Novel Techniques of Fingerprints: A Qualitative study of Criminal Investigation in Pakistan

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Abstract

The novel study has been done by using finger prints to solve a murder cases. It proves that how much finger prints help in solving such cases. All Intelligence and forensic teams used forensic technique to solve such cases in minimum time. According to the primary study of the crime scene, death appeared to occur accidently and was related to homicide based on the shreds of evidence and the state of the dead corpse. As a result, it became critical to seek out additional impression evidence in order to complete the right analysis on time. All of the evidence gathered at the crime site was difficult to deal with. Fingerprints are frequently used as a vital tool in biometric identification. A case of murder has been faced in model town Lahore. Where a person is sleeping in his apartment. Some unknown people come and murdered him by sharp Knife. The Forensic team and Police have come on time and pick all crime scenes evidences. They collected all finger prints and traced by using ninhydrin and cyanoacrylate solutions. Some Finger Prints matched with culprits' biometric data. As a result, it may be inferred that in this instance, it is always important and helpful not to disregard tiny evidence such as fingerprints. Using only fingerprints, the criminals are arrested within 24 hours. Finger Prints are important evidences to solve a case in less time. In this work, Ninhydrin and Cyanoacrylate methods are utilized.

Key words: *Finger, Prints, Crime, Murder, Criminals.*

1. Introduction

A finger impression is made by the rubbing edges of a human finger. A key criminological strategy is recovering fingerprints from a crime location to some extent. Dampness and oil on a finger leave fingerprints on things like glass and metal. The expression measurable alludes to the intersection

between regulation and science. In this exploration, we'll take a gander at genuine models and inspect master sees on how unique mark proof is used to address violations. Unique mark ID can be utilized to connect violations that are associated with being connected. Unique mark information, for instance, could interface a solitary culprit to a few violations or crime locations. This wrongdoing linkage helps police authorities in restricting the pool of likely offenders and distinguishing criminal patterns to find and convict guilty parties.[1]

In the field of criminological science that arrangements with fingerprints are extremely fundamental. Breaking down fingerprints left at the location of a crime is one of the main parts of scientific examination.[2] A few logical methodologies could be utilized to maintain equity these days, on account of the fast development of criminological regions. These methodologies might uncover key analytical leads by uncovering legal proof.[3] It's a good idea to search for follows during a homicide request, for instance. On a basic vehicle crime location, in any case, searching for fingerprints or contacting DNA seems well. How about we take a gander at each kind of proof in more detail.[4]

The outward kind of the grinding edge skin is a prompt impression of its ability. Hands and feet can securely understand surfaces by the edges and sweat pores, while the kinks license the skin to flex. The edges, wrinkles, and mature scars of contact edge skin are trustworthy morphological properties. On the contact edge skin, moles, wrinkles, irritates, cuts, and calluses are typical morphological traits. Whether or not quality is really tough or not altogether firmly established by

[1] Jacqueline T. Fish et al., Crime Scene Investigation (Waltham, MA: Anderson Publishing, 2014).
[2] Peter White, Crime Scene to Court: The Essentials of Forensic Science (Cambridge: The Royal Society of Chemistry, 2016).
[3] ROSS M GARDNER and DONNA KROUSKUP, Practical Crime Scene Processing and Investigation, 3rd ed. (CRC Press, 2018).
[4] See supra note 2.

its life designs and physiology. The conventional condition of crushing edge skin on the left palm is found in Fig 1.1.

Fig 1.1 Friction ridge skin of the left palm[5]

Essential edges (on deeper level edges) and optional edges anchor the edges and wrinkles on the erosion edge skin's surface to the dermis (under the valleys). The construction of rubbing edge skin is displayed in **Figure 1.2**. The essential and auxiliary edges are connected to the dermis to give the rubbing edge skin soundness and strength. Sweat organs are situated in the dermis and hypodermis and reach out from the primary edges.[6]

[5] John Roman et al., The DNA Field Experiment: Cost-Effectiveness Analysis of the Use of DNA in the Investigation of High-Volume Crimes (Urban Institute, 2016).
[6] Ainsley J. Dominick, Niamh Nic Daeid, and Stephen M. Bleay, "The Recoverability of Fingerprints on Nonporous Surfaces Exposed to Elevated Temperatures," Journal of Forensic Identification 61, no. 5 (2011): 520–36.

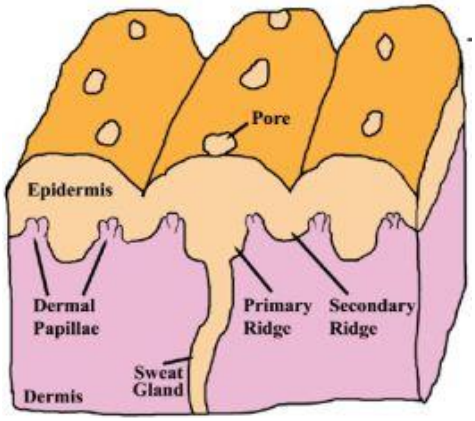

Fig 1.2 Friction ridge structure

A common procedure for permeable materials like paper and cardboard is portrayed in the stream outline. The advancement methodology picked was not entirely set in stone by whether or not the thing was wet after utilizing optical strategies. The water-dissolvable part of the inert finger impression store is at this point not present assuming that the thing has been soaked. Medicines like DFO, ninhydrin, and metal salt treatment can be utilized in an assortment of situations. From that point forward, toward the finish of the cycle, you can apply an actual engineer.

2. Review of Literature

Peterson et al. reported that their technique was influenced by the research, which centered on data collected at specific locations to examine victim characteristics, perpetrator characteristics, forensic evidence, and prosecution outcomes.[7] Roman et al. explained that Forensic evidence typologies have been developed by several forensic authorities.[8] The two most common kinds of biological evidence are blood and saliva. Blood evidence can include wet blood (such as a tube of plasma from an autopsy) or swabs of traces acquired at crime scenes. Other biological evidence

[7] Joseph L. Peterson et al., "The Uses and Effects of Forensic Science in the Adjudication of Felony Cases," Journal of Forensic Sciences 32, no. 6 (November 1987): 1730–53, doi:10.1520/jfs11231j.
[8] See supra note 5.

includes sperm stains, urine, and sweat. In each scenario, the objective is to provide sufficient scientific proof to enable DNA tests.

Win et al. elaborate that Fingerprints serve a significant role in community security and criminal investigation in forensic investigation, law enforcement, customs access, and public security organs. Furthermore, they compare and analyze classification, matching, feature extraction, fingerprinting, and machine learning approaches are all available.[9]

Johnson & Riemen explained that following a mass killing, victims are identified by collecting and analyzing several scientific identifiers as well as contextual information about each body.[10] They explained that in this work, they look at fingerprint feature extraction and how it can help enhance the efficiency of a fingerprint login authentication system by introducing a new feature extractor based on binary images and a quick thinning technique. There method can improve the accuracy of fingerprint image recognition in an automatic fingerprint identification system.

Fingerprints are the most commonly used type of physical evidence in criminal investigations for identifying criminals or establishing a link between crime scenes. On the other hand, detecting latent (hidden) fingerprints is difficult, especially when they are present on metallic surfaces. The initial layer of Polypyrrole or PEDOY was electrodeposited onto the surface carrying a latent impression after the monomer was oxidized in LiClO4 aqueous solution. Using a solution of (C4H9)4NBF4/CH3CN, the second layer of fluorescent Poly (2,2′:5′,2″-terthiophene) was electrodeposited onto the first layer.

[9] Khin Nandar Win et al., "Fingerprint Classification and Identification Algorithms for Criminal Investigation: A Survey," Future Generation Computer Systems 110, no. 2 (2020): 758–71, doi:10.1016/j.future.2019.10.019.

[10] Bryan T. Johnson and John A. Riemen, "Digital Capture of Fingerprints in a Disaster Victim Identification Setting: A Review and Case Study," Forensic Sciences Research 4, no. 4 (2019): 293–302, doi:10.1080/20961790.2018.1521327.

Yan & Chen explained that Fingerprint extraction is critical in criminal investigations and information security. Because latent fingerprints aren't always visible, imaging often involves the use of intrusive techniques. With hyperspectral imaging techniques, non-intrusive fingerprint extraction is possible, but it requires well-designed picture processing algorithms. In this paper, the problem of fingerprint extraction from hyperspectral images is examined, and a processing method is propose.[11]

Photographs of fingerprints are critical in the investigation of serial criminal cases. The main purpose of this study was to employ deep machine learning, a form of Convolutional Neural Network, to provide a comprehensive fingerprint analysis of crime scenes. In conclusion, previous forensic evidence research aided in the development of the study's research strategy and analytical procedures. The research builds on prior work and aims to close open issues in this important research area.

3. Materials and Methods

Present research was based on secondary data. The Data and evidences were collected from a murder case crime scene. On April 20, 2021, Lahore police received a call about a dead cadaver found in a condo (Model Town, Lahore) (Fig. 1,2 and 3). The body with abnormal red imprints on the button was found attached to the floor with different kinds of cement tapes, alongside an enormous jug of water and a piece of paper with a red powder on it next to the dead body, during the examination. All articles were gathered from the crime location with care and consideration by crime location experts and shipped off the Punjab Forensic Science Agency's unique finger

[11] Longbin Yan and Jie Chen, "Non-Intrusive Fingerprints Extraction from Hyperspectral Imagery," 2018 26th European Signal Processing Conference (EUSIPCO), 2018, 1432–36, doi:10.23919/eusipco.2018.8553281.

impression area in Lahore, Pakistan, to be dissected for idle fingerprints. Fingerprints are broken down by Ninhydrin and cyanoacrylate strategies.

Fig 1.3 Crime Scene.

A piece of paper

A plastic water bottle

An adhesive tape

Different type of novel techniques were applied to investigate the case and results were finalized on the basis of these findings**.** This was a collective effort by a research team for the collection of evidences to solve the case. There were different equipment used in crime scene like light sources, whatever transmits electromagnetic radiation of any frequency is alluded to as a light source (from bright to infrared). A crime location responder will require light sources, and the scope of them will be fundamental. Applicators of powder fingerprint tools for finger impression powder exist in an assortment of shapes, sizes, and fiber pieces. The powder is applied on a surface utilizing delicate brushes, wiping out the gamble of harming the fragile example. Cameras is unique finger impression and palm print photography should be possible with any camera that incorporates

close-up connections. A camera framework with a macro photography focal point, then again, is great.

After the collection of these evidence there were used some lab equipment's for further process. Seething esters of Cyanoacrylate, frequently known as superglue raging, were presented in the United States in the mid-1980s as a strategy for creating idle fingerprints. A low-pressure iron statement box is a steel container with a door on one side that is intended to keep inactive prints alive. The chamber is connected to a system of pumps and suction funnels that act together to reduce the strain and allow metals to evaporate. Laser "Light enhancement through the animated outflow of radiation" is an abbreviation. Fisher clarifies that "not all lasers are appropriate for finger impression handling."

4. RESULTS & CONCLUSION

Fig 1.4(a) and (b) show that a total of five fingerprints are collected from the adhesive tape found near the dead body. These all are formed by the Cyanoacrylate method. As these are formed, Forensic scientists matched them with their database AFIS system. Out of five, only one fingerprint matched with one Suspect.

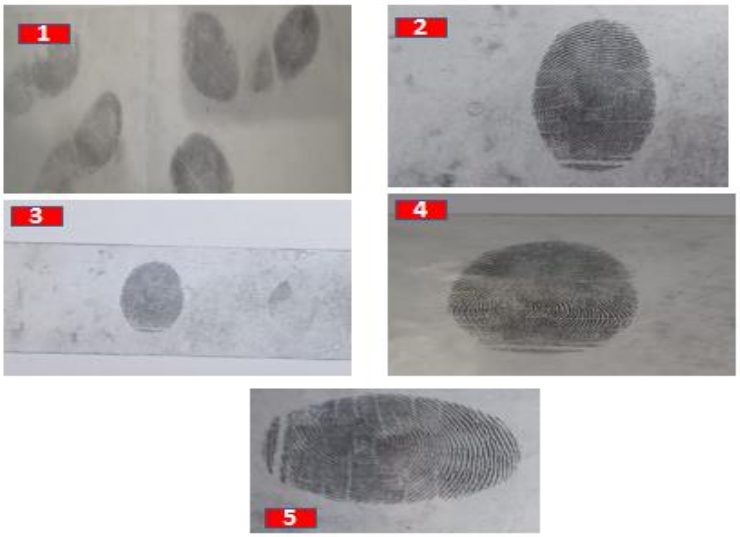

Fig 1.4(a): Five Fingerprints obtained by Adhesive Tape by using the Cyanoacrylate method.

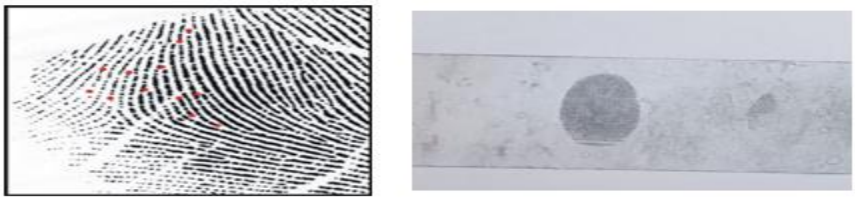

Fig 1.4 (b) (Left) Fingerprint from AFIS System, (Right) Fingerprint of suspect that matched.

1.5 Finger Prints obtained from a piece of paper:

Fig 1.5 (a) and (b) show that a total of two fingerprints are collected on a paper that is placed near the dead body. These all are obtained by using the Ninhydrin solution method. As fingerprints are obtained, Forensic experts matched them with their database AFIS System. Only one Fingerprint matched with one Suspect. So, in this way, one Suspect is identified and the case shifts towards the police branch.

Fig 1.5 (a) Fingerprints obtained from a piece of paper by Ninhydrin solution method.

Fig 1.5 (b) (Left) Fingerprint from AFIS System, (Right) Fingerprint of suspect that matched.

Fig 1.6 (a) and (b) show that a total of two fingerprints are collected from the water bottle placed near the dead body. These fingerprints are collected by the Cyanoacrylate fuming method. Out of two fingerprints, only one matched with the suspect. So, in this way suspect is identified and the case transferred to the police branch.

Fig 1.6 (a) Finger Prints found on a bottle by Cyanoacrylate method.

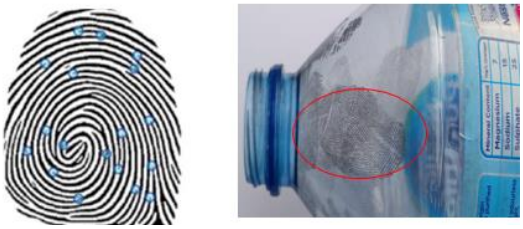

Fig 1.6(b) (Left) Fingerprint from AFIS System, (Right) Fingerprint of suspect that matched.

5. Conclusions:

The investigation into the death scene urged looking into the role of novel techniques of fingerprints very once, highlighting the need of conducting a proper and complete investigation into the crime scene. According to the primary study of the crime scene, death appeared to occur accidentally and was related to homicide based on the shreds of evidence and the state of the corpse. As a result, it became critical to seek out additional impression evidence to complete the right analysis on time. All of the evidence gathered at the crime site was difficult to deal with. Fingerprints are frequently used as a vital tool in biometric identification. However, due to the nature of the evidence surface, cyanoacrylate and ninhydrin being the noval techniques proved to be the ideal approach in this circumstance. All of the evidences pointed to four primary suspects in the case, yielding a clear, affirmative result. In less than twenty-four hours, the case was solved. As a result, it may be inferred that in this instance, it is always important and helpful not to disregard tiny evidence such as fingerprints. Using only fingerprints, the criminals were arrested within 24 hours. Fingerprints are important pieces of evidence to solve a case in less time. In this work, Ninhydrin and Cyanoacrylate methods are utilized.

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