholding method. Also as the rate of usage is increasing it is mandatory to provide a huge memory system. These are the two main problems to be focused on.

2.1 Literature Review

Exploring the Usefulness of Light Field Cameras for Biometrics: An Empirical Study on Face and Iris Recognition explained an idea of using Light field camera (1) to selecting the best focus image from the set of depth images, and (2) combining all the depth images using super resolution schemes to exploit the supplementary information available within the set elements. The main advantage of the paper is new perspective for large scale database and Reliable with the statistical confidence interval of 90%.

3-D Face Recognition under Occlusion Using Masked Projection offered the idea of the adaptive model-based registration and the masked projection approaches proposed and the idea is motivated by large occlusions causing a high proportion of missing points. It presents a fully automatic 3-D face recognizer, which is robust to facial occlusions. The limitation of the paper is that time consuming especially at nose area .If occlusions are so large that the nose area is totally invisible, the initial alignment becomes impossible.

A Multi-modal and Multi-algorithmic Biometric System Combining Iris and Face proposed Score level fusion strategy is adapted. Two different features for face are used: Gabor filters based and Local Binary Patterns (LBP) based. The iris features are extracted using Daugman's Gabor filters based approach. Significant improvement in the verification performance is carried out from the work.

Face and Iris biometrics person identification using hybrid fusion at feature and score-level explained Hybridized fusion strategy that combines, three classifiers based on feature and score level fusion using a decision level fusion rule with recognition accuracy is 98.75% .The limitation of the work is high execution time due to large feature vectors obtained from the face and Iris fused vectors

Bin-based Weak Classifier Fusion of Iris and Face Biometrics proposed a bin-based weak classifier fusion method for Multi biometrics of Iris and Face. The matching scores of iris and face image patches Non-linear score mapping is simple and efficient .It can discover detailed and distinctive information hidden in matching scores are partitioned into multiple bins so that the weak classifiers are learned on the bins.

Joint iris and facial recognition based on feature fusion and bio mimetic pattern recognition proposed system Based on biometric pattern recognition. The Contour let transform (CT) and two directional two dimensional principal component analysis (2D) 2PCA are used here to extract the iris feature and the facial feature. This method is able to keep the enrollment process safe in the state-of-the-art recognition accuracy.

3. SYSTEM DESCRIPTION

The main intention of this proposed system is to handle the rare cases that include reducing enrolment failure due to physical obscures in biometric application, also to increase the performance of the face and iris recognition system by providing strong algorithm. This work is expected to be disclosed its usefulness based on the concept of Change detection in order to handle the rare cases by differential calculus.

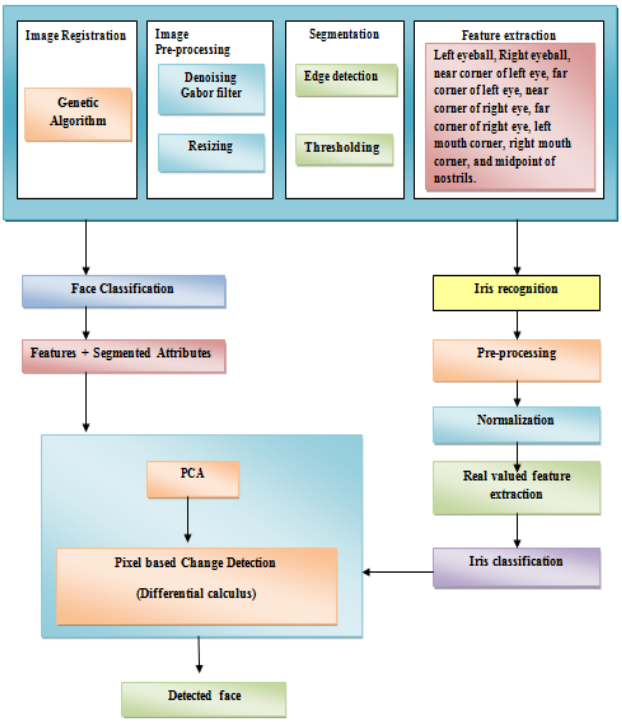

Fig-1: System architecture

Three main combination of algorithms are proposed here.Genetic algorithm for detection face from the video stream, PCA algorithm for recognition, Change detection using calculus for handling the rare case in other words estimating the novelty of the user.

3.1 FACE RECOGNITION

Face recognition technology is a combination of various other technologies and their features and characteristics makes face recognition a better performer depending upon the application. Face recognition works under three phases- Detection, Extraction and Recognition.

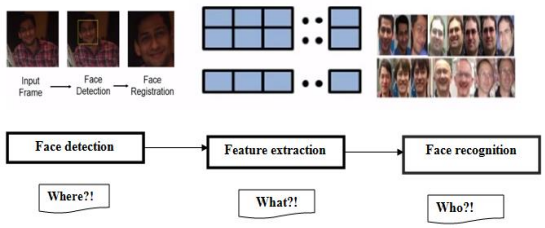

Fig 2- Three stages of face recognition

Genetic algorithm is used in detecting and extracting the facial features from the video stream by eigen technique.The feature based Genetic algorithm is chosen as it deals with geometrical elements of the human face also in oreder to perform math calculus in change detection mechanism.

3.2 IRIS RECOGNITION

Iris recognition is a high reliable biometric security system that acquires increased attention. The human iris is an annular region between the black pupil and the white sclera. The texture of iris is unique to each subject. The iris is first localized with two circles in the image. Then the iris part is unwrapped to a rectangular region where the iris texture is analyzed. In general the whole procedure of feature Extraction of iris recognition system includes two steps. Initial, an arrangement of one-dimensional (1-D) force signs is built keeping in mind the end goal to adequately portray the most imperative data in the first two-dimensional (2-D) picture. Second, utilizing a specific class of dyadic wavelets, a position arrangement of neighbourhood sharp variety focuses in such flags is recorded. The process of iris recognition consisting of the following

- ***Finding an Iris in an Image:*** Minimum 70 pixels in iris radius is required to capture rich details of iris pattern
- ***Iris Feature Encoding by 2D Wavelet Demodulation***: The highlighted feature patterns are then demodulated in order to extract its phase information using quadrature 2D Gabor wavelets

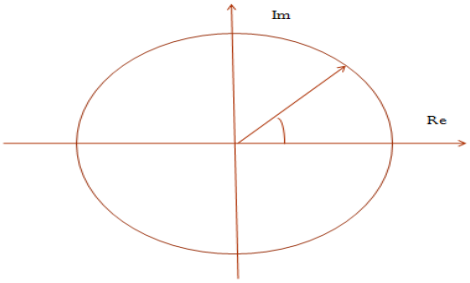

Figure 3:Phase demodulation

The rich district of an iris is anticipated onto quadrature 2D Gabor wavelets producing complex-esteemed coefficients whose genuine and fanciful parts indicate the directions of a phase in the intricate plane. The edge of each phase is quantized to one of the four quadrants, setting two bits of stage data. This procedure is rehashed the whole way across the iris with numerous wavelet sizes, frequencies, and introductions, to extricate 2,048 bits.

- ***Recognising iris***: This acknowledgment process is done paying little heed to its size, position, and introduction by speaking to invariant optical size of an iris. The invariance to all of these variables can promptly be accomplished

4.CHANDE DETECTION USING CALCULUS

Change detection is the process of assessing two image of the same kind with respect to time. Pixel based change detection compares the image pixel by pixel. For the most part, change detection is mainly involved in many mathematical functions as followed, Image differencing image rationing, image regression and Change Vector Analysis.

Considering Iris, the deviation is expected to be happened in the diameter of an iris due to lightening, physical obscures. And hence the algorithm flows as following,

In mathematics, differential calculus is a subfield of analytics worried with the investigation of the rates at which amounts change.

Let the radius of the iris with respect to time be r = r(t).

The Area of the circle is,

$$A = \pi r^2(t) \qquad (10)$$

$$\frac{dA}{dt} = 2\pi r(t)\frac{dr(t)}{dt} \qquad (11)$$

Where, A is the Area of the iris. r be the radius of the iris. $r(t)$ be the radius of the iris with respect to time. dA/dt is calculated in order to measure the rate of change in the circumference with respect time.

5.RESULTS AND DISSCUSSIONS

For evaluating the performance of the biometric system, different combination of algorithms along with the system is being estimated and tabulated. The experiments were performed for each biometric modality separately. For face modality, two separate experiments are performed one each for Genetic and PCA. The results are reported in terms of Equal Error Rate (EER). Equal error rate (EER) is a biometric security system algorithm used to predetermine the threshold values for its false acceptance rate and its false rejection rate. When the rates are equal, the common value is referred to as the equal error rate. and in terms of GAR (Genuine Acceptance Rate) at 1% False Acceptance Rate (FAR).

Table -1: Verification result of different combination of algorithm

SYSTEM	EER	GAR at 1% FAR
Face	9.84	78.45
Face-Genetic Algorithm	8.56	83.56
Face - GA-PCA	4.85	87.09
Face+ Iris-GA-PCA	2.32	91.45
Face+ Iris –GA-PCA-Change detection	1.42	97.89

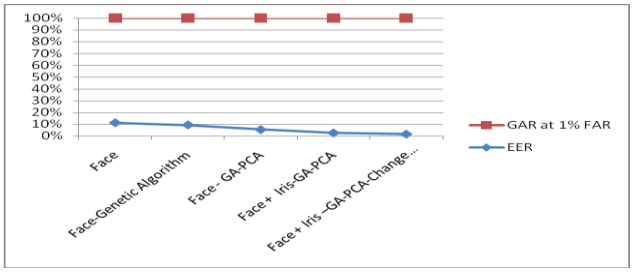

Chart 1- Recognition rate Comparison

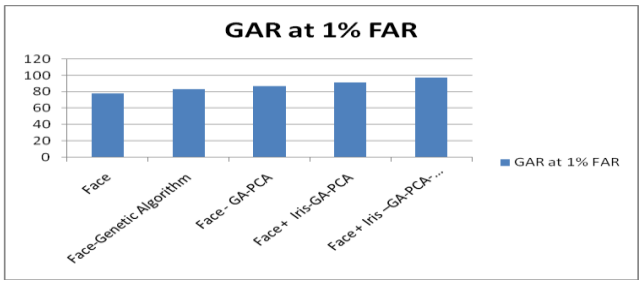

Chart 2- Verification comparison with respect to GAR with 1% of FAR

6. CONCLUSION

The main idea of this proposed system is to provide a strong biometric system by holding various algorithms as a combination. Genetic algorithm is used in order to register or segment the image. PCA algorithm is used for machine learning. Change detection concept is used in order to find the minimum change with respect to time .Differential calculus is used to find the minimum rate of change in the regions of the iris. Differential calculus is used as it deals with small regions. The proposed system achieves the recognition rate up to 97.89% which is greater than the model that is used Gabor filtering that achieves 96.81%[2].The reliability of this system is increased. Yet the speed and the performance of the system are required to be increased as it demands many steps to be solved.

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