Biometric Trait: Offline Signature Identification and Verification based on MultimodalFusion Techniques

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Abstract:

Biometrics refers to the process of identification of humans by their characteristics or traits. Biometrics is used in computer science as a form of identification and access control which is one of the most secure methods to keep humans' privacy. Biometric can be classified into two categories: behavioral and physiological. Handwritten signature is amongst the first few biometrics to be used even before the advent of computers. Offline Signature verification is an authentication method that uses the dynamics of a person's handwritten signature measure and analyses the physical activity of signing. In this research we demonstrate to study about offline signature verification system. There are 2 main steps: Training and Testing. In training the database is read one at a time and it is preprocessed by denoising, skeleton identification by converting black/white image format and then identifying bounding box of actual signature image and cropping it. By applying Integer Wavelet Transform followed by Discrete Cosine Transform followed by Principal Component Analysis, then features such as geometric, statistical are extracted, concatenated, and saved with class tag and train with Neural Network and develop structure. In testing after reading case image, preprocessing, and extracting feature we test using Neural Network and display class of test case. The accuracy of each method is found better on local database and graph is plotted.

Keywords: *Biometrics, Signature, geometric, Neural Network, Wavelet Transform.*

1. Introduction

Biometric system is a technology that takes individual physiological, behavioral or both traits as input, analyses it and identifies individual. It relies on specific data about unique biological trait to work effectively. Unique identifiers include fingerprint, hand geometry, earlobe geometry, retina,
. iris patterns, voice waves, DNA, signature. Basically, Biometrics is divided into two parts i.e., Physiological and Behavioral. Physiological is includes face, fingerprint, hand, iris, DNA. Behavioral includes Keystroke, signature and voice as shown in the Fig 1
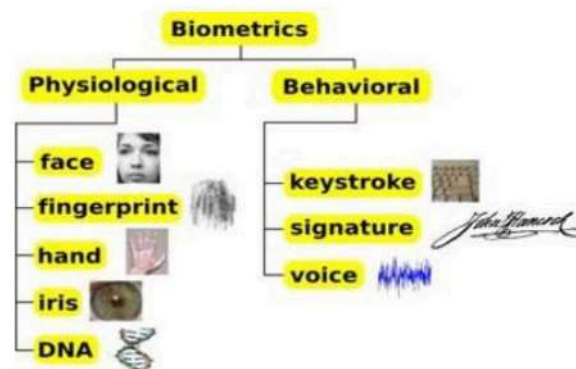
Figure 1: Biometric Traits

The human characteristics such as physiological or behavioral traits can be used for biometric in terms of related parameters described below.

- Universality: Each candidate should have characteristic.
- Uniqueness: Each has separate characteristics and don't match with other person.
- Permanence: Measures how better a biometric resist aging and over time.
- Collectability: Ease of acquisition for measurement.
- Performance: Accuracy and robustness of techniques used.
- Acceptability: Degree of approval of a technology.
- Circumvention: Ease of use of a substitute.

Handwritten signature verification consists of two parts online and offline. In offline signature verification method, it makes use of simple scanner or camera that can take an image having signature and process the image further with whatever feature it gets. This method can be seen useful in many applications such as banking cheques, medical certificates, and prescriptions etc. Offline signature verification is one the most challenging area of pattern recognition. The problem however is that the offline signature can be easily imitated or forged which could lead to false representation or fraud. Therefore, there is need for adequate protection of personal signatures.

The main objective is to recognize offline handwritten documents, which include characters, words, lines, paragraph etc. There is extensive work in the field of handwritten recognition, and several reviews existed. Our approach is to recognize handwritten by using templates. Along with this we maintain a unique user accounts, which enables a particular user to create his/her training sets.

2. Related Work

Tejas Jadhav et al,. [1] applied local binary pattern (LBP) to extract the feature of image. The features obtained from LBP are compared with test features using K-Near Neighbor classifier. The experiments are conducted and tested on CEDAR signature database to obtain recognition rate. Somaya et al., [2] characterized Otsu thresholding algorithm PDF to extract the feature of image. The features obtained from Otsu thresholding algorithm PDF are compared with test features using Codebook based and feature based approaches. The experiments are conducted and tested on IAM handwriting database and OUMI database signature database to obtain recognition rate. Anujsharma et al., [3] gave detailed information about combined static and dynamic feature extraction technique to extract the feature of image. The features obtained from combined static and dynamic feature extraction technique are compared with test features using Hybrid convolution neural network classifier. The experiments are conducted and tested on SVM recognition technique signature database to obtain recognition rate. Piotrporwik et al., [4] specified dynamic handwritten time frequency characteristics FIR system characterizing to extract the