

# GRILLING ON CONTACT-LESS DACTYLOGRAM MATCHING AND MASQUERADE DETECTION IN CRIME ANALYSIS USING DATA MINING

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**Abstract:** The paper aims at identifying the persons who involved in criminal activities, using their fingerprint. Fingerprint of one person never match with one another. According to this theory, the paper has been urbanized. Other personal uniqueness can change but fingerprints do not. In earlier civilization, branding was used to spot the criminal for what he was. In contact-less dactylogram matching and masquerade detection in crime analysis using data mining, the fingerprints and the details about the accused person are stored including their personal details. These details are stored in the same form, how records of criminals are maintained by the police department or detective agent. The obtained fingerprint is primarily loaded in the system by the help of scanners. The print which is obtained is not clear; it undergoes several image processing techniques to get a pure black and white image. The fingerprint identification software normally does not use these types of Minutiae Matching method what we use in this paper. The reason is they use the formula methods for finding the complete fingerprint. That traces all the lines in the fingerprint and matches it with the same kind of traced fingerprint. In this paper some special features like wig, mustache, beard, and spectacle are added to the face using face masking to find the criminal by advanced method also has been developed.

**Index Terms:** Fingerprints, Masquerade Detection, Minutiae Matching Method

## 2. INTRODUCTION

Fingerprints are mostly invisible to the naked eye. Required different processes to render them perceptible. They can be grouped into difficult-to-avoid traces: making them very valuable in forensics as proof of contact between an individual and the surface containing the fingerprint residue; at some point in time. Exemplary fingerprints are taken directly off a finger and are widely used. Research in contact-less fingerprint localization (coarse scan), acquisition (detailed scan) and processing in crime scenes has increased significantly. Biometric identification method is most widely used for fingerprint recognition to identify the criminals. Fingerprints are exclusive and remain perpetual throughout a person's life. Fingerprint identification has a great utility in forensic science and aids crime investigations which are all include cyber dogmatism. [1]. Most of the fingerprint recognition systems are based on local ridge features known as minutiae. It is extremely important to mark these minutiae accurately to reject the false ones. Recently to overcome disadvantages of traditional dactyloscopic techniques most importantly, alterations from contact-based physical or chemical fingerprint processing can hinder or even rule out further investigations from other perspectives (e.g. DNA). Contact-based methods are often well researched and many procedures and best-practice guides exist. With new possibilities offered by contact-less localization, acquisition and digital fingerprint investigation, including the use of 3D topography data potentially allowing for new features, new challenges arise [2]. A fundamental change in procedures is the conversion of physical trace evidence into digital objects, requiring new means to ensure the comprehensibility of fully digital investigations. Authenticity and integrity ensuring mechanisms are also need. These are applied to the chain of custody for digital objects.

## 3. RELATED WORK

Jain proposed an alignment based matching method; where it adopted the associated ridge too align the input minutiae with the template minutiae. The result of the performance is good to the deformation. Tong noticed that short part of the ridges only is saved, the algorithm may result in inaccurate alignment. Moreover, it is difficult to find the large ridges in tinned finger print image. Jain and Yan proposed a new way called minutiae matching method using both global and local structure of features. Local structure implemented to find the correspondent minutiae and Global structure implemented to compute similarly score, in this case if less neighborhood method minutiae is used. Lee proposed a local alignment method [3]. Where ridge frequency value is used to minimize the distance error by normalizing the distance between Minutiae's. The localization and acquisition process and all transformations applied to digital trace evidence and their results need to be explained to non-technicians, persuading a judge to allow the evidence in court. In some countries the Daubert factors are used, which must be met by contact-less latent fingerprint processing in crime scenes. Benchmarking with technical properties, application-related aspects, input sensory technologies, preprocessing algorithms, tested objects and materials, and forensic legal requirements is a means to address some factors. In this paper a criminal information is maintained in the excel sheet and registers for fingerprint verification is proposed. If any criminal offense occurs, they have to search for entire record to find the appropriate persons. The result obtained will be on the guessing base and the exact persons cannot be traced or determined [4]. The comparison of criminal is done only through straight manner. Where there is no predefined methodology or techniques used for finding appropriate solution. It is tedious process and time

consuming is also high. Record based investigation does not provide optimum solution. It takes more time for analysis, where the verification techniques are not done. In proposed the crime investigation is performed by introducing the data mining technique. Initially the crime details will be added and the parameters are passed to find the actual person who man involved in crime activities. A new method is introduced to evaluate the correlation of two ridges called minutiae matching and pattern matching. Based on the mining process the list of criminals who uses the same methods will be shortlisted. After that verification is done by fingerprint and face masking techniques [5]. In spite of the various methods used for matching fingerprints the Criminal Investigation system software matches the fingerprints using the pixels of the image. The advantage of this type of matching is the accuracy of the result. In assumption the Matching algorithm is also presented to identify the matching finger prints of criminals. These experiments are done on a set of fingerprint images to show it is effective, fast and has high accuracy in fingerprint verification of criminals.

#### 4. DECTYLOGRAM VERIFICATION AND MASQUERADEDETECTION

In the crime details the criminal details are gathered and stored in the database such as name, address, history of criminal offense, techniques and the methodology used by the criminals for performing the particular crime offense. All the details of criminal which is used for the investigation is gathered as well as fingerprint of the criminal is also stored in the database for accurate processing. Authentication is the first process to identify the criminal. Only the authorized persons can access the software. This grants access permission to particular single user. After getting the permission from the administrator the user is allowed to process the functions. It reduces the fake user and enhances the security for the software. The unauthorized users cannot perform any transactions. The process of conveying crimes or convicts to the previous explained or unsolved crime occurrences is known as crime matching. Assuming that one or more offenders are responsible for a specific crime has been arrested. Using the cyber detection process the previous unsolved offenders are arrested [6]. In the crime Minutiae Matching analysis, the new crime activity is taken as report and given as input in our application to find the real criminal who has carried out this task. To confirm the criminal before investigation, the crime matching clusters to the criminal details and gives the details report about the criminal who may be responsible for carrying out this criminal offense. In our proposed work the investigation is carried out using two techniques. They are,

1) Fingerprint Verification

2) Face Masking

#### 5. FINGERPRINT PATTTERN VERIFICATION

Each person has separate fingerprints, based on this to verify the variation of two person's finger prints. In this module the scanned fingerprint image of the suspects is placed in the system and the scanned fingerprint is stored in the database. A fingerprint is made of a series of ridges and furrows on the surface of the fingerprints. The captured fingerprints are processed through a series of image processing methods to obtain a clear image of original finger print. Then the fingerprint from the archive is also selected. After this selection process the matching module begins and the matching results are displayed at the end. The Matching process is based on Minutiae Patterns [7]. In this process the two images (fingerprints) which are shown in Figure 2 the archive fingerprint will be from the database and other one which is to be matched are superimposed. Using this method, we may come to conclusion that this image may match with available one. Actual matching process is done using the pixels. The position of the obtained image is automatically moved from one position to find the exact fingerprint. The pixels of the both images are read and matched. If the pixels of the two images are matched, the matched ones and unmatched ones are shown in different colors.











Fig 1: The existing fingerprint does not match with the current fingerprint.

#### 6. MINUTIAE MATCHING METHOD

Matching minutiae is defined as the points where the ridge lines end or fork. The minutiae points are the local ridge that can be of many types [8]. These types are –

4.1.2 CLASSIFICATION OF FINGERPRINTS

<b>Bifurcation</b>		Connection of two or more line-types which meet or deviate.
<b>Loop</b>		Recursive line-type which enters and leaves from the same side of the fingerprint
<b>Island</b>		A line-type that stands alone but does not touch another line-type
<b>Ellipse</b>		Circular or oval shaped line-type found in the center of the fingerprint and generally found in the Whorl print pattern.
<b>Tented Arch</b>		Highly rises and falls at a steep angle and are associated with Tented Arch Prints.
<b>Spiral</b>		Spiral out from the midpoint and are normally related with Whorl Prints.
<b>Rod</b>		It is a straight line with little or no re-curve feature found in the center.
<b>Sweat Gland</b>		Moisture and oil, they produce actually electronically image.

7. OTHER COMMON TYPES OF FINGER PRINT

1. Ridge culmination is the point where the ridge ends rapidly.
2. Ridge bifurcation is the point where a single ridge branches out into two or more ridges.
3. Ridge dots are very small ridges.
4. Ridge island so occupy a middle space between two diverging ridges which are slightly longer than dots.

- 5. Spurs are a notch produced from a ridge.
- 6. Bridges are small ridges that join two longer closest ridges.
- 7. Ponds or Lakes are found between two diverging ridges, they are empty space.

**8. MINUTIAE EXTRACTION**

By the assumption the Minutiae Extraction is developed. The detected Minutiae  $m_i$  is defined by four parameters:

$$m_i = (x_i, y_i, \theta_i, t_i)$$

$x_i, y_i$  - coordinates of the minutiae point,

$\theta_i$  -minutiae direction normally obtained from local ridge orientation,

$t_i$  -type of minutiae (ridge ending or ridge bifurcation)

The position of the minutiae point is at the tip of the ridge or the valley and the direction is computed to the X axis [9]



Fig 2. Comparing two fingerprints

**9. MATCHING ALGORITHM**

To match the solid sized fingerprint metaphors, a brute-force identical: inspects all the possible solutions, is not realistic since the number of possible keys upsurges exponentially with the number of feature points on the patterns [10]. Transformation function that maps the minutiae set from I to  $I'$  according to given geometrical transformation. Then matching problem can be formulated as:

$$S(T, I) = \max \left[ \forall_m \sum_{ij}^n md(m_i, \text{map}_m(m_{2'})) \right] m_d(m_i m_j) = sd(m_i m_j).dd(m_i m_j)$$

Where,

n -The number of minutiae points in I input set,

m – The number of transformation equal to the number of minutiae in T template set.



Fig 3: The existing fingerprint matches with the current fingerprint.

## 10. FACE MASKING

In this paper, some special features like wig, mustache, beard, and spectacle are added to the face is also implemented. The person identified by the fingerprint matching process may be an accused in many criminals obtained from the database the morphing process can be performed. The morphing is done by adding the different kind of beards, mustache. This kind of morphing is done to the faces, because the suspected person by changing his face. The different type of masked images can be published, so that the suspected can be easily identified. This helps to find the criminal person even if any face masking is performed.

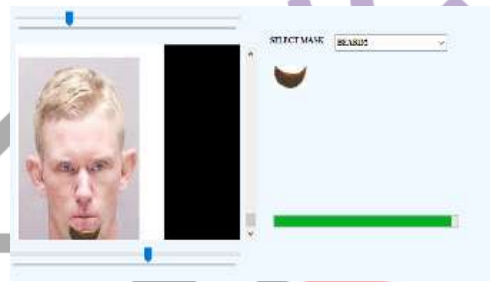


Fig 4: Mask detection to the face.

## 11. REPORT

The criminal details are taken as the report for future evidence. So, the investigation for the higher officials helps to complete investigation in efficient manner. The report cannot be modified and it can take as hard copy for investigation and also for an evidence to corner the criminals.

## 12. CONCLUSION AND FUTURE ENHANCEMENT

There is scope for future development of this paper. The world of computer fields is not fixed; it subjects to be dynamic. The technology which is famous today becomes archaic the very next-day. To keep abstract of technical improvement, the system may be further sophisticated. So, it is not concluded. Yet it will improve with further enhancements. Enrichments can be done in a proficient manner. We can even update the same with further revision establishment and can be integrated with minimal amendment. Thus, the paper is flexible and can be enhanced at any time with more advanced features.

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