CYB 305: Biometrics

Biometric is a technique used to identify analyze and measure an individual’s physical and behavioral characteristics each human being is unique in terms of characters. Physical attributions such as fingerprint, color of iris, hand, hair and hand geometry are the examples of physiological characteristics. Behavioral characteristics are signature the way of typing on a computer etc. makes a person unique from the rest.

Need for Biometric Security

With increasing use of computer science in the field of banking, science, medicine etc., there’s a need to protect the system from unauthorized users. In this regard biometrics is used for authenticating unauthorized users. In this regard biometrics is used for authenticating and authorizing a user. It is a one to many matching and comparison of a person’s biometrics with the whole database.

Verification: This is the verification where like samples are entered by the user is compared with the previously stored template in the database.

Authorization: It is the process of assigning or allowing access rights to authenticated or verified user

Shortcomings of Traditional security Methods

* They can be easily be forgotten egg Pin
* They can be bypassed e.g. Pin
* I.D. cards, ATM’S can be lost or stolen
* They can easily be compromised

Steps in developing a Biometric System

* Acquire/collect samples from the user
* Extract prominent features from the samples being stored
* Compare the incoming features with the one in the database
* Make a decision (allow or deny)

Where an authorized user is denied it’s one of two things:

FAR → False Acceptance Rate

FRR → False Rejection Rate

FAR → False Acceptance Rate:

It is a measure of possibility that a biometric system will incorrectly identify an unauthorized user as a valid user.

FAR= N.O. of False Acceptance / N.O. of tried attempts

FRR → False Rejection Rate:

It is a measure of possibility that a biometric system would incorrectly reject an authorized user to a valid user.

FRR= N.O. of Rejection / N.O. of attempts

Types of Biometrics

* Physical
* Behavioral
* Hybrid
* Physical Method: this method contains the age of shape and size of the body e.g. Fingerprint Recognition, Hand Geometry System, Face Recognition, Iris Recognition.
* Behavioral Method: it entails the use of behavioral over time to develop the system. Examples are: Rhyme/Pattern of typing on Computer Keyboard, Gait( the way if walking) and Signature(pattern used in signing)
* Hybrid: This takes properties of both Physical and Behavioral properties it includes both traits e.g. voice recognition depends on size and sounds of vocal cords, size of lips and shape of lips, emotional status and age.

Physical Method:

* Fingerprint: it is the most known and used biometric system to authenticate and verify the user. Everyone has a unique fingerprint which is composed of ridges, groves and direction of lines. There are 3 basic patterns of ridges namely:
* Arch
* Loop
* Whorl

The uniqueness of fingerprint is determined by these 3 features as well as the minute features such as bifurcation and sports. Fingerprint matching techniques are divided into 3 types namely:

* Minute based techniques: are found and mapped to their relative position of the finger
* Correlation: this uses a richer based info for its mapping
* Pattern based method: compares the inner print patterns in the data base

### Advantages:

* It’s highly reliable
* It’s cheap
* It’s very secure
* It consumes little to no memory space.

### Disadvantages:

* Scars or cuts can hinder recognition process
* The system can be fooled
* It’s unhygienic

### Application:

* Banks
* Police Station
* Government Sectors

Facial Recognition:

This is based and determined by the shape and size of the jaw, chin, shape and location of the eyes, nose, and lips. The facial geometry is transferred to the database in terms of points. The comparison algorithm is performed on points or pixels.

### Ways facial recognition is performed:

* Facial matrix: in this type of method the distance between pupils or from nose to lips are measured
* Eigen Faces: in this method, your overall face image is measured based on weighted combination of number of faces
* Skin Texture Measurement: in this method the unique lines, patterns and spots on a person’s skin are located

### Advantages:

* It offers easy storage of templates in data base, it is safer in the sense that it does not involve physical contact with the system
* It reduces statistical complexity

### Disadvantages:

* Uniqueness is not guaranteed especially in the case of identical twins
* Facial traits change over time
* It requires adequate lighting to get correct input

### Application areas:

* Banks
* Mobile devices

Retina/Iris Recognition:

Iris recognition walks on iris pattern in the human eyes, in adults the texture if iris is stable throughout life time and the iris pattern for the left and right eye are different.

### Advantages:

* It is highly feasible
* It has no physical contact
* It is highly accurate

### Disadvantages:

* It’s relatively expensive
* It requires the person keeps stable

### Application Area:

* National Security and Identity Card (India)
* Google to access their data center

**PLEASE MAKE ANY POSSIBLE CORRECTION IF NEED BE**