



## A REVIEW ON IMPROVED FINGER PRINT MATCHING USING MINUTIAE SINGULAR POINTS NETWORK

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### Abstract

Fingerprint matching is the process used to determine whether two sets of fingerprint ridge detail come from the same finger. There exist multiple algorithms that do fingerprint matching in many different ways. Some methods involve matching minutiae points between the two images, while others look for similarities in the bigger structure of the fingerprint. In this paper, we provide a study of the existing techniques in the area of finger print matching algorithms.

### Introduction

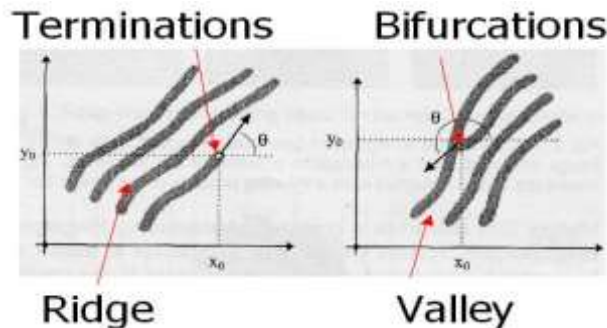
A fingerprint is the feature pattern of one finger. It is believed with strong evidences that each fingerprint is unique. Each person has his own fingerprints with the permanent uniqueness. So fingerprints have being used for identification and forensic investigation for a long time.



*Fig1.1: A fingerprint image acquired by an Optical Sensor*

A fingerprint is composed of many ridges and furrows. These ridges and furrows present good similarities in each small local window, like parallelism and average width.

However, shown by intensive research on fingerprint recognition, fingerprints are not distinguished by their ridges and furrows, but by Minutia, which are some abnormal points on the ridges. Among the variety of minutia types reported in literatures, two are mostly significant and in heavy usage: one is called termination, which is the immediate ending of a ridge; the other is called bifurcation, which is the point on the ridge from which two branches derive.



*Fig1.2: Minutia. (Valley is also referred as Furrow, Termination is also called Ending, and Bifurcation is also called Branch)*

What is Fingerprint Recognition?

The fingerprint recognition problem can be grouped into two sub-domains: one is fingerprint verification and the other is fingerprint identification. In addition, different from the manual approach for fingerprint recognition by experts, the fingerprint recognition here is referred as AFRS (Automatic Fingerprint Recognition System), which is program-based.

Fingerprint verification is to verify the authenticity of one person by his fingerprint. The user provides his fingerprint together with his identity information like his ID number. The fingerprint verification system retrieves the fingerprint template according to the ID number and matches the template with the real-time acquired fingerprint from the user. Usually it is the underlying design principle of AFAS (Automatic Fingerprint Authentication System).

Fingerprint identification is to specify one person's identity by his fingerprint(s). Without knowledge of the person's identity, the fingerprint identification system tries to match his fingerprint(s) with those in the whole fingerprint database. It is especially useful for criminal investigation cases. And it is the design principle of AFIS (Automatic Fingerprint Identification System).

However, all fingerprint recognition problems, either verification or identification, are ultimately based on a well-defined representation of a fingerprint. As long as the representation of fingerprints remains the uniqueness and keeps simple, the fingerprint matching, either for the 1-to-1 verification case or 1-to-m identification case, is straightforward and easy.

### Literature survey

**Iwasokun Gabriel Babatunde[1]**, Biometrics have featured prominently for human verification and identification with fingerprint emerging as the dominant one. The dominance of fingerprint has been established by the continuous emergence of different forms of Automated Fingerprint Identification Systems (AFIS). In the course of performing human verification and identification, an AFIS performs fingerprint enrolment, enhancement, minutiae extraction and pattern matching. One of the challenges confronting fingerprint pattern matching is variation in image ridge orientation which often results in mismatch among images from the same source. In this paper, an algorithm for fingerprint pattern matching that addresses this problem is proposed. The algorithm uses the Euclidian and spatial relationships between the minutiae and singular points to determine the pattern matching scores for fingerprint images. Experimental study on FVC2002 fingerprint database measured the False Acceptance Rate (FAR), False Rejection Rate (FRR), Receiver Operating Characteristics (ROC) Curve, Equal Error Rate (EER) and the Average Matching Time (AMT). Analyses of the metrics obtained from the measurements revealed high adequacy level of the new algorithm at distinguishing fingerprints obtained from different sources. It is also revealed that correct matching of images from same source is heavily dependent on the quality of the images.

**Madhuri[2]**, There exist many human recognition techniques which are based on fingerprints. Most of these techniques use minutiae points for fingerprint representation and matching. However, these techniques are not



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rotation invariant and fail when enrolled image of a person is matched with a rotated test image. Moreover, such techniques fail when partial fingerprint images are matched. This paper proposes a fingerprint recognition technique which uses local robust features for fingerprint representation and matching. The technique performs well in presence of rotation and able to carry out recognition in presence of partial fingerprints. Experiments are performed using a database of 200 images collected from 100 subjects, 2 images per subject. The technique has produced a recognition accuracy of 99.46% with an equal error rate of 0.54%.

**Manisha Redhu[3]**, The popular Biometric used to authenticate a person is fingerprint which is unique and permanent throughout the person life. Fingerprint Recognition or fingerprint authentication refers to the automated methods of verifying a match between two human fingerprint Fingerprints are widely used in daily life for more than 100 years due to its feasibility, distinctiveness, permanence, accuracy, reliability, and acceptability. A large number of approaches to fingerprint matching and various algorithm and methods are behind their matching procedure, Example of these matching are correlation matching ,Minutiae Based matching and pattern based matching. In this paper we projected Fingerprint Recognition using Minutia Score matching method.

**Smita S. Mudholkar[4]**, Identifying attackers is a major apprehension to both organizations and governments. Recently, the most used applications for prevention or detection of attacks are intrusion detection systems. Biometrics technology is simply the measurement and use of the unique characteristics of living humans to distinguish them from one another and it is more useful as compare to passwords and tokens as they can be lost or stolen so we have choose the technique biometric authentication. The biometric authentication provides the ability to require more instances of authentication in such a quick and easy manner that users are not bothered by the additional requirements. In this paper, we have given a brief introduction about biometrics. Then we have given the information regarding the intrusion detection system and finally we have proposed a method which is based on fingerprint recognition which would allow us to detect more efficiently any abuse of the computer system that is running.

### Existing Techniques

The large number of approaches to fingerprint matching can be coarsely classified into three families.

- **Correlation-based matching:** Two fingerprint images are superimposed and the correlation between corresponding pixels is computed for different alignments (e.g. various displacements and rotations).
- **Minutiae-based matching:** This is the most popular and widely used technique, being the basis of the fingerprint comparison made by fingerprint examiners. Minutiae are extracted from the two fingerprints and stored as sets of points in the two- dimensional plane. Minutiae-based matching essentially consists of finding the alignment between the template and the input minutiae sets that results in the maximum number of minutiae pairings.
- **Pattern-based (or image-based) matching:** Pattern based algorithms compare the basic fingerprint patterns (arch, whorl, and loop) between a previously stored template and a candidate fingerprint. This requires that the images be aligned in the same orientation. To do this, the algorithm finds a central point in the fingerprint image and centers on that. In a pattern-based algorithm, the template contains the type, size, and orientation of patterns within the aligned fingerprint image. The candidate fingerprint image is graphically compared with the template to determine the degree to which they match.

### Conclusion

As security is concern, fingerprint recognition plays an important role in authorization as every people has a unique fingerprint. In this paper we have presented various fingerprint matching techniques. Literature of various authors has been presented in this paper along with the their advantages and shortcomings. It is concluded that the existing fingerprint matching algorithms takes a lot of time to match the fingerprints and existing techniques does not work on fingerprint images having noise. Hence a more robust algorithm is required to be developed that can overcome the problems of the existing techniques.



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