Enhanced Automatic Educational System

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Abstract: **Humans have always been tantalized by the skin carvings and ridges which is fascinating and follows some pattern. These includes fingerprints of palm and foot whose patterns have an exquisite shape. The ridge growth is synchronized with the neocortex which is the brain's primary center of intelligence and contributes to an individual's ability to learn and react. This paper takes into account the fingerprint patterns of an individual to analyze their behavior and personality type to enhance their learning ability.**

Keywords: **Finger prints, Feature extraction, Minutiae algorithm, Principal component analysis.**

1. Introduction

Human being have craved upon the idea of knowing the unknown. Finger prints are the reflection to our inborn potential and talent. This paper reveals minute details of an individual born with above average intelligence in specific areas [4]. By considering their fingerprint pattern and relating them with their behavior, personality type and learning ability.

We identified the different types of learning styles, personality types, preferred acquisition style, quotients of intelligence. This is based on the formation of ridges and valleys in a finger print which result in different type of minutiae points. The different types of minutiae points include bifurcation, dot, enclosure, ending and island. The minutiae extraction technique includes bifurcation and grey scale.

The different learning style include – visual, kinesthetic and auditory. The personality type includes – dominant, steady, influential and compliant. [1] The quotient of intelligence is majorly classified as – Intelligent quotients (IQ), Emotional quotients (EQ), Creative quotients (CQ), Adversity quotient (AQ), Spiritual quotient(SQ). The combinations of fingerprint result in unique patterns which help us identify the above mentioned traits [10].

2. Related work

Alessandro Farina and Zsolt M. Kovács-Vajna describes minutiae algorithm for fingerprint mining from binary images [1]. Identifying the different types of learning styles, personality types, preferred acquisition style and innate quotients of intelligence [4]. Learning the connection between brain and fingerprint is explained with respect to neocotex which is the primary center of intelligence [5].

Learning the principles, classes of fingerprints and various techniques to recognize these patterns [14].

Learning about the various fingerprint techniques such as Minute Distance Vector, Artificial Neural Network & Principle Component Analysis [15]. Learn about the fingerprint identification and authentication with respect to multiple template matching [16]. Learn about different personality, behavioral and intelligence level of individuals [13]. Learn about the importance of enhancement of fingerprint in automated finger print identification system [2]. To develop a mimetic finger print matching technique which aims to identify the optimal or close to optimal matching between two minutiae sets [3]. Reviews about the guidelines for scanner quality evaluation and it also gives examples of new fingerprint sensors that is used in modern times [6].

3. Proposed system

In this system, a set of training data is taken in which different individual's finger print pattern is stored [6]. In order to check one's learning ability the user needs to input their fingerprint through the finger print scanner. The fingerprint scanner used in the system is FM220STAR-tek scanner which has a greater ability to store and manage the fingerprint. All the inputs gathered are compared against the training data set [5]. The percentage of the input which matches with the training dataset is calculated and taken in to consideration.

For scanning the finger print and analyzing it the algorithm used is minutiae matching algorithm [2]. Histogram equalization is used to enhance the algorithm [3]. Figure 1 shows the different samples of fingerprints. Figure 2 shows the bifurcation and ridges of a sample figure print. Figure 3 shows figure print type of 9 different individuals.
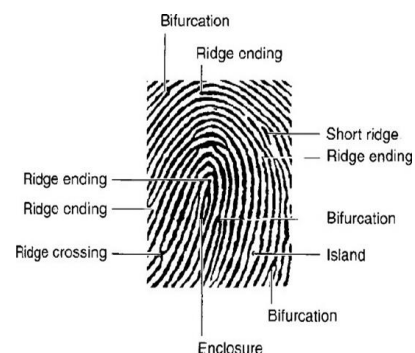

Fig. 1. Parts of finger print

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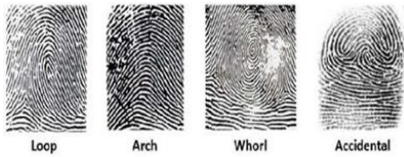**Volume-3, Issue-2, February-2020**
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Fig. 2. General types of finger prints

| S.No.	Name	Fingerprint	Type
1.	Aalekh		Loop
2.	Akshat		Loop
3.	Aryan		Loop
4.	Ashutosh		Whorl
5.	Avichal		Loop
6.	Dipali		Whorl
7.	Ishan		Whorl
8.	Kartikay		Arch
9.	Kirti		Whorl

Fig. 3. Finger prints

4. Implementation

This section provides the architectural design of enhanced automated learning system as shown in figure 4. The user input is taken through a finger print sensor. Then a histogram equalizer is run on it in order to get an image with better quality by changing the intensity level of the image. The minutiae bifurcation technique is applied as shown in figure 5.

The minutiae matching algorithm as given below is run which matches the minutiae points of the user input with the training data set so as to know the percentage of true match in order to determine the learning ability of an individual by drawing inferences based on multiple template pattern match.

Finger Print Scanning uses Minutiae Algorithm
Steps:
1) Step1- Preprocessing:
   a) Image will be enhanced and noise is reduced using directional filters [7]
   b) Image will be binarized using the Otsu method.
   c) Thinned Ridge map will be obtained by extracting set of interesting lines
   d) Deputing the ridge map for removing unwanted spikes & joining the broken lines using smoothing. Figure 5 gives an example of the preprocessing method

2) Feature Extraction:
   a) Finding the Ridge Endings
   b) Finding the Ridge Bifurcations
   c) Each minutiae is named using the location [x,y] coordinates and its orientation
   d) Minutiae map or Finger Print feature vector will describe the fingerprints [7].
3) Minutiae Detection
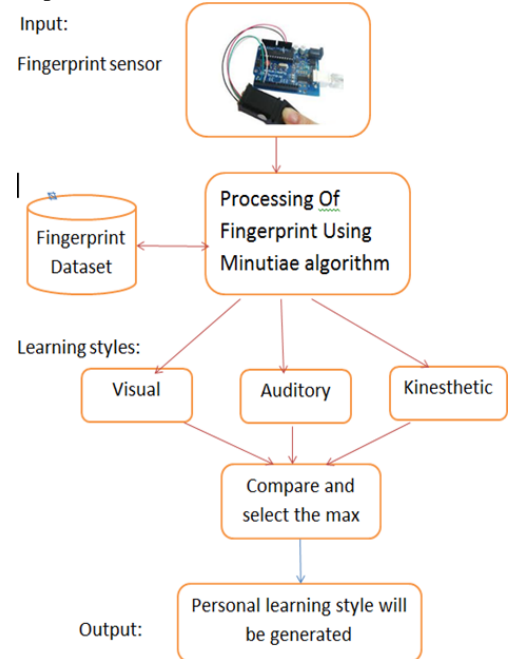   a) Simple pattern matching is done using thinned ridge map [8].

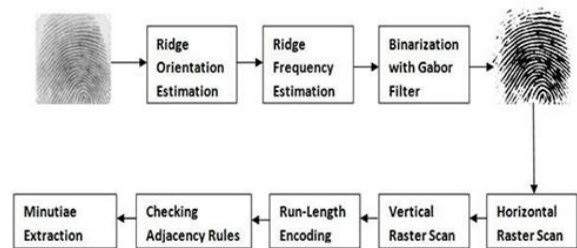Fig. 4. Architecture diagram of automated enhanced learning systems

Fig. 5. Minutiae algorithm extraction process.

5. Applications of the proposed system

1. The System Provides Biometric Information.
2. Easy to use as there is an enhanced method of matching multiple fingerprint patterns for effective analysis of learning styles.
3. Flexible and Cost effective.
4. Security loop holes of the previous system is overridden.

6. Conclusion

This paper presents the design and development of an enhanced automated learning system using IoT and ML algorithms in order to identify an individual's learning style,

behavioral and personality traits based on the ridge and valley formation which results in unique fingerprint pattern of an individual formed due to the structure of the neocortex (primary intelligence center of the brain).

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