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Design, Acquisition and Collection of Various Multimodal Databases to Increase Accuracy and Level of Security

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***Abstract*—** Biometric identification and verification technique is an automated sample detection and recognition system that make use of physiological or behavioral characteristics of individuals. Physical biometric traits which include face, fingerprints, palm prints, ear specimens , eye patterns such as iris and retina. Behavioral biometric traits include gait(behaviour), signature, typing speed/patterns, voice patterns etc. Fnimodal biometric systems developed for each of these biometric features are not sufficient for gaining accuracy and security. To overcome this problem, multimodal biometrics are developed that apply fusion strategy of multiple biometric modalities or features from two or more than two sources. When we compare Fni-modal biometric systems with multimodal biometric systems then multimodal systems improves recognition accuracy, security issues and system reliability problems. Various unimodal biometric databases are freely available But researchers are facing problems that there are very few multimodal databases are available developing multi modal biometric.This paper presents , collection of various biometric modalities like face, fingerprint, palm print, ear patterns which are obtained in controlled environment using different sensors to develop multimodal biometric system.

***Keywords*—** Biometric, Database, Face, Fingerprint, palm print, gait, Multimodal biometric.

I. INTRODUCTION

The main aim of this paper is to collect, design, acquire, various multimodal databases to increase accuracy and level of security. By designing multimodal databases . researchers may use them for their work. The biometric databases containing only single biometric feature is called unimodal biometric database, while those includes multiple biometric traits which are captured from the same people are known as multimodal biometric databases. multimodality feature gives lower susceptibility against hacker attacks. Also, by using multimodal biometrics one can beate the failure-to-enroll (FTE) rate.

Multimodal biometric characteristics corresponding of large number of people huge with the adequacy of biometric variability of each trait makes database collection quite difficult or tricky and might become time consuming. In this case large number dona tors are required . Also the legal issues about privacy as well as protection of data in case of gathering and keeping multimodal biometric modalities or are specially disputable. Because of these reasons, number of public

Multimodal data collection is categorized into two main groupings:

1) Databases which consists of multimodal biometric traits and 2)Databases those consists of multimodal scores. In first category, collected data are biometric samples like hand, iris,face images or palm print, ear pattern, fingerprints or voice signals, this can be applied at any fusion level In the second group of multimodal databases, biometric signals can be used at matching score or decision fusion level, in that images are stored with their scores [1]

II. EXISTING MULTIMODAL BIOMETRIC DATABASES

A. Xm2vts

The XM2VTS database contains varoius face images, videos and speech samples are collected from approximately 295 people during one month interval span. This data collection is done in 4 different sessions. During the session, two head rotations (clockwise/anticlockwise) for gathering face images and voice utterences were taken [2].

B. Banca

This database was designed and developed in four European languages and by making use of two modalities, such as voice patterns and face images. To design this database high as well as low quality microphones and cameras were used. Samples collected in three stages. One in controlled environment, second is degraded, and third is adverse situation, in 12 sessions, during three months duration. This database comprises around 52 subjects . Out of these, 26 are from male category and 26 from female category. Each sample is involved in 12 different recorded sessions within all three conditions by using separate and non-identical cameras. [3]

C. Biomet

This database comprises five different traits . They are audio samples, face images , hand geometry, fingerprints, and signature patterns. For capturing the face images a conventional digital camera is used in three different sittings, with three to five months interval Samples are collected from

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around 130 people for the first phase, 106 for the second phase, and 91 for the third drive. The proportion of people like males and females had been balanced for all drives. 10% of the donators were students those having mean age is 20. The age of the remaining donators are vin between the range from 35 to 60 years [4]

D.MyIDea

This multimodal database comprises with speaking face, voice, fingerprint of individuals, signature patterns, handwriting patterns, palm print and hand geometry modalities of biometric. It consists of total 104 subjects. Different types and quality of sensors are used that includes various realistic acquisition scenarios. [5].

E. BioSec

This multimodal dataset was obtained under FP6 EU BioSec Integrated Project. It consists of various fingerprints which were captured through three different types of sensors, front side face images were taken from a web cam, iris images and voice utterances signals are captured from 250 people. The speech patterns were taken down at 44 KHz stereo with 16 bits using devices such as a headset and a distant web cam microphone [6].

Fig.1 Samples of IIT Delhi Palm print Database

Fig.2 Samples of IIT Delhi Ear Database

F. BiosecurID

This database made up of speech, signature patterns,iris, face images, handwriting patterns, fingerprints, hand, and key stroking patterns. This comprises images those are captured from 400 subjects in four sessions. Total database collection is done in around 4 month time duration. [7].

G.Sdula-hmtm

This was created at Shandong University, Jinan, China having five biometric traits: face, iris, gait, fingerprint, and finger vein. Database is created by collecting sample of 106 subjects, out of which 61 are people from male category and 45 are from female category whose age lies in between 17 and 31, are involved [8][9].

H.IIT-Delhi-2

Following Palm print database and human ear database is obtained by IIT-Delhi-2 database. This database comprises of various ear images those are collected from staff and students of IIT Delhi [10]. All these images were obtained from distant in an indoor environment. The existing available samples are as shown below:

III. PROPOSED METHODOLOGY

Proposed multimodal biometric database comprises four traits , those are face, fingerprint, palm print and ear patterns. In this database creation, images are acquired from 20 subjects in three sessions during 15 day's time span. 20 subjects include 13 males and 7 females. This multimodal database can also be used as separate trait to build unimodal biometric system. Whereas researchers can also be used as this multimodal database by fusing several biometric traits like face, fingerprint, palm print and ear patterns by implementing serial or parallel fusion strategy.

- Face Database

While creating this database face images are captured using two different cameras they are INTEX – IT305WC and iBall. These images are captured in different poses, and styles by varying facial expressions, and wearing accessories or jewelery. The sequence for capturing these images is followed as: front image, toward left, toward right, toward up, toward down, small smile, big smile, closing eyes, wearing goggle, and again front image. Thus total 10 face images are taken from 1 subject. And we have total donators 20 subjects. So altogether there are 200 images collected with one type of sensor. We repeated this process for another type of sensor. And finally we are having with us around 400 images those are captured by two different sensors of 20 subjects.

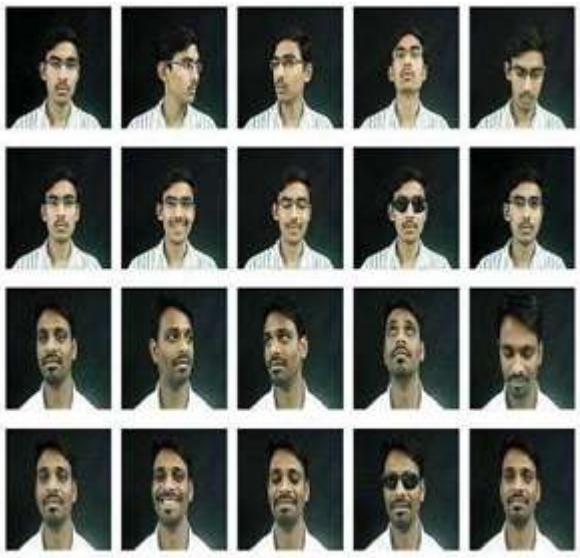

Fig. 3 Samples of Proposed Face Database

- Fingerprint Database

This database comprises fingerprint images which are captured using three different sensors they are NITGEN –

HFDU01-1, FUTRONIC – FS88, and Crossmatch 500P – RJ6482. We have captured all 10 fingerprint images in different poses i.e. 10 images in plain and 10 images by rolling fingerprint. Using this sensor we captured the fingerprint images of all 10 plain fingers starting from left hand index finger and ending with right hand index finger. We repeated this procedure three times in three conditions Normal, Dry, and oily skin respectively. Finally, total 30 fingerprints from 1 subject. Hence altogether 600 images are collected from 20 subjects.

Resolution, with the FBI NGI standards, easily acquires upper, lower and writer's palms as well as flat or plain and rolled fingerprints. Using this sensor we captured palmprint images of 20 subjectes in different poses like 10 plain as well as 10 images by rolling palm at various angular position two times. So 40 images are capture from 1 subject. Altogether 800 images are collected from 20 subjects.

Fig. 4 Samples of Proposed Fingerprint

A. Palm print Database

For collecting samples of palmprint, Crossmatch 500P – RJ6482 sensor is used . Its specifications are: 500 ppi or 1000ppi

Fig. 5 Samples of proposed Palm Print Database

Fig. 6 Samples of proposed Ear Database

B. Ear Database

This database is designed by capturing images of ears of 20 subjects by using two different cameras they are INTEX – IT305WC and iBall. These images are captured with different poses, , and wearing goggle or spectacles or by wearing jewelry and without any accessory. This database is collected in the same sequence which is followed for capturing face images.i.e. in different poses. Finally we have collected around 400 images captured by two sensors of 20 subjects.

IV. Result and Discussion

The result is given below existing & proposed system technics tabulation and charts the Design, acquisition, and collection of various multimodal databases other than mentioned in this paper like iris, retina, speech, gait, knuckle and many more can be collected to increase accuracy and level of security.

SNO	EXISTING SYSTEM	PROPOSED SYSTEM
Database used	FACE:XM2VTS FINGER PRINT AND PLAM PRINT:IIT DATABASE	FACE : INTEX -IT305C FINGER PRINT AND PLAM PRINT: NITGEN .HFDU01 FORTRONICE. FS88,CROSSMATCH-500P RJ6482
accuracy level	80%	90%

Table1: Existing & Proposed accuracy

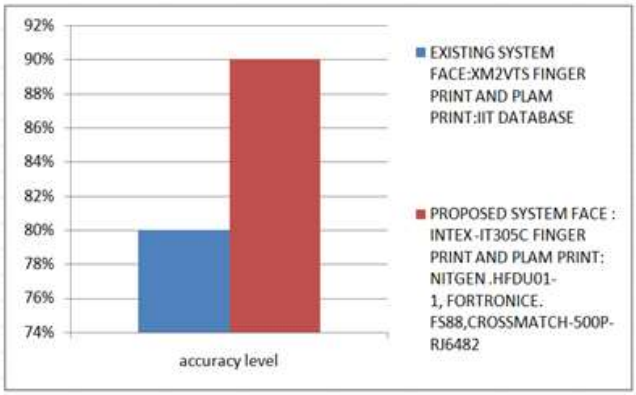

Fig.7 Proposed accuracy level

V.FUTURE SCOPE

Design, acquisition, and collection of various multimodal databases other than mentioned in this paper like iris, retina, speech, gait, knuckle and many more can be collected to increase accuracy and level of security.

VI. CONCLUSION

In current paper we have presented short overview of the existing multimodal biometric databases with detail description of the acquisition strategy they have used. Also we have presented detail design, acquisition of various biometric traits like face, fingerprint, palm prints and ear patterns which can be used for researchers in this field. As unimodal biometric traits are not sufficient for gaining accuracy and security. So multiple biometric modalities are used in designing multimodal biometric systems to achieve improved recognition accuracy, level of security and reliability. Various unimodal biometric databases are freely available. But researchers are facing most of the challenges that there are very few multimodal databases are available for doing their research in developing multimodal biometric system. In this paper, we have presented collection of various biometric modalities like face, fingerprint, palm print and ear database which are obtained in controlled environment.

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