

MULTIMODAL BIOMETRIC SYSTEM: A REVIEW

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ABSTRACT

Biometrics is the science and innovation of estimating and examining biological information of human body, extracting a list of feature set from the obtained information, and comparing this set against with the layout set in the database. The essential point of a biometric distinguishing proof framework is to separate consequently between subjects in a reliable and dependable way,, as indicated by a particular target application. In present day world correspondence, securing data is a critical task. Thus Cryptographic frameworks are fundamental parts of correspondence frameworks in all applications. Single source of information in biometric frameworks are called unimodal frameworks and are perfect however they normally experience the bad effects of a number of issues when they face with noisy information, for example, intra class varieties, limited degrees of flexibility, spoof assaults and non-all inclusiveness. Some of these issues can be solved by utilizing multimodal biometric frameworks that link at least two biometric modalities.

Keywords: Biometrics recognition, Face recognition, Types of Biometric Systems, Multimodal

1. INTRODUCTION

1.1 Biometrics recognition

The procedure of consequently separating individuals based on individuality data from their physical or behavioral attributes like unique mark, iris, face, voice, and so on. The biometric acknowledgment can be additionally partitioned into two modes: ID and check. The distinguishing proof mode is intended for recognizing an approved client when he needs to get to a biometric acknowledgment framework. The framework at that point endeavors to discover

whom the biometric highlight has a place with, by contrasting the question test and a database of enlisted tests in the expectation of finding a match. This is known as a one-to-numerous correlation. On the opposite side, the verification mode is a one-to-one comparison in which the acknowledgment framework tries to check a person's identity [10].

1.2 Face Acknowledgment

Face acknowledgment is an all around significant worldview under example acknowledgment with numerous applications moving towards the utilization of facial highlights for approval and confirmation. Face acknowledgment can be utilized as a part of two sorts of use: 1) Identification and 2) Authentication. Since individuals can conceal their countenances or experience surgeries for facial adjustment, it is more helpful to utilize confront acknowledgment framework for confirmation where the picture taken from the subject can be contrasted against pictures in a database with enable access to the framework. However Face acknowledgment is defenseless to changes in the earth, for example, lighting and issues of obscure. The issue of Gender acknowledgment is especially testing, the same number of females are dishonestly distinguished as guys in confront acknowledgment. Enhancing sexual orientation acknowledgment rates will help the general proficiency of the face acknowledgment framework [9].

1.3 Types of Biometric Systems

Applications that are known as biometric framework can be ordered in two distinct composes

- a. Unimodal Biometric System (UBS)
- b. Multimodal Biometric System (MBS)

A. Unimodal (UBS)

The unimodal biometric framework utilizes single biometric attribute to recognize the client. It is solid and exact yet it can face with some these issues

1. Noise in detected information: Noise and varieties in biometric data may make false matches in the database.

2. Non-comprehensiveness: There are a few exemptions, in which an individual can't give a specific biometric.

B. Multimodal (MBS)

Multimodal biometric framework turns out to be progressively basic in present and future certifiable biometric framework organization. For instance, a multimodal biometric framework may utilize face, iris and ear highlights to affirm the character of a client [23]. These are a few points of interest for these frameworks:

1. Acknowledgment exactness: The quickest preferred standpoint of multimodal biometric framework is acknowledgment precision.

2. Biometric information enlistment: Multimodal biometric frameworks can address the issue of non-all inclusiveness.

3. Security: Multimodal biometric frameworks increment protection from certain sort of vulnerabilities [8]. There are different motivations to join at least two biometrics. One is that diverse biometric modalities may be more proper for the distinctive applications. Another reason is essentially client inclination. The point of multi-biometrics [2] is to diminish at least one of the accompanying:

- False acknowledge rate (FAR)
- False reject rate (FRR)
- Failure to select rate (FTE)
- Susceptibility to ancient rarities or emulates

The exactness of a multimodal biometric framework is typically estimated as far as coordinating blunders and picture obtaining mistakes. Coordinating mistakes comprise of false match rate (FMR) where an impostor is acknowledged and false non-coordinate rate (FNMR) where an authentic client is denied get to. Picture obtaining blunders involve inability to-select (FTE) and inability to-procure (FTA) [6].

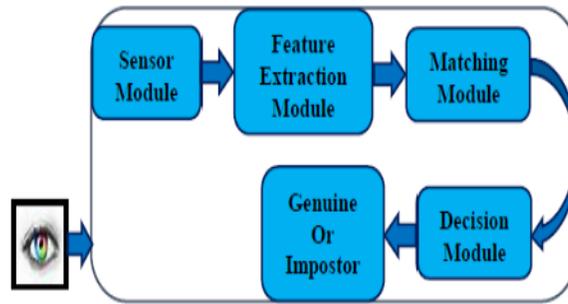


Figure 1: Unimodal biometric architecture [8]

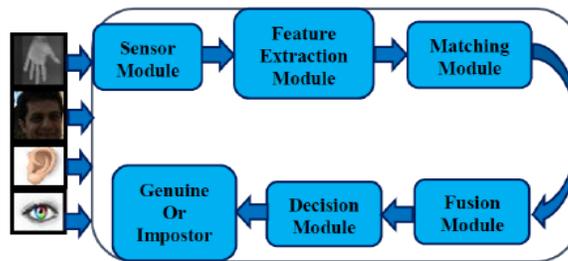


Figure 2: Multimodal biometric architecture [8]

1.4 Multimodal Biometric Systems Architectures

When it has been resolved which diverse biometric sources are to be incorporated, the framework design is chosen. It is for the most part acknowledged that there are two primary kinds of framework designs[6] with regards to multimodal biometric frameworks – to be specific 'serial' and parallel'.

Serial

In serial architecture [6], otherwise called course design, the preparing of the diverse information sources are done in grouping. Along these lines, the yield from the primary biometric quality, will influence the handling of the second biometric characteristic, et cetera.

Parallel

In parallel engineering, the preparing of various biometric inputs [6] are done freely from each other. Once both have been independently handled, their outcomes are combined [6].

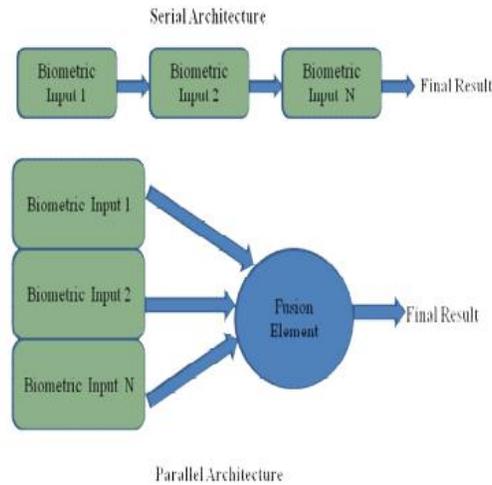


Figure 3: Two Main Architecture Designs for Multimodal Systems [6]

2. LITERATURE REVIEW

L. Puente Rodríguez et al. (2008) the combination methodology utilized has been the alleged "score combination" utilizing distinctive calculations, among them "Neural Networks" and "Bolster Vector Machines", and so on. The greater part of the examinations have been done from a similar gathering of information acquired because of the execution of the procedures of three unimodal check frameworks on three autonomous biometrical databases. Results demonstrate the considerable change that combination can create when unimodal outcomes are sufficiently bad.

Vincenzo Conti et al. (2010) In this paper, an inventive multimodal biometric distinguishing proof framework in light of iris and unique finger impression attributes is proposed. The paper is a best in class headway of Multibiometrics, offering an imaginative point of view on highlights combination. In more noteworthy detail, a recurrence based approach brings about a homogeneous biometric vector, coordinating iris and unique finger impression information. Progressively, a hamming-remove based coordinating calculation manages the bound together homogenous biometric vector. The proposed multimodal framework accomplishes fascinating outcomes with a few ordinarily utilized databases.

Sorin Soviany et al. (2011) The paper shows a novel way to deal with give a more secured remote access to informatics frameworks; this approach depends on biometric recognizable proof multimodal techniques with more levels of biometric combination. The multi-level combination

is the curiosity of this arrangement, as the genuine methodologies in multimodal biometric as depending on single-level combination plans. The mix of more combination plots inside the same biometric framework improves execution, security and exactness for the real unimodal biometric frameworks and furthermore for the multimodal ones, particularly for on score-level combination.

Jinfeng Yang et al. (2012) In this paper, another unique mark vein based biometric strategy is proposed for making a finger more general in biometrics. The unique mark and finger-vein highlights are first abused and separated utilizing a bound together Gabor channel structure. At that point, supervised local-preserving canonical correlation analysis method (SLPCCAM) is proposed to create fingerprint-vein feature vectors (FPVFs) in highlight level combination. In light of FPVFs, the closest neighborhood classifier is utilized for individual ID at last. Trial comes about demonstrate that the proposed approach has a high ability in unique mark vein based individual acknowledgment and multimodal highlight level combination.

I.Raghu et al. (2012) Since it is extremely hard to recall expansive private keys, these keys are put away by utilizing biometric highlights and this is called biometric encryption. In this paper creator propose a multimodal biometrics based encryption plot. Here we consolidate highlights of unique finger impression and iris with a client characterized mystery key. It is tentatively checked that the proposed framework beats unimodal biometric encryption Systems.

MADHAVI GUDAVALLI et al. (2012) hence, single biometric will most likely be unable to accomplish the coveted execution necessity in true applications. One of the strategies to beat these issues is to make utilization of multimodal biometric verification frameworks, which join data from various modalities to land at a choice. Multimodal biometric frameworks are those which use, or ability of using, in excess of one physiological or behavioral trademark for enlistment, check, or ID. Studies have exhibited that multimodal biometric frameworks can accomplish better execution contrasted and Unimodal frameworks. Creator talk about here various multimodal sources, multimodal structures and diverse combination strategies utilized as a part of multimodal biometric frameworks.

David Marius Daniel et al. (2014) This paper gives the execution got by a multimodal biometric framework that joins the component extraction level and the score level combination

of iris and unique mark unimodal biometric frameworks keeping in mind the end goal to exploit both combination methods.

Mehdi Ghayoumi et al. (2015) Single source of data in biometric frameworks are called unimodal frameworks and are impeccable yet they frequently experience the ill effects of a few issues when they look with loud information, for example, intraclass varieties, confined degrees of flexibility, parody assaults and non-all inclusiveness. A few of these issues can be illuminated by utilizing multimodal biometric frameworks that join at least two biometric modalities. Different techniques, combination levels and coordination procedures can be connected to join data in multimodal frameworks.

M.Saraswathi et al. (2016) in this paper, creator displays a face acknowledgment framework that distinguishes a man from the information picture given, for validation purposes. As an element extraction system, Linear Discriminant Analysis (LDA) is utilized. After the age of highlights, the arrangement is performed utilizing Euclidean Distance classifier. Acknowledgment rates are computed for differing sizes of preparing information and relating test information. The informational index is the ORL confront database which is a standard face database for confront acknowledgment frameworks. The database comprises of 400 pictures of 40 individuals with 10 unique postures for every person. Towards the end, test comes about demonstrate a high acknowledgment rate of 93.7% got by the utilization of LDA highlight set.

Ching-Han Chen et al. (2016) In this paper, creator join face and iris highlights for building up a multimode biometric approach, which can lessen the downside of single biometric approach and in addition to enhance the execution of verification framework. Creator joins a face database ORL and iris database CASIA to develop a multimodal biometric exploratory database with which we approve the proposed approach and assess the multimodal biometrics execution. The test comes about uncover the multimodal biometrics check is significantly more solid and exact than single biometric approach.

Table 1: Representation Of various Techniques applied

| S.No | Technique applied on algorithm | Outcome | Year |
|------|--|---|------|
| 1 | Different Fusion Techniques: 1.Simple Normalized Data + NN (3-3-1) 2.Simple Normalized Data & Sigmoid Transf. + NN (3-3-1) 3.Simple Normalized Data +Weighted Product + DSS 4.Simple Normalized Data + Weighted Product 5.Simple Normalized & Sigmoid Transf.+ SVM | Error Rate: 1.58% 1.65% 1.66% 1.67% 1.68% | 2008 |
| 2 | Log-Gabor-algorithm-based codifier to encode both fingerprint and iris features | It obtains a unified template. | 2010 |
| 3 | Multimodal Biometric Securing Methods for Informatics Systems | This approach is useful to select the suitable biometric sensors for access control applications based on their features. | 2011 |
| 4 | A new multimodal biometric method based on feature-level fusion of fingerprint and finger-vein | This method performed well in personal Identification. | 2012 |
| 5 | Multimodal biometrics encryption and verification system based on the fusion of fingerprint and iris features. | Multimodal biometric system provides good performance as far as | 2012 |

| | | | |
|---|---|--|------|
| | | system security is concerned but at the same time it increases system complexity due to fusion of feature map. | |
| 6 | Multimodal biometric system that combines two biometric fusion methods. | data obtained security, by this system, are higher than that specific to a single level fusion method. | 2014 |

3. CONCLUSION

Multimodal biometrics is an energizing and fascinating research area that makes a combination of sources for better exactness and security. It is imperative to consider distinctive biometric sensors innovations. The sensor highlights to be considered are electrical ones, thermic ones and furthermore their interfaces with PC or different gadgets and apparatuses. The unimodal highlights of unique mark and finger-vein were removed utilizing a bound together Gabor channel system, which is advantageous for CCA and its augmentation to locate the most corresponded includes amongst fingerprints and finger-vein. To make CCA appropriate to nonlinear issues, a novel SLPCCAM was utilized and connected to include extraction of two distinctive capabilities. Multimodal biometric framework gives great execution to the extent framework security is concerned however in the meantime it increases system complexity due to integration of feature map.

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