

# Biometrics and Identification: Survey

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## **Abstract:**

This paper displays the basic concepts to identify a person from many by using biometric criteria and how these criteria increases the security systems in the last few years. It displaying different researches and techniques that is related with this subject and the concepts to evaluate these techniques. The goal of this paper is comparing the techniques and methods in the identification systems or verifying persons depending on biometrics traits by using protected systems without humans entry in decision making to get into the comparing table that is depending on the similarity or difference traits for the different stages to design the identification system on persons, and by argument the comparing results it can give an idea on the importance of each stage and the adequate algorithms to inquiry it.

*keywords:* Identifications; Biometrics; pattern recognition; characteristics

## **1-Introduction:**

because of its accurate features that can't be forgotten, duplicated, misplaced or fake, biometrics schema assist and afford a numerous benefits in identification purposes and varication/authentication purposes not like the other approaches like passwords and tokens that might be forgotten or duplicated [1].

The identification based on an biometric system is an automatic pattern recognition system that supports in distinguishing an individual by defining physiological features such as finger-print, facial trait, eyes trait, hand shape, hand/limb mood, retina, DNA and palm-print and/or interactive features such as signature, voice and gait for the determination of authentication[2]. The goal of this paper is comparing the techniques and methods in the identification systems or verifying persons depending on biometrics traits by using protected systems without humans entry in decision making to get into the comparing table that is depending on the similarity or difference traits for the different stages to design the identification system on persons, and by argument the comparing results it can give an idea on the importance of each stage and the adequate algorithms to inquiry it. Section 2 introduce the types of biometrics. Section 3,4 represent the identification process of the types, factors of biometric technology and explains the automated identification biometrical system. Section 5 introduce some recently related works.

## **2-Types of Biometrics:**

There are many types of biometrics that can be used during the identification process. These types classified in to two kinds: physiological features and/or interactive features .This types can summarize in table[1] .

**Table[1]: types of biometrics measures**

	<b>Type</b>	<b>Characteristic</b>	<b>Algorithm for feature extraction</b>	<b>Properties</b>
<b>Physiological characteristic</b>	<b>Finger print[1]</b>	unique and consistent	Minutiae	The external part of the Finger contains edges And ravine. Edges are the higher part of the skin section while the ravine are the deeper one. The several types of cutout in edges that have necessary and distinguishable facts to identify thumbprints.
	<b>Face [1]</b>	The person's Face has measurements ,parts and physical characteristics that make it single.	Eigen face	There are Training phase And operative phase that divide the image into subspace by using PCA to use this input image in the eigen-space to be exercised to achieve recognition that is done using eigen-space classifier.

	<p><b>Iris</b></p>	<p>The circular part of the eye variable the scope of the pupil Surrounded by the white part [1].</p>	<p>Hough Transform for Localization [8]</p>	<p>It proposed localization, normalization and enhancement To localize the iris image integro- differential operator (IDO) and Hough transform technique for filtering it and using histogram operations for iris segmentation. the outer boundary is applying Daugman's on it while iris inner boundary by using wavelet transform [8].</p>
	<p><b>DNA[4]</b></p>	<p>The distinctive That is found In DNA make It distinguishab In almost all Creatures Which is help to be genetic cipher, so no two human being precisely alike.</p>	<p>Particle swarm optimization (PSO) algorithm</p>	<p>It is only need to change its letters in to the corresponding ASCII code numbers And does not need a clatter or variation elimination.</p>

	<b>Teeth [5]</b>	The human Structure or Bones are not simply decomposed which Teeth are parts of it that is found in the mouth cavity, thus they are safer from decomposing if the human died or main accident.	Pixel neighborhood segmentation techniques	There are types of teeth structure that took out from radiograph or photograph that have many cases of teeth which might be exist or not, top of the teeth and core cavity, dental repairs and periodontal tissue as shown below [5].
<b>Behavioral characteristic</b>	<b>Signature</b>	Behavioral patterns inherent in the process of signing. This includes changes in timing, pressure, and speed [1].	spatial frequency and orientation contents[9].	The relevant authentication accuracy can be much better when it offers a much more significant biometric tester in comparison to signatures [9].
	<b>Voice</b>	The physical and interactive features mixed together to remain persistent. but	Fourier transform [9].	The several band-pass occurrence channels are extra decayed the extracted Feature that is practical to the regulate amplitude

		the interactive features of voice changed cause of person's growth and health circumstances, [1].		of the feedback sign [9]
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**Figure (1) DNA biometric measure[4]**



**Figure (1) : Teeth biometric measure[4]**

### **3- Identification process:**

This procedure tries to answer of the following : “Are you the similar who you are is requesting?”, or, “Do I recognize you?” This is one-to-many equivalent and comparison of a biometrics of human with the exist database. Such system aims management the identity of a person from a big set of possible personalities.

#### **3.1- Identification types: Factors of biometric technology [1]:**

Some desirable factors of biometric characteristics:

First : Every single person should own the distinctive feature.

Second: The features must be necessarily distinct through entities including the residents.

Third: All features have to be adequately static along a period of time.

Fourth: It must be probable to obtain the distinctive devoid of affecting too much troublesomeness. The vector of data must be appropriate for advance processing.

From a presentation judgment, next possessions must also be taken in to version.

Fifth: The essential detection accuracy in a presentation must be realizable using the features.

Sixth: Denotes to readiness by a topic to current biometric features.

Seventh: Denoted to the hardness of it when using objects (such as, false limbs) in circumstance of physical features and imitation in situation of interactive features .



a short-lived of the greatest biometric techniques above factors are presented in tabletop (2), to distinguish between the biometrics modalities [3]:

TABLE 2. COMPARISON OF BIOMETRIC CHARACTERISTICS [3]:

Biometric characteristic	Universality	Distinctiveness	permanence	collectability	performance	acceptability	circumvention
Face thermo-gram	High	High	Low	High	Medium	High	Low
Hand-Mood	Medium	Medium	Medium	Medium	Medium	Medium	Low
Way of walking	Medium	Low	Low	High	Low	High	Medium
Keystroke	Low	Low	Low	Medium	Low	Medium	Medium
smell	High	High	High	Low	Low	Medium	Low
Auricle	Medium	Medium	High	Medium	Medium	High	Medium
Hand-shape	Medium	Medium	Medium	High	Medium	Medium	Medium
Thumbprint	Medium	High	High	Medium	High	Medium	Medium
Face	High	Low	Medium	High	Low	High	High
Iris mesh	High	High	Medium	Low	High	Low	Low
Irish	High	High	High	Medium	High	Low	Low
Forehand-Print	Medium	High	High	Medium	High	Medium	Medium
Speech	Medium	Low	Low	Medium	Low	High	High
Signing up	Low	Low	Low	High	Low	High	High
DNA-STR	High	High	High	Low	High	Low	Low
Teeth	High	High	High	Medium	Medium	Medium	High

### 3.2- Advantages of Using Biometric Methods [6]:

- Accurate Identification

Using biometrics methods is to offer distinctive and precise identification methods. These structures can't be simply repeated, which means only the official person gets entree and get great level of security.

- **Accountability**

As a result it get true and wide-ranging answerability, which can't be repeated.

- **Easy and Safe for Use**

The rewards of using biometrics traits for identification is that the structure that is planned is easy and safe to use which gives precise outcomes with humble scan or a snapshot.

- **Time Saving**

It requests a few seconds for a creature to be recognized or forbidden, which is enormously quick and that is extra benefit that it has over the extra old-style security systems.

- **User Friendly Systems**

To get an easy installed, quickly, reliably and uniformly biometric system by minimizing the amount of training and no expensive password administrators.

- **Safety and avoiding errors**

The problem with the traditional security system is that it consist of a high arrangement of numbers, letters, and signs, which makes them hard to remember or it can be easily stolen or lost, so you can't tell if it was the real user or not.

These problems can't accrue in the biometric identification system because it won't deal with the problematic of distribution, repetition, or fraud.

- **Suitability**

Another advantage for these system because it provided an opportunity to get rid of the old traditional methods of nuisance regulations like remembering password frequently or carrying exposure on ID cards.

- **Versatility**

the most out of the biometric system is that it can be used for many of applications

such as checkpoints including entrances, exits, doorways and to display stuff-time and presence, which increases responsibility.

- **Capability of growth**

This systems have the capability of increase and growth in simply ways. It depend on the requirements that you need such as using higher versions of sensors to get higher level of security with multi model uses to rise detection correctness or using devices that are not very discriminative at the lowermost level of security.

#### **4- Automated Identification Biometrical system [7]:**

Security sestym for storing and dealing of bio-metric and related biographic information for nationwide protection; migration and border organization; intelligence;

investigations for nationwide secure locations with secrecy locations of community ensuring; and related checkup, training, organize journalism, planning, or other organizational usage.

### **Unique Data Elements**

spread data from the system to inner and outer subsystems of a real-time-basis, and it holds the following data elements:

**Biometric data:** ordinal facial photos, fingerprints, iris photographs, palm patterns, latent, and other modalities :full-name (i.e., first, middle, last, nicknames, and pennames), date of birth (DOB), sex, Digest; personal-counting).. etc.

**Encounter data:** deal identifier facts, such as sending institute; timestamp; workplace; motive fingerprinted, such as access, visa request, credentialing submission.

**Learn and testing data:** data that may be actual or replicated, and biographic and encounter- connected data for use only for analysis and exercise determinations.

### **5- Related Works:**

[Abdullah M. 2017] proposed model uses three types of biometric traits face, iris and fingerprint. Number of stages are taking place for the design of the system. The proposed system will perform in two phases, training and testing. It uses singular Value Decomposition (SVD) as a method for feature extraction and Artificial Neural Network (ANN) was used as a tool for recognition, so it gave high accuracy from this work with 95% recognition rate.

[Khudhur S. ,Crook. M. 2017] proposed a system that automated the human identification based on dental X-ray. It included a features extraction method for separation teeth and a complete database system with full actions, such as matching, searching, editing and insertion. the matching process to the query dental X-ray for unknown person with matching rate equal to 70%.

[Croock M. 2016] Proposed An accurate teeth edge detection method for dental X-Ray images is proposed. This method adopted three stages algorithm Witten in MATLAB environment. These stages are image enhancement, teeth segmentation and edge detection with feature extraction. Three features are selected to be the identity for each teeth individually: Area, Euler Number and Standard Deviation.

[Darabakh Kh. et al 2015] introduced an iris feature extraction and recognition method that uses mean thresholding and Mean by median thresholding which achieved a recognition rate about 98.3269% [12].

[Islam S.M.S. 2013] introduce attribute level mixture of 3-D-attributes take out from ear and front data. Based similarity are merged with another nearby point algorithm using a summation with weight instruction. it access the detection (at 0.001 FAR) rates of 99.0% correspondingly, with neutral and 96.8%, with non-neutral facial terms on the main databases of 3Dear and facial trait [3].

[Said E. 2010] proposed clustering in teeth X-Ray based morphology in which they uses a gray scale contrast stretching transformation to improve the performant of teeth clustering [5].

[Yao et al. 2007] suggested a multi-modal biometrics scheme merging facial trait and Palm print structures. The distinct faster biometrics recognition that it has a huge amount of data that leads to an accessibility which is an actual significant mixture. Facial feature, an illustrative of contacting biometrics and palm print feature, a typical contacting biometrics, it selected in place of combination. Other thought by planning suitable mixture technique. So, combination is achieved at feature stage cause it holds a great data in the input design [1].

[Fuge et al. 2004] modify a characteristics stage fusion depending on multi-modal consuming both facial trait and palm-print. Based on PCA and ICA by means of classification procedures. 70.83%, 85.83% of PCA-based accuracy degree for face, palm-print [3]. PCA leads to principal component analysis and ICA leads to independent component analysis.

## 6- Discussion and conclusions:

According to the persons related work, this paper introduce a comparison table[3]. Summary some previous researches upon some criteria.

**Table[3] shows the comparison**

Researchers	Year	Multi-biometric Principles	Algorithm	Results
Abdullah M. [12]	2017	Iris+ face+ fingerprint	SVD+ ANN	Recognition Rate= 95 %

Khudhur S. [11]	2017	dental	image enhancement image segmentation	Matching rate = 70%
Croock M. [10]	2016	teeth	Euler Number and Standard Deviation	Accurate result
Darabakh Kh. [12]	2015	Iris	Mean by median thresholding	Recognition rate 98.3269%
Islam S.M.S. [3]	2013	Face + Ear	fuzzy vault	FAR = 0.001 % Recognition: 96.8% Verification: 97.1%
Said E. [5]	2010	Teeth	Integral projection	It is feasible approach for large database.
Yao et al. [1]	2007	Face and palmprint	Standard Deviation (STD), Euler number and Area about transform +PCA	90.73
Feng et al [3]	2004	Face+ palm print	PCA	accuracy rate 70.83%, 85.83%
Feng et al [3]	2004	Face+ palm print	ICA	accuracy rate (85%, 92.5%)
Verlinde et al. [1]	1999	frontal face + voice	k-NN	95%

[Abdullah M. 2017] improve a nicely method for multi biometric identification using three biometric characteristics such as face, iris and fingerprint by using SVD algorithm and Wavelet Decomposition as a tool for extracting the features and as a purpose for enhancing the performance and increasing the accuracy. SVD is used for every matrix for the hidden characteristics and the energy of Wavelet is used effectively and efficiently to evaluate the vector, as a result the final work gives high accuracy with recognition rate of 95%

[Khudher S. , Crook M. 2017] proposed a method for individual identification based on dental features by using dental radiographs (X-Ray) processed utilizing MATLAB software in a three steps algorithm: image enhancement, image segmentation and features extraction. The obtained features are stored in a database for each tooth of individuals and used canny algorithm to detect edges and it gives a perfect result which is minimize the time consuming and system resources of error equal to 5.2% and the matching rate equal to 70%.

[Croock M. 2016] proved an accurate edge detection method for dental x-ray which is canny edge detection algorithm. It has been tasted of different bite wing dental x-ray images for the upper, lower teeth and it also takes in consider the missing teeth as an object to ensure an accurate result.

[Darabakh Kh. 2015] proposed a 98% recognition rate of iris by analyzing the characteristics of eyelashes in the preprocessing stage which is consist of sub stages such as The Outer Circularity Region of Iris to get the outer circularity of iris, making a binary image is to convert the image pixels in to binary, image thinning which is a morphological operation to detect the boundary points, Extreme point Identification to identify the extreme point of the eyelashes and The Outer Circularity of Iris to generate the intersection region of the eyelash occlusion region. In the feature extraction stage used the mean thresholding to normalize the image by sliding a window on each row and lastly the matching stage used a fragile bit distance algorithm that represent the texture of iris by using a binary iris code



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