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"Development of Biometrics technology in multimode fusion data in various levels"

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Abstract: *In this paper study of the biometrics. The recognition of face and fingerprint. The authentication of face and fingerprint are using various fusion levels. In this technology are useful for various applications. The biometrics is unimodal and multimodal system. Unimodal suffers from inter class, noisy data etc. the drawbacks can remove by using multimodal biometrics. The development of feature, sensor, match, rank, decision and other approach of fusion.*

Keywords: *[Multimode, Sensor, Feature level, Fingerprint, Face.]*

I. Introduction

The biometrics system is a technology used to identify measure and analyze an individual's Behavioral and physical characteristics. Each and every human being as unique fingerprint, face, iris, Signature and voice characteristics make him or her different of all other. This technology is used to write authentication of him or her. The many research of Biometrics authentication but this paper using the technology of multimode fusion techniques. This technology is easy and simple but secured data. The authentication of fusion data the two detection is important as like face and fingerprint [1]. The face and fingerprint is write detection of him or her data will be open easy. But this two is authe-ntication is wronging the data will not open.

II. Multimode Biometrics

Multimodal biometric system can be considered more reliable due to presence of multiple biometric traits to be used for authentication or authorization purpose. These systems can meet strict performance requirements imposed by different applications. These kinds of systems require improving speed and reliability of biometric authentication by integrating scores of different modality. Varieties of fusion techniques are available for this purpose. They are: majority voting, sum and product rules, k-NN classifiers, SVMs, decision trees, Bayesian methods, etc. [2]. Let us have look at few examples of multimodal biometric systems in Table 1:

Review of literature

Table 1.

Modalities fused	Authors	Level of fusion	Fusion methodology
Face and voice	Brunelli and Falavigana, 1995	Match score and rank	Geometric weighted average; HyperBF
Face, voice and lip movement	Frischholz and Dieckmann, 2000	Match score, decision	Weighted sum rule, majority voting
Face and fingerprint	Hong and Jain, 1998	Match score	Product rule
Face, fingerprint and hand geometry	Ross and Jain, 2003	Match score	Sum rule, decision trees, discriminant function
Face, fingerprint and voice	Jain et al., 199b	Match score	Likelihood ratio
Face and plamprint	Fenget al2004	feature	Feature concatenation

2.1Physiological

As depicted earlier, the physiological modalities are based on the direct measurement of parts of human body such as fingerprint, iris, shape, and position of fingers, etc. [3]
There are some physical traits which remain unaltered throughout a person's life [4]. They can be an excellent resource for identification of an individual

2.2Behavioral
Behavioral biometrics pertains to the behavior exhibited by people or the manner in which people perform tasks such as walking, signing, and typing on the keyboard [3].

2.3Combination of physiological and behavioral modality
Voice recognition biometric modality is a combination of both physiological and behavioral modalities [1]. Voice recognition is nothing but sound recognition [2]. It relies on features influenced by:

III. Fusion In Multimodal Biometrics

Biometric evidence in a multi biometrics system can be fused at several different levels. The fusion can be divided into the following main categories Prior to matching fusion, fusion occurs before matching of biometrics is done. This includes the following fusion levels:- sensor level fusion and feature level fusion. After matching fusion, fusion is done after the fusion of biometric data [5]. This includes the following fusion levels:- match score level fusion, rank level fusion and decision level fusion.

3.1 Sensor level fusion

Fusion at the Sensor level involves combining the raw data from various biometric sensors and this fusion is recommended for multi-sample and multi-sensor systems. All the modalities must be compatible raw data and must be known in advance or estimated accurately [5]. New data for feature extraction is generated from the integration of the raw data acquired from the sensors. For example, in face biometrics, 3-D texture data and 2-D depth data that is obtained by two different sensors may be used to produce a 3-D texture image of the face to be subjected to feature extraction. Fig. 1.Below shows the sensor level fusion.

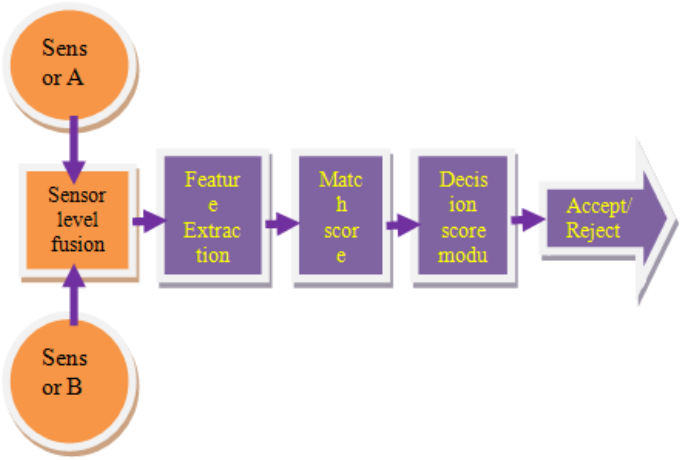

Fig 1. Sensor level fusion

3.2Feature level Fusion

This refers to the fusion of feature vectors obtained from a number of feature sources [6]. Examples of feature sources are: (a) feature vectors of a single biometric trait obtained from different sensors; (b) Feature vectors from a single biometric obtained from different entities, like fingerprint feature vectors from left and right hand; and (c) Feature vectors generated from multiple biometric traits. Fig.2. Below shows the feature level fusion.

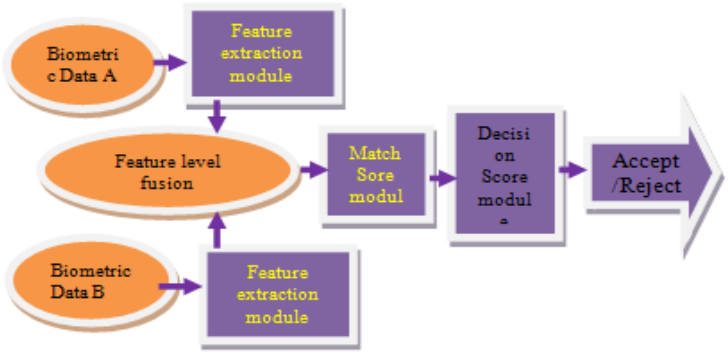

Fig.2 Feature level fusion

3.3 Matching score level fusion

This fusion involves the combination of similarity scores provided by the individual matching module of the biometric systems to produce the final combined match score. This method is also known as measurement level fusion or confidence level fusion. The combined matched score output generated by biometrics matchers provide all the required information about the input biometrics. Matching score fusion is classified by the two different approaches based on how the match score is processed. These are:- classifying the feature vector and combining the feature vector [5]. Normalization is also needed because of the dissimilar match score generated by the various modalities. Fig. 3. Below shows the match score level fusion

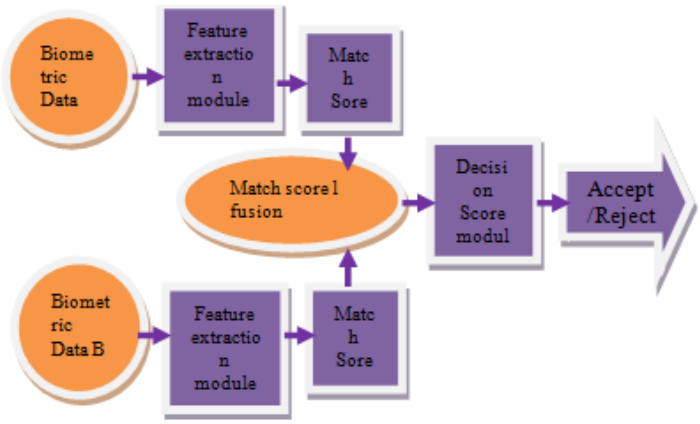

Fig.3. Match Score level Fusion

3.4. Rank level fusion

This type of fusion is used in identification systems and entails combining numerous ranks associated with any identity and determining a new rank that would be used in determining the final decision. The aim of rank-level fusion is to combine the rank output by each individual biometric matcher in order to derive the final rank. Ross et al. defines three methods to combine the ranks assigned by different matchers. This includes (i) highest rank method (ii) the Borda count method, (iii) and the logistic regression method. [7]

3.5. Other approaches to fusion

In July 2012 Dr. Shubhangi D C et al proposed the Face and Fingerprint recognition algorithm by combining ridge based matching for the fingerprint unimodal and Eigen for Face unimodal. This by recognition of the face first followed by the fingerprint recognition. The fingerprint recognition was based on the core and minutiae detection of the fingerprint data [9]. The Eigen faces were used to classify the face image which was then followed by the training of Neural Network to perform pattern recognition and identification.

3.6 Decision level fusion

In this level of fusion the information fusion occurs after each unimodal biometric system makes an independent individual decision about the identity of the user. [5] This is known as the simplest form of fusion since only the final output of the individual modalities is fused to form the multimodal biometric. Different methods are proposed for the decision level fusion for example, Majority voting, AND' and 'OR' rules. [5] After each unimodal has produced its outputs label that is, accept or reject in a verification system, a single final class label can be attained by using techniques such as majority voting[8]. Fig. 4.Below shows the decision level fusion.

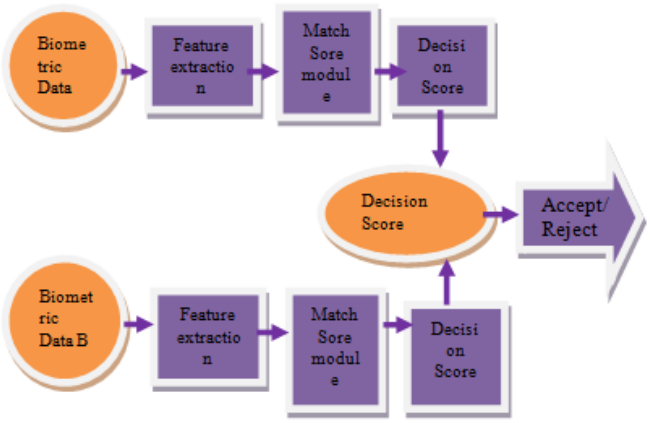

Fig.4. Decision Level Fusion

IV. Multimode Fusion Fingerprint And Face Data

4.1 Fingerprint Recognition

A fingerprint normally shows up as a progression of dark lines that speaks to the high cresting part of the ridge peel of friction, though the valleys in between these ridges appear as white space and are low shadow portion of the ridge peel of friction. The Fig. 2 shows the fundamental features of biometric like ridge endings, bifurcations and core of fingerprint. The points at which ridge endings are there are the focuses at which stoppage of ridge[2]. Bifurcations are the points on the image of fingerprint at which there is division of one ridge to two. And core is the central point of pattern of fingerprint.

4.2 Facial Recognition System

Face recognition is an area of research which is active and hence they can be used in applications of wide range, for example, security and surveillance. Face is an advanced structure which is multidimensional and requires a decent technique of computing for purpose of recognition. The system of face recognition can be used in two modes: Verification and Identification [10]. The extraction of the features of face incorporates localizing presumably the most qualitative elements of the image of face such as mouth, nose and eyes region.

Face recognition has dependably been an exceptionally difficult task for the researchers. On another hand, it has dependably been extremely hard for implementing because of all diverse circumstances that face of human can be found. Because of the difficulty in the task of the recognition of face, quantity of techniques is diverse and large. It is not surmise that images are dependably captured in perfect conditions, there might be variation in expression, pose and illumination[11]. Such difficulties are more unmistakable in recognition of heterogeneous face. In a decade ago, there were numerous methods created for handling such types of issues. From surveys of face recognition, it implies that they have face recognition of the images of that face which are of same sort. This confines the face recognition or particular data type. Such circumstance can be handled by utilizing images of face of diverse methodology, it allude as heterogeneous faces.

V. Conclusions

This work presents a novel user authentication system based on a combined acquisition of fingerprint and face. Various level fusion is used as it is better and gives the optimal identification Face and fingerprint.

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