

Touch-less Fingerprint Recognition System

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Abstract: - Touch-less Fingerprint Recognition System is a viable alternative to conventional touch based fingerprint recognition system. Fingerprint recognition is one of the application of biometrics that is used for identification of a person. In touch based sensing, many sensors were developed for fingerprint recognition purpose in which the user's fingerprint is placed on the sensor. Depending upon the pressure applied on a sensor by the person the input fingerprint from one and same finger can vary which may lead to problems like forgery and hygiene. Touch-less fingerprint technology is developed so that the problems in touch based sensing techniques can be depleted as this system avoids physical contact between a finger and sensor. Touch-less system is different from conventional system because they use digital camera to acquire the fingerprint image whereas in conventional system live acquisition technique is used. In touch-less fingerprint system we consider constraint of the fingerprint images that were acquired with the digital camera such as the low contrast between the ridges and the valleys in the fingerprint images, motion blurriness and defocus. Touch-less system can be mainly divided into four major parts they are data acquisition, pre-processing, extraction of features and matching. In feature extraction, minutia from fingerprint images are extracted and in matching process the number of minutia pairings between two fingerprints is matched. This project is coded by using MATLAB software. Fingerprint recognition system has been widely adopted for verification purpose because of their reliability as compared to other biometric application. As fingerprint is believed to be unique for each person fingerprint recognition has found its application in various different fields.

Keywords: Touch-less fingerprint recognition system, data acquisition, pre-processing, feature extraction and matching.

I. INTRODUCTION

Human being possesses various psychological, physical and behavioural characteristics. The measure of these characteristic is called as biometrics. Face, voice, lip movements, signature, iris, hand geometry, fingerprints are the most commonly used recognition methods. Due to the growing role of internet and electronic transfer in our modern society the progress in this field is quite remarkable. Biometric characteristic of an individual are unique and cannot be lost, stolen or broken hence they are more advantageous than traditional authentication techniques namely password, smart cards etc. Fingerprint based recognition system is reliable technique which can be used for personal identification. The first ever technique which used fingerprint for human verification purpose was "Offline Fingerprint Acquisition Technique". The process carried out in this technique was to spread black ink on fingertip of a

person which was then pressed on the paper card. But this technique had a major drawback that it was unhygienic. After this technique, touch based fingerprint system was introduced in which the person presses his fingertip upon the sensor that could have led to skin deformation depending upon the pressure applied by the person on the sensor while pressing on it. Hence, to reduce all this problems touch-less fingerprint technology is introduced as it uses camera for image acquisition and skin deformation can be avoided. Fingerprint identification also known as dactyloscopy is the process in which comparison of two instances of friction ridge skin impression (minutiae) from human fingers is done to determine whether this impression could have come from the same individual. Fingerprints are made of a series of delta, ridge ending, furrows and ridges that generally follow a number of distinct pattern. Fingerprint provides police with extremely strong physical evidence that can tie suspects to evidence or crime scenes. Thus, this recognition system has found its application in forensic division for criminal investigation.



Fig: Fingerprint

II. PROPOSED METHOD

In this section we will explain the method used for synthesizing a fingerprint image. There are various problems that occur while developing a touch-less system. This problem are low contrast between the ridges and the valley pattern present in a fingerprint image, non-uniform lighting, out of focus images and motion blurriness that occur due to lack of depth in the field of digital camera. This touch-less system is divided into four main modules they are given as follows:

1. Data Acquisition:

In data acquisition process we acquire the image of the fingertip with the help of digital camera. The image

acquired should be clear and sharp so that the minutiae present on it is visible and we can process the image properly in next stage.

2. *Pre-processing*

The images acquired for fingerprint recognition may have problems like low contrast between valleys and ridges of fingertip, noises etc. This problem can be removed with the help of pre-processing. Pre-processing is an important step in detecting minutia from the fingerprint. It is used to reduce the noises as well as increase the contrast between ridges and valleys. In this firstly, the RGB fingerprint image is converted to gray scale. To reduce the degradation that is caused by the illumination the image is normalized. After this normalization technique segmentation is done by using the skin color-detection process which is followed by the morphological processing. The resulting image is cropped and enhanced, the core point is detected on the enhanced image.

3. *Feature Extraction:*

In this process the feature vectors are taken out from images of fingertip after pre-processing is done. In feature extractor, gabor filter is used for formation of feature vectors. A gabor filter is used for smoothing out noises. As the number of extracted gabor features is more, principle component analysis (PCA) is used to reduce the dimension and size of the feature vector while the characteristic of the same are retained that contribute most to its changes by brightening the latter principle component. Features of minutia are extracted from the image. For carrying out minutia extraction following processes are done and they are ridge thinning and minutia

marking. The image that we receive after feature extraction is given a particular name and then it is sent to reference database where the data with which the current image is to be matched is already present.

4. *Matching:*

The last step after completing all the above processes is matching minutia. Algorithm that extracts important minutia, will enhance the fingerprint matching technique's performance. For the comparison purpose, to check the individuality of a person through the feature matching is possible. The two minutia sets are from the same fingerprint image or not is determined by using the matching algorithm. Hence, the system returns either a binary decision in case of verification or a degree to which the image is similar in case of identification. It includes two consecutive stages: alignment stage and match stage.

- *Alignment stage:*
While matching two fingerprints choose any one minutia from each image and calculate the similarity between the ridges. If the similarity is larger than threshold, then transform each set of minutia to a new co-ordination system.
- *Match stage:*
After the set of transformed minutia is acquired, the counting of matched minutia pairs is done with the help of elastic match algorithm.

If both images are similar then they get matched and we receive the output at the end of the process that has been carried.

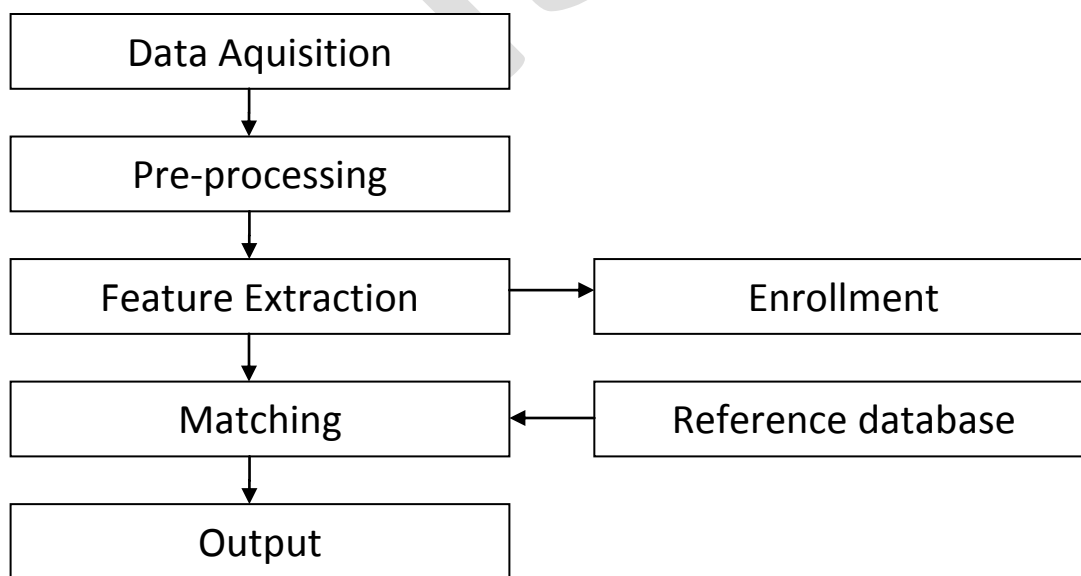


Fig: Block diagram of system

III. APPLICATIONS

Touch-less fingerprint system has found its application in various fields they are e-passports, industrial application and home or domestic application. While issuing e-passports fingerprint of a person is acquired and it is used for personal identification. Touch-less fingerprint based security system project can be used in various industries like automobile industries or software development companies by the employees and workers working in that particular company.

This project can be used to make the door locking process at our home automatic, so the user is not obligated to carry the door lock keys along with him, he can just use his finger for opening the door. In forensic labs this system can be used to find the identity of a dead person and it can also be used in criminal investigation by matching the fingerprint of suspect with the information present in the database.

Also fingerprints obtained from a crime scene are considered as evidence against criminal tying him to the scene of crime. Many of the banks use key based locks for their lockers or safes. We can implement touch-less fingerprint based locker system in banks using this project

IV. ADVANTAGES AND DISADVANTAGES

Advantages

The advantage of this system is that it acquire no latent fingerprints. There is no distortion in the image of fingerprint that we get from the camera. This recognition system is reliable because the acquired image cannot be altered. It is hygienic as it does not require the user to come in contact with the sensor for acquiring fingerprint. It does not require maintenance and it has a long lifetime. Fake fingerprint cannot be taken because camera is used to capture the image which does not lead to forgery.

Disadvantages

The clarity of image that is captured should be good because if the image is blurred then the fingerprint will not be recognized. If the image is too bright then the ridges and valleys of the fingerprint will not be properly visible.

V. FUTURE SCOPE

This system can be used in any employee management attendance system. In future, fingerprint recognition will be used to secure the reliability and safety of a variety of business in various industrial sector which includes personal devices as well as financial industry. This system can be further developed in terms of efficiency and accuracy which can become possible if the hardware to capture the image is improved.

VI. CONCLUSION

This paper describes a touch-less fingerprint sensing device which uses camera. The proposed method is mainly implemented in the given four stages: data acquisition, pre-processing, feature extraction and matching. A touch based system can be used in forensic application like criminal investigation, terrorist identification and other national security issues. Touch-less fingerprint recognition technique is considered as a hygienic and convenient personal identification system.

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