Review on Multimodal Biometric

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Abstract—A biometric ,system has been the important affordable and more reliable system .A biometrics identification system is refers to the automatic recognition of individual person based on their characteristics. Early authentication method like which can be stolen or shared by with other person . Biometric has two modals ,unimodals and multimodals .Inunimodol system , it has disadvantages due to lack of its non –versality and unacuptable error rate .To overcome these unimodal issues multimodals is better approach for combining two or more features of person like for sirisdetetmines a authentication (i.e. identification and verification) this paper that characterstics ,types and biometrics ,fusion levels and research areas etc.

Keywords— *Biometric, Unimodal, Multimodal, Security, Spoofing Attack*

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I. INTRODUCTION

Biometric identification system is one of the important auth entication techniques to provide a proper validation. In Past decades, knowledge based security like passwords, tokens and id cards. These kinds of security considerations can be easily breached.To overcome these issues ,the biometric authentication system is more powerful tool .Containing fingerprint and iris technology Fingerprint and iris technology are unique for identify the person authentication . Its matching accuracy is very high .Fingerprint is a graphical pattern of ridges and valleys on the surface of human finger. Iris is one of the biometric authentication system which are located between cornea and lens of the human eye.

Characteristics of Biometric:-

Any physical and/or behaviour characteristics of a human can be considered as a biometric if it exhibits following characteristics[9].

- **Scalability:**Biometrics systems can be quite flexible and easily scalable. You can use higher versions of sensors and security systems based on your requirements.
- **Versatality**: There are different typesof biometrics scanners available today and they can be used for various applications. They can be used by companies at security checkpoints including entrances, exits, doorways, and more.
- **Uniqueness:** The given biometric trait should exhibits distinct features acrossindividuals comprising thepopulation.
- **Accountability:B**iometrics creates a clear, definable audit trail of transactions or activities. This is especially handy in case of security breaches because you know exactly who is responsible for it. As a result you get true and complete accountability, which cannot be duplicated.
- **Easy and safe for use:**Biometrics technology gives you accurate results with minimal invasiveness as a simple scan or a photograph is usually all that's required. Moreover the software and hardware can be easily used and you can have them installed without the need for excessive training..
- **Performance:** The biometric trait should the required accuracy imposed by theapplication.
- **Time Saving:** Biometric identification is extremely quick, which is another advantage it has over other traditional security methods. A person can be identified or rejected in a matter of seconds.
- **Circumvention:**This indicates how easily the chosen biometric trait can fooled usingartifacts

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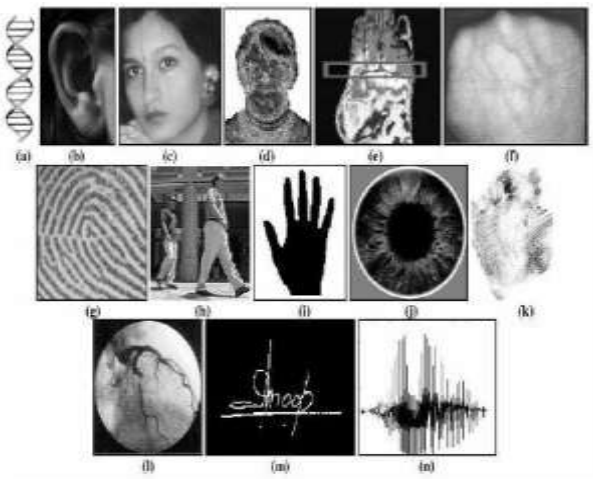

Examples of biometric characteristics: (a) DNA, (b) ear, (c) face, (d)facial thermo gram,(e) hand thermo gram(f)hand vein(g)fingerprint, (h)gait,(i) hand geometry, (j)iris, (k)palm print(l) retina(m) signature (n) voice

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Need of Multimodal Biometrics :-

Most of the biometric systems deployed in real world applications are unimodal which rely on the evidence of single source of information for authentication (e.g. fingerprint, face, voice etc.). These systems are vulnerable to variety of problems such as noisy data, intra-class variations, inter-class similarities, non-universality and spoofing. It leads to considerably high false acceptance rate (FAR) and false rejection rate (FRR), limited discrimination capability, upper bound in performance and lack of permanence. Some of the limitations imposed by Unimodal biometric systems can be overcome by including multiple sources of information for establishing identity. These systems allow the integration of two or more types of biometric systems known as multimodal biometric systems. These systems are more reliable due to the presence of multiple, independent biometric.

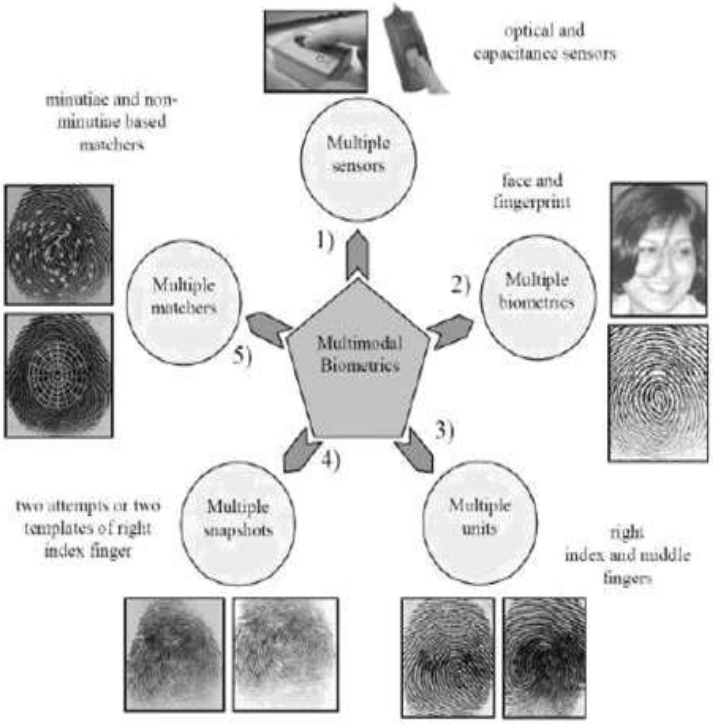


Fig. 3 Diagram of Multimodal Biometrics

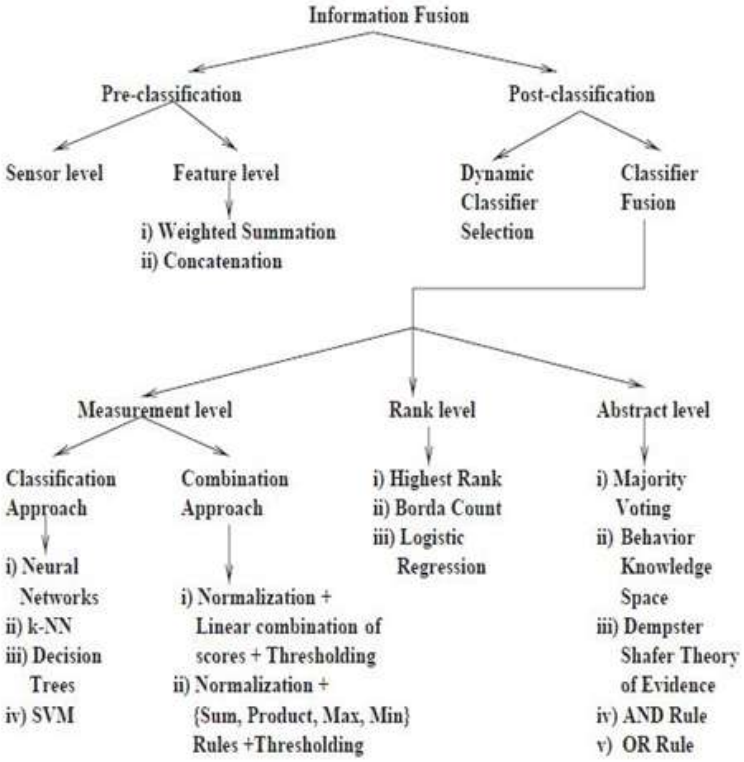
Fusion in Multimodal Biometric System:-

A Mechanism that can combine the classification results from each biometric channel is called as biometric fusion[8].

INFORMATION FUSION:-

Pre-classificationfusion: Prior to classification /matching, integration of information can take place either at the sensor level or at the feature level.

Post-classification fusion: Schemes for integration of information after the classification..



.Fig. 4 Approaches to information fusion

Level of fusion:-

A generic biometric system has 4 important modules:

1) **Sensor module:** It captures the *trait* in the form of raw biometric *data*

2) **Feature extraction module:** It processes the data to extract a *feature set* that is a compact representation of the trait

3) **Matching module:** It employs a classifier to compare the extracted feature set with thetemplates residing in the database to generate matching scores

4) **Decision module** which uses the matching scores to either determine an identity or validate a claimed

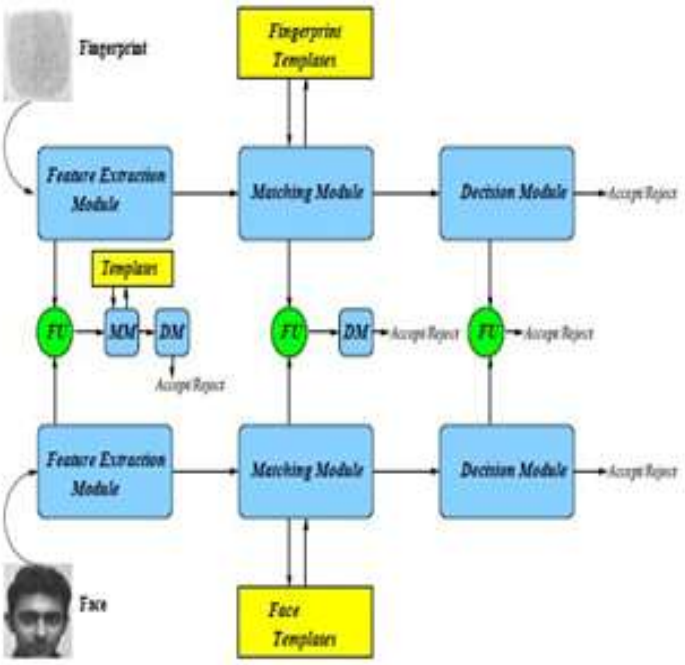
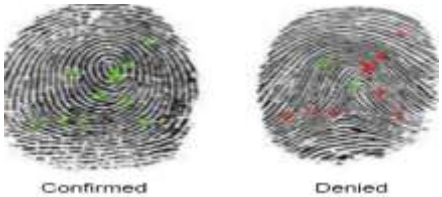


Fig. 5 Levels of fusion in bimodal biometric system; FU: Fusion Module, MM: Matching Module, DM: Decision Module

Biometric AuthenticationTraits:In this paper, we have discussed multimodal biometric authentication system by integration of fingerprints and iris recognition for better security consideration as much as possible. Biometric traits are conffered as follows:

Fingerprint Recognition: Finger print is a graphical Pattern of ridges and valleys on the surface of human finger.The finger prints recognition is used for forensic department for criminal identification.Most automate system for finger print comparison is based on minutiae matching.Minutiae matching chractersitics represents the termination and burification of the fingerprints. A good quality of finger prints image contains about 40 to 100 minutiae. Each person has its own fingerprints with the permanent uniqueness.Finger print is composed of ridges and furrows which are parallel and have same width..



Iris Recognition:

Iris biometric authentification system which are located Between cornea and lens of the human eye.The iris funct ion is used to control the amount of light entering thro gh the pupil.it consists no of layers, in the lowest layer it contains dense color cells also it determine the color ofiris.In image processing technique,it can be employed to convert iris pattern to unique code which is stored in a database and allows comparison between templates.

- Image Acquisition:Take photo of iris with good resolution and quality.
- Segmentation:Process the acquiring image for separation of iris from eye image.
- Normalization
- Features extraction and features encoding.
- Storing extracted code in database & comparing Asquiring iris images with codes in database.

II. CHALLENGES AND RESEARCH AREAS:-

In the previous sections, followings are the challenges in designing the multimodal systems. Successful pursuit of these biometric challenges will generate significant advances to improve safety and security in future missions. The sensors used for acquiring the data should show consistency in performance under variety of operational environment. Fundamental understanding of biometric technologies, operational requirements and privacy principles to enable beneficial public debate on where and how biometrics systems should be used, embed privacy functionality into every layer of architecture, protective solutions that meet operational needs, enhance public confidence in biometric technology and safeguard personal information. Designing biometric sensors, which automatically recognize the operating environment (outdoor / indoor / lighting etc) and communicate with other system components to automatically adjust settings to deliver optimal data, is also the challenging area. The sensor should be fast in collecting quality images from a distance and should have low cost with no failures to enroll. The multimodal biometric systems can be improved by enhancing matching algorithms, integration of multiple sensors, analysis of the scalability of biometric systems, followed by research on scalability improvements and quality measures to assist decision making in matching process. Open standards for biometric data interchange formats, file formats, applications interfaces, implementation agreements, testing methodology, adoption of standards based solutions, guidelines for auditing biometric systems and records and framework for integration of privacy principles are the possible research areas in the field[11].

IV. CONCLUSION

Biometrics systems are widely used to overcome the traditional methods of authentication. But the unimodal biometric system fails in case of lack of biometric data for particular trait. Thus the individual traits (fingerprint, and iris) are combined to develop a multimodal biometric system. The performanceof multimodal system better as compared to unimodal biometrics with accuracy .

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