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Multimodal Biometric System Integrating Fingerprint Face and Iris

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ABSTRACT: Biometric recognition system, which uses psychological or behavioral characteristics to identify a person. In real time applications mostly used single modal biometric system to authenticate person. The recognition performance of single modal biometric systems having variety of problems such as noisy data, non-universality, spoof attacks, intra-class variations, or distinctiveness. To solve these limitations to describe a multimodal biometric system that combines multiple source of information an individual for recognition. This is able to reduce the problems faced by a single modal biometric system, to improve the recognition performance. This paper presents a multimodal biometric system by integrating iris, face and fingerprint to identify a person using Daugman's algorithm for iris recognition,WLD and Eigen faces for face recognition and minute feature and decision tree algorithm for fingerprint recognition. Experimental estimations are performed on a public dataset indicate the accuracy of the proposed system. The effectiveness of proposed system with respect to False Accept Rate and Genuine Accept Rate is demonstrated with the help of Multimodal Biometrics Integration software.

KEYWORDS: Multimodal Biometric System, *I*ris recognition, Face recognition, Fingerprint recognition. Gabor filter

I. INTRODUCTION

The word biometrics comes from the ancient Greek words: bios living and metros measure. It is well-known the humans use inputs such as face, iris fingerprint, voice or palm print to recognize each other. Recognition of people based their characteristics is important in many rising technologies. These days, biometrics is used in a wide variety of applications that require the identification or verification schemes to confirm the identity of an individual.

In a real time applications mostly used unimodal biometrics to authenticate or recognize the human being or user. By using unimodal biometric system, raise some problems such as noise in sensed data, non universality, spoofing, intra-class variations etc. to solve these limitations by integrating multiple sources of information which is called as multimodal biometric system.

Multimodal biometric systems combine biometric information from multiple sources to establish the authenticity of a person. As identified in, multimodal biometric systems resolve, to a degree, the issue posed by non-universality. This is done by taking into account multiple biometric traits that can better identify a person when used in conjunction as opposed to a single modality. Multimodal biometric systems also act as deterrent to spoof attacks by making it more difficult to replicate the information since any illegitimate use will require the subject to imitate multiple features. Most currently deployed biometric systems are Unimodal they rely on a single feature to identify a person. Although these features such as palm print, face, iris, fingerprint, etc. may be sufficiently unique, systems must still contend with a variety of problems such as noisy in sensed data, intraclass variations, non-universality, spoof attacks, and unacceptable error rates. To solve these limitations may be eliminated and system accuracy increased by making use of a multimodal biometric system. The combination of features used for an effective multimodal system clearly needs to provide a unique solution for a person's identity. Combining multiple modalities can successfully increase the recognition accuracy of a biometric system beyond increase the population coverage; prevent spoof attacks, and reducing the error rate. Although the storage requirements, processing time and the computational requirements of a multimodal biometric system are much greater than a unimodal system.

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II. RELATEDWORK

A lot of work has been done in the last years in the field of multimodal biometrics yielding mature hybrid biometric systems. Fusion at the match score level has been highly studied in the literature. PCA and LDA techniques are used for the face feature extraction and classification purpose. Mean rule, Bayesian rule are used as the fusion techniques with FAR of 0% and FRR of 0.5% to 1.7%. Euclidean distance is used as the classification technique with 83.25% accuracy performance rate.Neural Network is used as the classification technique with FAR below than 2.2%. Tohet al.[8] combined palm print, fingerprint and iris by using global and local learning decision as fusion technique and The accuracy performance is 89% to 96%.Feng et al. [9] combined face and palmprint at feature level by combining the features extracted by using PCA and ICA with the NN classifier and support vector machine as the classifier. Fierrez-Aguilar and Ortega-Garcia [10] proposed a multimodal biometric approach including face, a minutiae-based fingerprint with fusion at the matching score level,and in this technique the fusion approach obtained false acceptance rate (FAR) of 0.5. Viriri and Tapamo [11] introduced a multimodal approach including iris and signature biometrics at score level fusion with False Reject Rate (FRR) 0.007% on a False Accept Rate(FAR) of 0.02%. Kisku et al. [12] proposed a multimodalbiometric system including face and Palmprint biometrics at feature level fusion technique. The system attained 98.75% recognition rate with 0% FAR. Meraoumia et al. [13] presented a multimodal biometric system using hand images and by combining two different biometric traits palmprint and finger-print with FAR= 0.003 %. 0.001.. The results showed that face and iris based multimodal biometric system can improve the accuracy rate about 10%, higher than single face/iris basedunimodal biometric system.

III.PROPOSED METHODOLOGY

A. FINGERPRINT RECOGNITION:

Minutiae-based fingerprint recognition and matching are widely used by both machine and human experts. Minutiae representation has several advantages compared to other fingerprint representations .Minutiae have been (historically) used as key features in fingerprint recognition responsibilities. Its configuration is very high distinctive and several theoretical models [94, 61, use it to provide an approximation of the individuality of fingerprints. Minutiae-based systems are more accurate than compared to correlation based systems and the template size of minutiae-based fingerprint representation is very small.

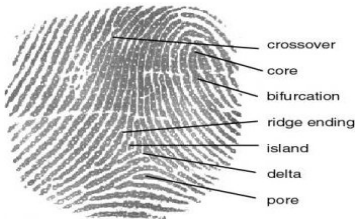

Fig 1 basic fingerprint

B. IRIS RECOGNITION:

Iris recognition is one of the mostlyused biometric verification and identification technique. This technique is used for human being recognition, person identification, and authentication and security applications. In this paper describes Daugman's algorithm for iris recognition. It gives more accurate result when compared to other methods. Daugman's algorithm used Integro-differential operator. This operator is used for to detect the center and diameter of the iris. In this the input image is converted from Cartesian coordinates to polar coordinates and the rectangular representation of the region of the interest is generated. The algorithm gives the accuracy of more than 99.95%.

1.1Integro-differential operator: Integro-differential operator was proposed by Daugman's to localize the iris and pupil boundaries [18]. This operator assumes that both pupil and limbus are full circular contours and performs as a circular edge detector. Also, Integro-differential operator is used to detect the upper and lower eyelids by modifying the contour search from circular to an arc. The integro-differential can describes as a variation of the Hough transform because it depends on the first derivatives of the image, and it executes a search to find geometric parameters. But, it excludes thresholding problems of the Hough transform, since it works with raw derivative information.

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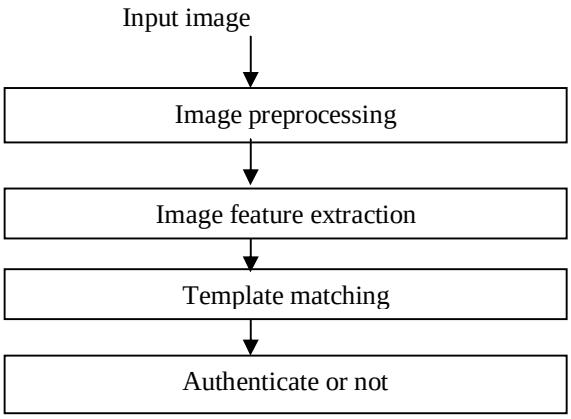

C. FACE RECOGNITION:

Face recognition is the technique in which it includes the recognizing people with their natural characteristics. Face recognition is more usual, nonintrusive and may be used without the cooperation of the subject. Face recognition can be divided in to two methods i.e. verification and identification. In verification system it includeconfirming the identity claimed by a person. In face identification system, in which it creates the identity of a person out of n people.

Weber's Local Descriptors (WLD):

Weber local descriptor is depends on Weber's law which is easy and is robust local descriptor. It not only depends on the change of aincentive but also the incentive of the original intensity.WLD has two mechanism; they are "differential excitation" and "orientation". The difference between the intensity of centre pixel and its adjacent neighbours is called as differential excitation. The other element is the orientation element which states that "the ratio of change of horizontal directions to that of vertical direction of an image".

IV. EXPERIMENTAL RESULTS

Experimental results prove that our system is fast and have high accuracy rate in multimodal biometrics system. From the experiments we have achieve more than 90% of recognition rate. Some iris face and fingerprint images are taken for the experiment. Results of recognition for some three modalities are providing high accuracy and reduce the error rates.

Fig 4.1simple GUI

Step1:This is the first GUI that appears when we execute the project in Mat lab. It consists of 3axex components in which input image, execution of three input images are displayed simultaneously. It also consists of eight push buttons input image, preprocessing, Feature Extraction, stored database, iris, fingerprint, fingerprint database and finally recognition process is computed. On clicking each button performs corresponding action.

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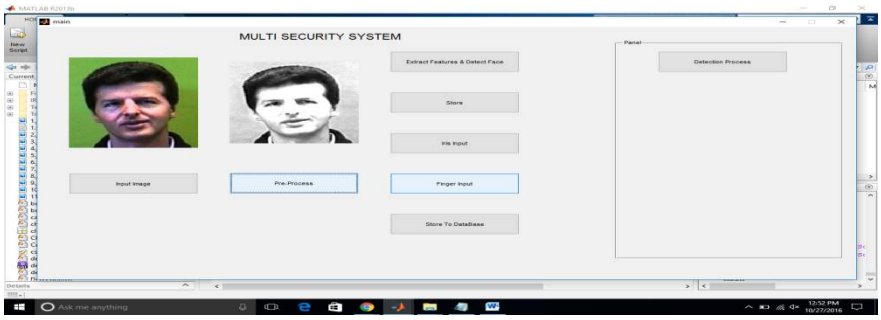

Step2: In the above figure 4.2 shows the face image is selected from the HMM dataset and it given an input image and it is automatically converts the gray scale image and performs the preprocessing.

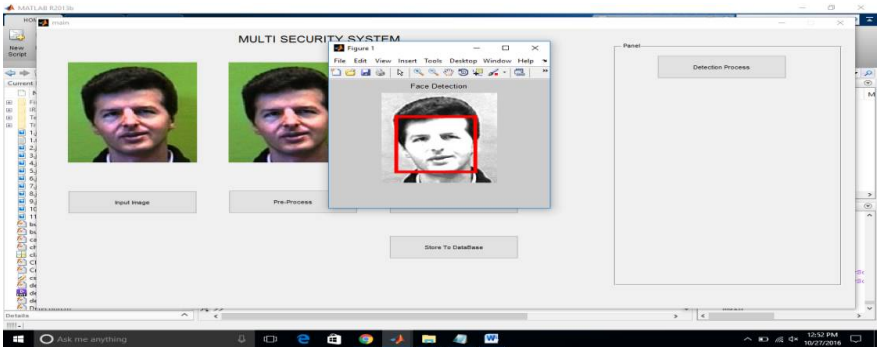

Fig 4.3 face recognition

Step3**:** In the above figure 4.3 shows after completion of preprocessing step the features are extracted and the detection process is completed and finally the face image is stored in the database.

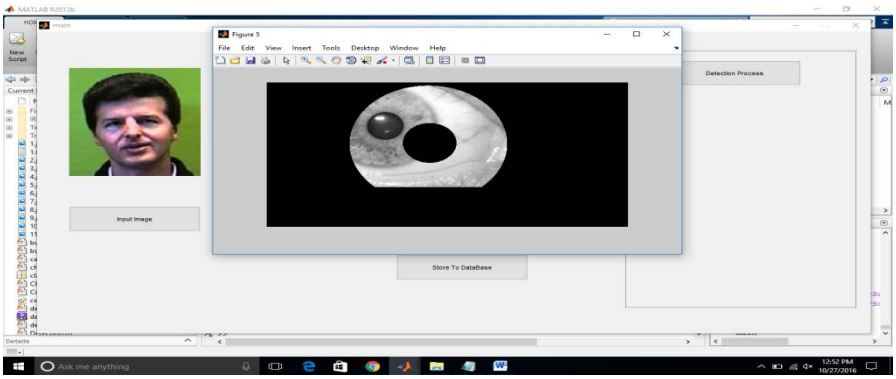

Fig 4.4 iris image

Step4:From the above fig4.4 shows selecting the iris image in HMM dataset program is written such that it automatically converts input image to scale 256*256 and converts to gray scale. The given face image and the iris image is converted in to gray scale image. And it performs the data preprocessing, after completion of preprocessing step, the center and radius is calculated.

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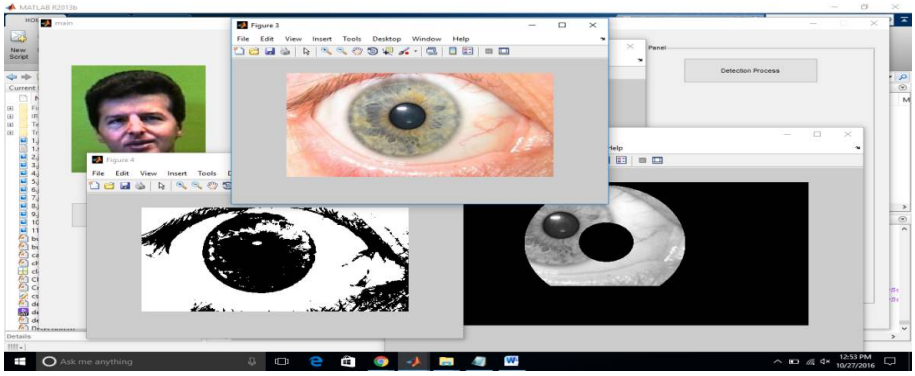

Fig4.5 iris recognition

Step5: In the above figure 6.8 shows after completion of preprocessing step the iris features are extracted and the detection process is completed and finally the iris image is stored in the database.

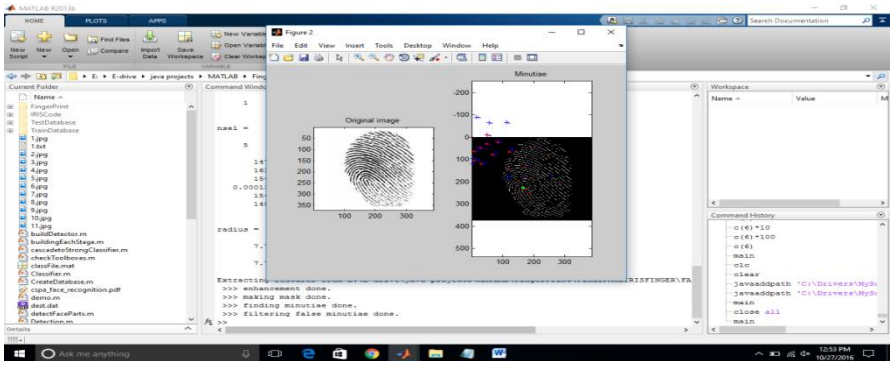

Fig4.6 fingerprint recognition

Step6:From the above fig 4.6 shows selecting the fingerprint image in HMM dataset program is written such that it automatically converts input image to scale 256*256 and converts to gray scale. the given fingerprint image converted in to gray scale image. And it performs the data preprocessing, after completion of preprocessing step the normalization is performed and minutia features are calculated and finally store the database.

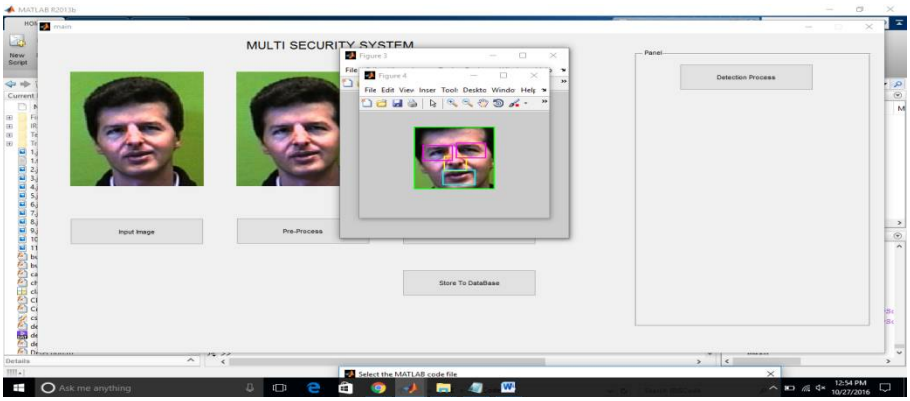

Fig4.7 given user is authenticated

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Step7:From the above figure on the given face image the Recognition process is completed and the given user is authenticated and genuine user.

V. RESULT

Captured the combination of the three images as input and done the preprocessing .after the completion of preprocessing the feature extraction is performed and the results show that the person is authenticated.

VI. CONCLUSION

Based on the combination of face fingerprint iris integrated system the given input image is authenticated. Biometric features are unique to each individual and remain unaltered during a person's lifetime. These features make biometrics a promising solution to the society. In this paper, a multimodal biometric recognition system integrating iris, face and fingerprint is proposed. The three biometric traits is carried out at the min max normalization. Finally the multimodal biometric system improves the system accuracy and reduces the system error rates.

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