# A Review on the Division of Overlapped Fingerprint using Speckle Noise Reduction

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*Abstract*: A fingerprint in its narrow sense is an impression left by the friction ridges of a human finger. The recovery of fingerprints from a crime scene is an important method of science. Normally, fingerprint images contain a single fingerprint or a set of non-overlapped fingerprints. There may be situations where overlapped fingerprint can be obtained. It can be frequently encountered in the latent fingerprint lifted from crime scenes. It is essential to separate those overlapped fingerprint is the separation of mixed orientation field into its component orientation field. The region masks are then further used to separate the fingerprints. This requires the user's physical concentration to acquire the separate region masks, which are found to be time-consuming. In this we study about the different type of fingerprint and different methods for the division of overlapped fingerprint.

*Keywords*: latent overlapped fingerprints; region masking; fully automated system; region segmentation;

# **I INTRODUCTION**

A **fingerprint** in its narrow sense is an impression left by the friction ridges of a human finger. The recovery of fingerprints from a crime scene is an important method of forensic science. Fingerprints are easily deposited on suitable surfaces (such as glass or metal or polished stone) by the natural secretions of sweat from the eccrine glands that are present in epidermal ridges. These are sometimes referred to as "Chanced Impressions".

In a wider use of the term, fingerprints are the traces of an impression from the friction ridges of any part of a human or other primate hand. A print from the sole of the foot can also leave an impression of friction ridges.

# II LITERARURE SURVEY

In the year 2010 Author Jie Zhou et.al say overlapped fingerprints are not unusual in latent fingerprint images taken from crime scenes. However, separating latent overlapped fingerprints is a very challenging issue for both existing automatic fingerprint verification or recognition systems and human fingerprint experts.

In the year 2011 Author Yuan Shi et.al says separated overlapped fingerprints into component fingerprint is very useful in latent they proposed an algorithm for separating overlapped fingerprints, which outperforms the state of the art method in both perfection and efficiency.

In the year 2012 Author Qijun Zhao et.al says overlapping latent fingerprints are usually encountered at crime scenes. The identification or verification of component fingerprints, both by AFIS and by latent examiners, is very challenging because of the poor quality, complex background and contaminated ridge structures

In the year 2012 Author Yuan Shi, et.al says separating overlapped fingerprints into component fingerprints is very useful in latent fingerprint recognition. Although a few preliminary studies on this ttopic have been published, these algorithms are not robust for realistic latent overlapped fingerprints

In the year 2014, Author Ning Zhang, et.al, says overlapped fingerprints are usually encountered at crime scenes. The identification of such overlapped fingerprints is difficult for state-of-the-art AFIS. A few algorithms have been proposed to separate the latent overlapped fingerprints

In the year 2016 Tejas K, Swathi C, et.al says Fingerprints have grown to be the most robust and efficient means of biometric identification. Latent fingerprints are commonly found at crime scenes. They are also of the overlapped kind making it harder for identification and thus the separation of overlapped fingerprints has been a conundrum to surpass.

## In the year 2018 Ankita Sharma et.al says Fingerprints are commonly used biometric trait used for identification.

Latent prints are the fingerprint impressions which are inadvertently left by a person on different surfaces that come in contact with the finger at the crime scene. These latent fingerprints are used as evidence in the forensics to identify the suspect. Sometimes one

fingerprint gets overlapped on another fingerprint, due to which it becomes difficult to extract features from the fingerprint and identify the suspect.

## **III BIOLOGY**

A friction ridge is a raised portion of the epidermis on the digits (fingers and toes), the palm of the hand or the sole of the foot, consisting of one or more connected ridge units of friction ridge skin.[1] These are sometimes known as "epidermal ridges" which are caused by the underlying interface between the dermal papillae of the dermis and the interpapillary (rete) pegs of the epidermis. These epidermal ridges serve to amplify vibrations triggered, for example, when fingertips brush across an uneven surface, better transmitting the signals to sensory nerves involved in fine texture perception. These ridges may also assist in gripping rough surfaces and may improve surface contact in wet conditions.

## **IV TYPES OF FINGERPRINT**

Before computerization, manual filing systems were used in large fingerprint repositories. Manual classification systems were based on the general ridge patterns of several or all fingers (such as the presence or absence of circular patterns). This allowed the filing and retrieval of paper records in large collections based on friction ridge patterns alone. Classification systems include the Roscher system, the Juan Vucetich system, and the Henry Classification System. In the Henry system of classification, there are three basic fingerprint patterns: loop, whorl, and arch, which constitute 60–65%, 30–35%, and 5% of all fingerprints respectively.





The friction ridges on a finger. Fingerprint identification, known as dactyloscopy, or hand print identification, is the process of comparing two instances of friction ridge skin impressions (see Minutiae), from human fingers or toes, or even the palm of the hand or sole of the foot, to determine whether these impressions could have come from the same individual. The flexibility of friction ridge skin means that no two finger or palm prints are ever exactly alike in every detail; even two impressions recorded immediately after each other from the same hand may be slightly different. Fingerprint identification, also referred to as individualization, involves an expert, or an expert computer system operating under threshold scoring rules, determining whether two friction ridge impressions are likely to have originated from the same finger or palm (or toe or sole).



Figure 1.2: An image of a fingerprint created by the friction ridge structure.

An intentional recording of friction ridges is usually made with black printer's ink rolled across a contrasting white background, typically a white card. Friction ridges can also be recorded digitally, usually on a glass plate, using a technique called Live Scan.

A "latent print" is the chance recording of friction ridges deposited on the surface of an object or a wall. Latent prints are invisible to the naked eye, whereas "patent prints" or "plastic prints" are viewable with the unaided eye. Latent prints are often fragmentary and require the use of chemical methods, powder, or alternative light sources in order to be made clear. Sometimes an ordinary bright flashlight will make a latent print visible. When friction ridges come into contact with a surface that will take a print, material that is on the friction ridges such as perspiration, oil, grease, ink or blood, will be transferred to the surface.

Factors which affect the quality of friction ridge impressions are numerous. Pliability of the skin, deposition pressure, slippage, the material from which the surface is made, the roughness of the surface and the substance deposited are just some of the various factors which can cause a latent print to appear differently from any known recording of the same friction ridges. Indeed, the conditions surrounding every instance of friction ridge deposition are unique and never duplicated. For these reasons, fingerprint examiners are required to undergo extensive training. The scientific study of fingerprints is called dermatoglyphics.

# VI TYPES OF PRINT

# (i) EXEMPLAR



Figure 1.3: Exemplar prints on paper using ink

Exemplar prints, or known prints, is the name given to fingerprints deliberately collected from a subject, whether for purposes of enrollment in a system or when under arrest for a suspected criminal offense. During criminal arrests, a set of exemplar prints will normally include one print taken from each finger that has been rolled from one edge of the nail to the other, plain (or slap) impressions of each of the four fingers of each hand, and plain impressions of each thumb. Exemplar prints can be collected using live scan or by using ink on paper cards.



Although the word latent means hidden or invisible, in modern usage for forensic science the term latent prints means any chance or accidental impression left by friction ridge skin on a surface, regardless of whether it is visible or invisible at the time of deposition.

## (iii) PATENT

Patent prints are chance friction ridge impressions which are obvious to the human eye and which have been caused by the transfer of foreign material from a finger onto a surface. Some obvious examples would be impressions from flour and wet clay. Patent prints can be left on a surface by materials such as ink, dirt, or blood.

## (iv) PLASTIC

A plastic print is a friction ridge impression left in a material that retains the shape of the ridge detail. Although very few criminals would be careless enough to leave their prints in a lump of wet clay, this would make a perfect plastic print. After photographically recording such prints, attempts should be made to develop other non-plastic impressions deposited from sweat or other contaminants.

## (v) ELECTRONIC RECORDING

There has been a newspaper report of a man selling stolen watches sending images of them on a mobile phone, and those images included parts of his hands in enough detail for police to be able to identify fingerprint patterns.

# (vi) FOOTPRINTS

Friction ridge skin present on the soles of the feet and toes (plantar surfaces) is as unique in its ridge detail as are the fingers and palms (palmar surfaces). When recovered at crime scenes or on items of evidence, sole and toe impressions can be used in the same manner as finger and palm prints to effect identifications.

## VI PROPOSED METHODOLOGY

The primary step in the separation is region masking. Region masking is the process of separation of an overlapped fingerprint into background and foreground regions, the foreground region is further sub-divided into overlapped region and non-overlapped regions of each individual component fingerprints.

The region mask helps in segregating different regions of overlapped fingerprint, which are further used to estimate the initial orientation field. The research made so far within overlapped fingerprint separation employs the use of a manual approach to carry out region.



Figure 1.6: A flow model for proposed algorithm

# VII CONCLUSION AND EXPECTED RESULT

So with the advancement of the technology, an algorithm is proposed to separate the overlapped fingerprints and evaluated it using both real overlapped latent fingerprints and simulated overlapped fingerprints. The algorithm is based on two assumptions which are both reasonable and practical.

1. The overlapped fingerprint image consists of at most two fingerprints.

2. There exist differences between the orientation fields of the two component fingerprints in the overlapped area. The proposed algorithm consists of the following four steps:

- 1. Region segmentation
- 2. Initial orientation field estimation
- 3. Orientation field separation
- 4. Fingerprint separation

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