

IDENTIFICATION OF AN INDIVIDUAL THROUGH FINGERPRINTS

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ABSTRACT

The science of identification of person through the examination of fingerprints is known as Dactylography. Fingerprints are playing a vital role in the criminal investigation because evidence of fingerprint is considered as conclusive evidence in the court law. It is a very accurate and cheapest method of identification of person. Fingerprint Identification is the method of identification using the impressions made by the minute ridge formations or patterns found on the fingertips. No two persons have exactly the same arrangement of ridge patterns, and the patterns of any one individual remain unchanged throughout life. Fingerprints offer an infallible means of personal identification. Other personal characteristics may change, but fingerprints do not. Fingerprints can be recorded on a standard fingerprint card or can be recorded digitally and transmitted electronically to the fingerprint bureau for comparison. By comparing fingerprints at the scene of a crime with the fingerprint record of suspected persons, officials can establish absolute proof of the presence or identity of a person. People can be identified by their fingerprints. This assertion is supported by the philosophy of friction ridge identification, which states that friction ridge identification is established through the agreement of friction ridge formations, in sequence, having sufficient uniqueness to individualize. Main purpose of this paper is to know the procedure of comparison of crime scene print with suspected prints and also attempted to understand the basic principles of fingerprints, legal aspects, types of fingerprint patterns and ridge characteristics of fingerprints.

Keywords: Identification, Individuality, fingerprints, Chance print, Ridges, Evidence.

Number of Tables : 3

Number of Figures : 4

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INTRODUCTION

Palmer surfaces of the hands and of the soles of the feet have friction ridges. The ridges are the raised portions of skin between furrows on either side. They are also known as “Papillary” or epidermal ridges. The ridges flow in various directions giving rise to innumerable patterns.

The ridges have small pores, which exude perspiration. It spreads all over the surface. The evaporation of the perspiration concentrates its non-volatile constituents, notably, the common salt, oil, and the albumins. Whenever the epidermis comes in contact with a surface, they are left there on in small quantities. The deposits take the pattern of the ridges. The mark is latent due to the colourless nature of the perspiration residues. But it can be developed to give a visible print. The rough and the fibrous surfaces do not give decipherable patterns. The prints are visible when the surface of hand is smeared with coloured powders or liquids. The mark may be distinct impression if the receiving surface is pliable such as butter, dust, putty, wet paint, mud, wet clay, kneaded flour, any semi-solid substance or warm wax (paraffin or sealing wax). Objectives of the study include To know the biological facts about the fingerprints. To know the legal aspects and evidentiary value of fingerprints. To understand the types of fingerprint Patterns. To know the procedure of comparison of chance print with suspected prints for the identification of an individual.

METHODS AND MATERIALS

The present study is based on primary and secondary sources. For the present study the fingerprints are taken from the students who have studied in B.sc 6th semester in the Dept of Forensic Science and Criminology, Karnatak Science College, Dharwad. Books,

journals and internet materials are used as secondary sources for this study.

RESULT AND DISCUSSION

The following biological principles are basic for understanding the ‘Dactyloscopy’ and its applicability in the field of personal identification.

Unique

The fingers have papillary ridges. The ridges form complex patterns. The ridge pattern of each finger has individuality of its own. The patterns vary not only from one individual to another, but they are different in the same individual on each finger. Duplication of the pattern has never been observed. Nor the same expected. It was customary, formerly, to calculate the probability of a finger occurring in a second individual. It is no longer done as the individuality of the pattern is accepted. The probability is considered only, when the print carries limited details due to smudging or when it is incomplete.

Permanent

The finger prints of an individual do not change throughout his life. In fact, the ridges appear before birth. They start appearing during third or fourth month of pregnancy. They remain even after the death of the individual, till the epidermal skin is destroyed by fire, putrefaction or is eaten by insects or other creatures.

Universal

All individuals and hence all criminals carry this medium of identification. The finger and toe digits and palmer surfaces of the hands and the feet carry the friction ridges. The fingers have more intricate patterns. They allow easier individualization and

classification. A criminal uses his hands in the commission of crime. He leaves marks at the scene of occurrence or on objects, which come in contact with the hands in the commission of crime. There are, therefore, fair chances of occurrence of finger prints in all types of crime. If a criminal wears gloves, no finger prints will be found at the scene. However, by and large the population in India, especially the criminal community, does not wear gloves. They, therefore, leave finger prints in most of the cases.

Inimitable

Successful forgery of finger prints has not been reported so far. Near perfect forgeries have been attempted. It is possible that the advancement of science may bring the forgery still closer to perfection but complete success in the enterprise is extremely difficult. If not impossible, the investigating officer, the expert, the court and Lawyers, must guard against such possibilities, especially in view of the potentialities of the computer. They should make use of scientific tools, which will undoubtedly enable the expert to detect such frauds.

Classifiable

The scope for the classification of finger prints is large and yet the work is simple. Records of millions of persons of persons can be classified and kept and retrieved easily. Computerization of finger prints records, and hence their searches are becoming popular because the computers have increased the efficiency beyond imagination. A search can be made virtually in a jiffy with the computerized records.

Legal Aspects

Specimens and the Constitutions:

It was previously contended that in an accused is forced to give his finger prints, it is equivalent to compel him to be a witness against himself. This is against article 20(3) of the Indian constitution, which provides that no person, accused of any offence shall be compelled, to be a witness against himself case were rejected by the high courts on the plea that taking of finger prints against the will of the accused amounted to compel him to be a witness against himself. Ultimately the Supreme Court considered this matter in one case. A bench of seventeen judges has decided that taking of finger prints even against the wishes of a person is not against the constitution. The controversy is thus settled.

Authorities

The taking of finger prints is covered by various sections of the Identification of prisoners Act: Section 4 of the Act permits a police officer of the rank of sub-inspector or an investigating officer (in offences covered by chapter XIV of the (Cr.P.C) above this rank to finger print an accused, arrested for an offence punishable with at least one year's rigorous imprisonment. ;Under section 4 and 6 of the Act, a first class magistrate can direct any person to be finger printed, if in the opinion of the magistrate it will expedite investigation of the case. All means to collect the specimens can be used. ;Section 73 of the Indian evidence Act also covers finger printing. The court may direct any person present in the court to give his finger prints, if the same is required for comparison with questioned finger print by the court.

Finger Print Experts

The evidence of a finger print expert, a person especially skilled in finger prints, is considered relevant evidence by virtue of section 45 of the Indian evidence Act.

Finger Prints Reports

In view of the general recognition of the individuality of finger prints the code of criminal procedure has been modified. The report of the director of a finger print bureau is accepted as evidence like the report of a chemical examiner under section 293 of code of criminal procedure, 1973. The court may call the expert for evidence, if it so decides.

Finger Print Bureau

All the major state in India, have finger print bureaus. In addition the central government has also a central finger print bureau located at Delhi under the Department of National Crime Record Bureau. The finger print

record at the national level has been digitized and computerized. Any police force in India can utilize its services. Finger prints bureau perform the following main functions: Collect, classify and store the record.;Eliminate the record of the dead persons.;Search and locate the finger prints records of a given person if it exists. ;Compare the finger prints.;Visit the scene of crime to locate, collect and ultimately compare the finger prints. ;Give evidence in courts (or on commission) whenever required.

Fingerprint patterns

Fingerprint patterns are determined by the configuration of the ridge appearing on the distal phalange of the finger. It is the shape and direction of the ridges, along with a consideration of type line, delta and core, that constitute a fingerprint pattern. The three basic pattern types- Arch, Loop and Whorl- subdivided into nine subtypes for the purpose of classification.

Table 1: Types of fingerprint patterns and their symbols and conditions

Basic Patterns	Patterns Type	Symbol	No of Deltas Present	No of Cores Present
Arch	Plain Arch	A	Nil	Nil
	Tented Arch	T	Nil	Nil
Loop	Radial Loop	R	One	One
	Ulnar Loop	U	One	One
Whorl	Plain Whorl	W	Two	One
Composites	1. Central Pocket Loop (Whorl + Loop)	C	Two	One
	2. Lateral Pocket Loop (Double Loop)	S	Two	Two
	3. Twinned Loop (Double Loop)	S	Two	Two
	4. Accidentals	X	Minimum Two	Minimum Two

Plain Arch is the most simple of all the fingerprint patterns and is easily distinguished. In plain arches ridges enter on one side of the impression and flow or tend to flow out on the other side with a rise or wave in the centre. There may be numerous ridge formations such as ending ridges, bifurcations, dots and islands involved in this type of pattern, but they all tend to follow the general ridge contour, i.e. they enter on one side, make a rise or a wave in the centre, and flow or tend to flow out on the other side ;Tented Arch is the one in which most of the ridges enter upon one side of the impression and flow or tend to flow out upon the other side as in the plain arch type, however, the ridge or ridges at the centre do not.

Loops In terms of fingerprints, as well as in the general application of the word loop, there can not be a loop unless there is a recurve or retrieval of one or more of the ridges along with the other pre-requisites. A pattern possesses several requisites before it may be classified as a loop. However, this type of pattern is the most common and constitutes about sixty to sixty five percent of all prints. A loop as that type of fingerprint pattern in which one or more of the ridges enter on either side of the impression, recurve, touch or pass an imaginary line drawn from delta to core, and terminates or tend to terminate on or towards the same side of the impression from where such ridge or ridges entered. A loop has one core and one delta.

Loops are subdivided into two main types – Radial Loop and Ulnar Loop – according their positioning and the flow of the ridges. The terms radial and ulnar are derived from the *Radius* and *Ulna* bones of the forearm.

The classification of loop is based on the direction of the loops flow on the hand (not on the fingerprint slip or card).

ULNAR LOOP is so called because the ridges flow or terminate in the direction of *ulna* bone of the forearm. In case of right hand fingers, the ridges slant towards right side and for the left hand fingers, the slant of the ridges is towards left side.

RADIAL LOOP is so called because the ridges flow or terminate in the direction of *radius* bone of the forearm. In case of the right hand fingers, the ridges slant towards left and in the left hand fingers, the slant is towards right side.

WHORLS

A whorl is characterized by a circular pattern having one or more ridges revolve around the core making a complete circle. The whorl is that type of pattern in which at least two deltas are present with a recurve in front of each. Whorl type patterns occur in about thirty percent of all fingerprints. It is important to note that this is a very general definition. This pattern, however, may be subdivided for extension purposes in large groups where whorls are predominant. Even though this extension may be used, all types of whorls are grouped under the general name of *whorl* and are designated by letter 'W'.

WHORL consists of the simplest form of whorl construction and is the most common of the whorl subdivisions. It is designated by the symbol 'W' for both general classification and extension purposes. It has two deltas and at least one ridge making a complete circuit, which may be spiral, oval,

circular or any variant of a circle. An imaginary line drawn between the two deltas must touch or cross at least one of the recurving ridges within the inner pattern area. A recurving ridge, however, which has an appendage connected with it in the line of flow, cannot be considered as a circuit. An appendage connected at that point is considered to spoil the recurve on that side.

CENTRAL POCKET LOOP is a composite pattern in which most of the ridges take the form of a loop. However, one or more ridges recurve around the core to form a centre pocket. The circuit may be spiral, oval, circular or any variant of a circle. The central pocket loop has two deltas present and falls within the whorl group for the purpose of classification. An imaginary line drawn between the two deltas must not touch or cross any of the recurving ridges within the inner pattern area.

TWINNED LOOP such type of pattern also there are two distinct loops combined into one print i.e. one resting upon the other. The core ridges have their exit always on the opposite sides of the deltas in this pattern. It is also called 'S' type of pattern as it appears 'S' letter.

LATERAL POCKET LOOP is a pattern in which there are two distinct loops, but each of these loops which are interlocked like the two parts of the English letter 'S'. Hence it is called as 'S' type of pattern. In this type of pattern, there two distinct loops combined into one print i.e. one resting on another or one loop serves as side pocket to the other loop. This pocket is formed by the downward bending on one side of the ridge of the other loop before they recurve. The

ridges about the centre i.e. the core lines have their exit always on the same side of the delta.

ACCIDENTAL pattern is one which comprises of two or more different types of patterns in a single print. Such as loop resting on whorl, whorl resting on loop and arch with central pocket etc. any pattern which do not fall under any of the above conventional category can be treated as accidental pattern. As these patterns occur rarely, it is called as accidental.

CHANCE PRINTS AT CRIME SCENE

In forensics, latent fingerprints are marks left at the scene of a crime which may not be immediately visible to the naked eye. To expose latent fingerprints, technicians use fingerprint powder, fuming and other techniques.

Identifying latent fingerprints is an important part of evidence collection and many technicians specialize in retrieving fingerprints from crime scenes and analyzing them in the lab in order to assist law enforcement with apprehending criminals.

The hands and feet are naturally oily, due to the glands, which secrete sweat, a mixture of water, salts and other trace compounds. The sweat adheres to the friction ridges of the finger and when a finger is placed on a surface such as glass, plastic or wood, an impression known as fingerprint will be left behind. The natural oils of the body preserve the fingerprint, which is utterly distinct; no two humans have the same fingerprints. Sometimes, latent fingerprints are made from substances other than sweat such as blood, other body fluids, or paint.

When investigators arrive at a crime scene, one of the first things they do after photographing the entire scene is dust for latent fingerprints. Dusting for fingerprints ensures that no prints are missed, even if patent fingerprints, prints readily visible to the naked eye, are evident. Specialized fingerprint powder is gently brushed over surfaces which may hold fingerprints to see if any appear. If latent fingerprints emerge after dusting, they are photographed and then carefully lifted with clear tape before being affixed to fingerprint cards. For difficult surfaces, another process known as fuming may be used to find latent fingerprints. Fuming can be used for very old fingerprints, because it causes a chemical reaction with trace substances which may be left behind by a fingerprint, even if the sweat itself is gone.

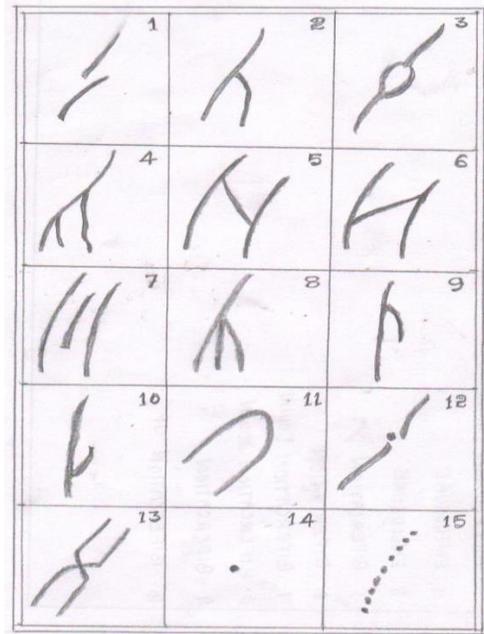
The new age of electronic fingerprint identification

Fingerprints are now processed through the Integrated Automated Fingerprint Identification system. The fingerprints are submitted electronically or by mail,

processed on IAFIS, and a response is returned to the contributing agency within two hours or less for electronic criminal fingerprint submissions. Fingerprint processing has been reduced from weeks and months to hours and minutes with IAFIS.

Ridge Characteristics

The friction ridges have certain basic features which are present in sufficient number in every fingerprint. These characteristic features could be made more elaborate on magnification or enlargement of a fingerprint. A single fingerprint may possess as many as hundred or more characteristic feature or the ridge detail is identified through the specific label attached to it according to its construction and alignment in the pattern. The variety and peculiarity are proper to itself as a whole, while the characteristic point refer to the ridge formation. Following are the main characteristics of ridge formations commonly found in a fingerprint impression.

**Fig: 1**

1. Ridge Ending or Ridge Termination: This is a ridge placed between two other, more or less parallel ridges. It ends abruptly and does not reappear (Fig: 1: 1).
2. Bifurcation or Diverging Fork: A ridge which leaves the left side of the pattern and divides for a certain length into two parallel lines (Fig: 1: 2) and at times into three forming a trifurcation (Fig: 1: 4 and 8).
3. Enclosure: this is in the shape of an ellipse, and is formed by a ridge which bifurcates only to fuse or converge again to a single ridge almost immediately, leaving a blank space within the ridge. An enclosure may be of a small or large size. The extra large enclosure may be referred to as a lake (Fig: 1: 3).
4. Convergence or Converging Fork: This is similar to divergence bifurcation but it is reverse or a mirror image. It is formed by two parallel ridges which leaves the left side of the pattern and fuse or converge to form a single ridge.
5. Interjunction or Bridge: The junction of two parallel ridges by a short diagonal ridge which meets the ridges at a very acute angle (Fig: 1: 5 and 6).
6. Fragment or Short Ridge: A ridge with ends which finishes abruptly, and of variable length. The fragment may be small or large in size (Fig: 1: 7).
7. Hook or Spur: It is formed when a ridge bifurcates into two and one bifurcated ridge only continues further while the other does not and appears to be attached to the ridge as an appendage ridge at an angle. A hook may be an upward hook, a downward hook, a rightward hook and a leftward hook (Fig: 1: 9 and 10).
8. Return: A single ridge which suddenly turns upon itself and returns the way it has come, forming a rounded loop without a core (Fig: 1:11).

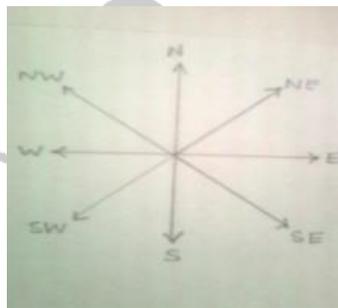
9. Deviated Break: An interruption formed by two ridges, which, instead of stopping just before they meet suddenly deviate, forming two ridge ending with a furrow between them (Fig: 1: 12).
10. Intersection: It is found when one ridge intersects or cuts another ridge (Fig: 1: 13).
11. Interruption or Natural Break: This is a natural break or interruption in a ridge. It is in its formation similar to two ridge endings facing each other.
12. Point or Dot or Spot: A very small fragment of a ridge which is only as long

as it is wide, which usually found in the middle of an interruption or delta or between two ridges (Fig: 1: 14).

13. Dotted Ridge: This is a ridge which created by the dots or points (Fig: 1: 15).

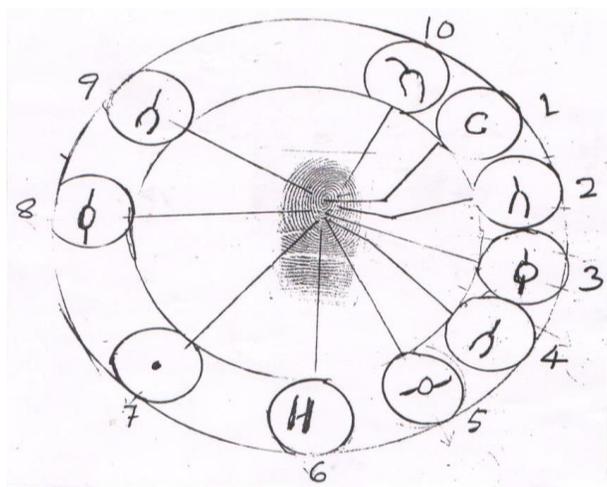
14. Change-Over: It is formed when two parallel ridges change their places. One ridge is interrupted while the other takes its place by passing through the break.

Comparison procedure of Chance print with Suspected prints

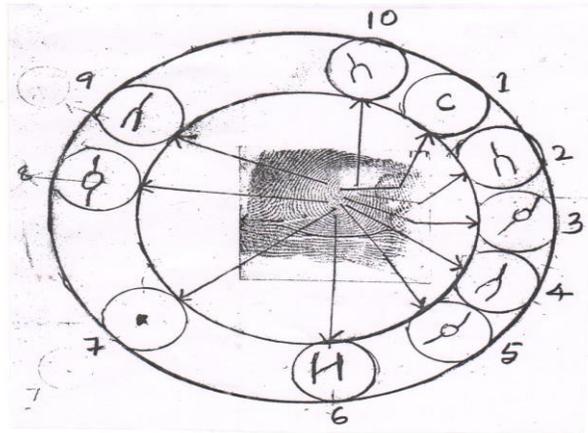


CHANCE PRINT

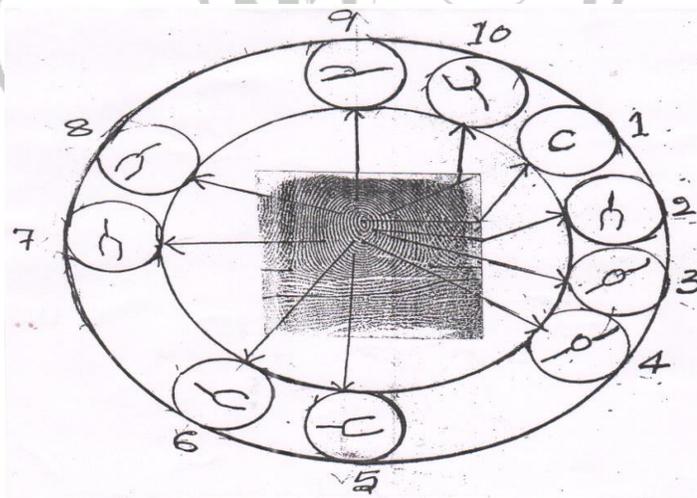
Fig 2:



1. Core. 2. Bifurcation. 3. Enclosure. 4. Bifurcation. 5. Enclosure. 6. Bridge. 7. Dot. 8. Enclosure. 9. Bifurcation. 10. Bifurcation.

Fig 3: SUSPECTED PRINT (S1)

1. Core. 2. Bifurcation. 3. Enclosure. 4. Bifurcation. 5. Enclosure. 6. Bridge. 7. Dot. 8. Enclosure. 9. Bifurcation. 10. Bifurcation.

Fig 4: SUSPECTED PRINT (S2)

Sources: Original photos from Bertillon's museum, Dept of Criminology and Forensic Science, Karnatak Science College, Dharwad (India).

1. Core. 2. Bifurcation. 3. Enclosure. 4. Enclosure. 5. Bifurcation. 6. Bifurcation. 7. Bifurcation. 8. Bifurcation. 9. Bifurcation. 10. Bifurcation.

Comparison Stage I

The following comparison stage number one shows that most probable suspected (rolled

print) which tally with the chance print (plain print) and make very easy to compare.

Table 2: Comparison of chance print pattern with patterns of suspected prints

SI No	Name of the Pattern/ Print		Ridge Counting/ Ridge Tracing	Remarks
	Print	Pattern		
1	Chance Print	Whorl	Inner	Similar
2	Suspected Print (S1)	Whorl	Inner	
3	Suspected Print (S2)	Whorl	Inner	

Comparison Stage II

The following comparison stage shows the details, description of Ridge Characteristics

of chance print and suspected prints which are depending upon 3D's formula i.e. Description, Direction and Distance.

Table 3: Identification of location of ridge characteristics and comparison of chance print with suspected prints

SI No	3D's	Chance Print	Suspected Print (S1)	Suspected Print (S2)	Remarks
1	Description Direction Distance	Core -- --	Core -- --	Core -- --	Similar
2	Description Direction Distance	Bifurcation. Bifurcation is in S-E direction from core. It is present after 5 intervening ridges from core.	Bifurcation. Bifurcation is in S-E direction from core. It is present after 5 intervening ridges from core.	Bifurcation. Bifurcation is in S-E direction from core. It is present after 2 intervening ridges from core.	Chance print and S1 Print are similar where as S2 is different

3	Description Direction Distance	Hook. Hook is in S-E direction from core. It is present after 2 intervening ridges from core.	Hook. Hook is in S-E direction from core. It is present after 2 intervening ridges from core.	Enclosure. Enclosure is in S-E direction from core. It is present after 4 intervening ridges from core.	Chance print and S1 Print are similar where as S2 is different
4	Description Direction Distance	Bifurcation. Bifurcation is in S-E direction from core. It is present after 4 intervening ridges from core.	Bifurcation. Bifurcation is in S-E direction from core. It is present after 4 intervening ridges from core.	Enclosure. Enclosure is in S-E direction from core. It is present after 3 intervening ridges from core.	Chance print and S1 Print are similar where as S2 is different
5	Description Direction Distance	Hook. Hook is in S-E direction from core. It is present after 4 intervening ridges from core.	Hook. Hook is in S-E direction from core. It is present after 4 intervening ridges from core.	Bifurcation. Bifurcation is in S direction from core. It is present after 8 intervening ridges from core.	Chance print and S1 Print are similar where as S2 is different
6	Description Direction Distance	Inter-change. Inter-change is in S direction from core. It is present after 9 intervening ridges from core.	Inter-change. Inter-change is in S direction from core. It is present after 9 intervening ridges from core.	Bifurcation. Bifurcation is in S-W direction from core. It is present after 4 intervening ridges from core.	Chance print and S1 Print are similar where as S2 is different
7	Description Direction Distance	Dot. Inter-change is in S-W direction from core. It is present after 6 intervening ridges from core.	Dot. Inter-change is in S-W direction from core. It is present after 6 intervening ridges from core.	Bifurcation. Bifurcation is in W direction from core. It is present after 10 intervening ridges from core.	Chance print and S1 Print are similar where as S2 is different
8	Description Direction Distance	Enclosure. Inter-change is in S-W direction from core. It is present after 6 intervening ridges from core.	Enclosure. Inter-change is in S-W direction from core. It is present after 6 intervening ridges from core.	Bifurcation. Bifurcation is in N- W direction from core. It is present after 6 intervening ridges from core.	Chance print and S1 Print are similar where as S2 is different

9	Description Direction Distance	Hook. Hook is in N-W direction from core. It is present after 4 intervening ridges from core.	Hook. Hook is in N-W direction from core. It is present after 4 intervening ridges from core.	Bifurcation. Bifurcation is in N- W direction from core. It is present after 5 intervening ridges from core.	Chance print and S1 Print are similar where as S2 is different
10	Description Direction Distance	Bifurcation. Bifurcation is in N-E direction from core. It is present after 3 intervening ridges from core.	Bifurcation. Bifurcation is in N-E direction from core. It is present after 3 intervening ridges from core.	Bifurcation. Bifurcation is in N-E direction from core. It is present after 10 intervening ridges from core.	Chance print and S1 Print are similar where as S2 is different

CONCLUSION AND EXPERT OPINION

After careful examination and comparison of Suspected prints S1 and S2 with Chance print by 3D's method, it is concluded and opined that S1 is matching with chance print so it can be of one individual and the other i.e. S2 does not match the characteristics as they belong to different individual.

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