

# Detection of Footprint Impressions at the Scene of Crime-A Review



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## Abstract

Forensic science works on physical evidence and hence the forensic investigators are searching for physical evidence in the crime scenes or scene of the crime to identify the perpetrator and to solve the mystery crime such as Footprint. The footprint is important physical evidence found in many crime scenes such as homicide, burglary, and sexual assault, but is simply ignored even in the initial stage of the investigation, considering unimportant. Footprint and gait analysis are most aligned with other pattern-based forms of evidence like blood pattern analysis. The examination and comparison of the footprint impressions are the most important part of forensic science. During footprint impressions, the investigation officer or forensic science expert mainly follow the parameters i.e., design, size, or shape of a footprint. Footprint impression is useful evidence in a criminal investigation for leading a case in appropriate direction. The footprints that are produced while standing are smaller as compared to those produced while walking. In this review paper, we highlight how to use the scientific method to easily analyse the footprint impression at the scene of the crime.

**Keywords:** Footprint; Impressions; Crime; Scene; Expert; Scientific Method; Heel Creases; Forensic; Criminal Civil; Forensic Podiatrists

## Introduction

Forensic is the study and use of forensic and technology to resolve criminal civil and regulatory matter. Bare footprint & impression and shoe print & impression is generally known as the footprint. The footprint is found in all physical crime scenes. Foot impression is obtained at the scene of the crime are they known or unknown evidence. Carefully forensic scientific examination of those Prints may yield information that can help in linking a suspect with the scene of the crime. Footprint imprints are like a piece of impression evidence that can be found on a suspect show at a crime scene, and it's based on unique shoe sizes or patterns. The examination of gait in humans can be traced to the time of Aristotle (382-322BCE) however, it was not until the Renaissance that Giovanni Borelli (1608-1679) performs the first truly scientific gait analysis examinations. When we look at Scotland in the 1700s, the first used to of footwear impression evidence in a criminal case [1,2]. The use of good evidence in criminal investigations dates to 1862 when Jessie McLachlan's footprint placed her at the scene of the women murder for which McLachlan's was subsequently convicted. Since the 1990s in modern items are used for forensic podiatrists assisted enforcement investigations, Sergeant Robert Kennedy of the Royal Canadian Mounted police (RCMP) has led the search that has to collect and analysed 24,000 footprints.

## Footprint Impression may be Divided into Two Basic Groups

### Two-Dimensional Footprint Impression

These types of impression are made when the under the sole of a shoe encounters a hard and flat or plane surface such as a linoleum floor or a countertop. In many cases, the material is transferred from the sole of the and deposited on the substrate. These are known as positive impressions and include those made with wet mud and blood. A positive impression is usually readily visible. At last, in the initial stages before the material adhering to the sole wears. Off and the prints becomes Latent (invisible to the naked eye) less frequently two-dimensional impression is made by the removal of residual material from the flat surface thus creating a negative footprint impression. These are made in dust or on a surface covered with a thin wax polish.

### Three-Dimensional Footprint Impression

These types of footprint impression are found when the shoe is impressed into a soft plastic material such as Earth sand or snow. As these are initially photography at the Crime scene to obtain a permanent record. they are then preserved, if possible,

by taking cast plaster of Paris and dental stone used for casting three-dimensional footprint impressions [3].

### Location of Footprint at the Crime Scene

Experts to find track marks at all the scenes of occurrence. The investigating officer, therefore, should pay particular attention to their search.

- i. The footprint is present at all surfaces where the suspects may have entered or exited the scene.
- ii. The footprint may be found in the field courtyards floors of rooms walls staircase roofs table and chair paper boxes drainpipes ext.
- iii. If the culprit has visited a garage, he/she is likely to leave prints on the garage surface of the garage floor.
- iv. If the culprit gates his footprint and footwear smeared in blood, he is likely to live Prince in blood.

### Crime Scene Examination of Footprint

Footprints can be considered as a type of evidence and collection can be done from various crime scenes [4]. The stride dimension, location of each footprint, its shape, size, angulations and deepness, interspaces and outer margins, heel creases, injuries or accidental damages provide indirect information about gait pattern, the height of the person, length of legs, range of body weight and interrelated movement of the foot, ankle, leg, and the body that are individualistic to that person. Thus, the impression of the footprint evidence whether complete or partial or even a small portion can provide evidence and may indicate the skeletal and body structure of the person who made it. The collection of the footprint is an important aspect of Crime scene investigation work at the Crime scene [5-8]. Investigating officers are specially trained in various collection techniques for footprint evidence depending on the types of impression found.

### Tracing

The value of a traced mark depends upon the observation skills of the investigating officer, and it is highly subjective the technique is not reliable it should not be used at all. the footprint as close as possible but taking care that it does not touch it. the lines should be drawn as thin as possible. The part of the foot of which the tracing is to be made the tip of the pain and then I should be in a line to avoid destruction. The clear outline of the different parts of the footprints should be shown in thin continuous lines the faint and doubtful outline may be shown with dotted lines.

### Photography

Generally, all Prince and impressions should be photographed before attempting any other method Thus photographs are first taken of both surface prints and sunken impressions. As the first details of marks are important it is advisable to abstain from photographs of the same mark two with lighting from both

sides and angles 45° and two which are single oblique lighting from another side. An SLR (single-lens reflex) 35mm camera and the fine again film their cameras were popular because of the handling size and availability of high-quality film from them. Photogrammetry should provide a useful record for the study of the gait pattern.

### Lifting

Any crime same surface prints are lifted after photography the sum lifting ordinarily spoils the original mark. It is possible to lift secondary prints, but the quality of the print is often very poor. The lifting techniques vary with different surfaces and materials the following techniques are commonly used:

- a) A bromide paper sheet is taken and sanitized by fixing it. After removing excess water, it is placed over the print and proceed uniformly. The particles of the print get attached to the gelatine surface and the outline of the print is obtained on the paper.
- b) If the print is found in white (or light shade) powder, an exposed bromide paper is developed and fixed. The shit thus obtained will be dark in colour. it provides the necessary contract to lifted print.
- c) If adhesive tape of sufficient dimensions is available for lifting food for shoe print. It is used to lift the mark like fingerprints developed by powders.
- d) Greasy and sticky marks and made by shoes smeared in blood and liquid on any surfaces are lifted by first dusting the mark with the powder and then lifting the dust prints after removing the excess Powder by blowing in the usual way [9-12].

### Examination Methods of Footprint Impressions

The track marks are lifted by the investigating officers. A specialised in the field help them in an important case. We have in India some specially trained officers posted in some districts.

### Casting

The casting process spoils the impression almost completely it is therefore necessary that the impression should be photographed before preparing a cost of the same. The varieties of materials plaster of Paris, wax, resins plaster powder, modulating clay, Sulphur, lead, woods, metal, plasticize and the like have been used to repair the costs. Plaster of Paris is whoever the most frequently used to the material.

### Holography

A British scientist, Dr Bradford has come with laser techniques for recording food and shoe prints. The compressed fibres tend to resume their original positions. Though visually the fibres do not appear to do so, in actual practice the fibres take quite a long time to come to their original positions. A laser beam can record is compression on the photographic plate. The outline of foot

or footwear and the surface characteristics of the tread such, as patterns, nails, wear and tear etc.

### Electrostatic technique

A new technique for lifting the invisible foot and footwear marks on floor and floor covering at the best upon the principles that the dust particles can lift high voltage onto a vinyl sheet, where they can be photographed or fixed in a gelatine paper. Take a black vinyl sheet and cover the area suspected of barefoot footwear marks. Cupboard sheet with Aluminium foil. Apply a high voltage of about 15,000 volts to the foil. Photograph the mark formed on the vinyl sheet. This technique is more used in the Indoor crime scene.

### Latent prints

Latest food for footwear prints is proceed like latent fingerprints. Many colour powders are present to develop a latent footprint the grey powder is used for dark colour surfaces. And the black powder is used against the light background and send powder is used for multicolor surface or magna brush technique is preferable [13]. The developed print is a photograph and may also be lifted if found on a subject that cannot be moved to the laboratory.

### Evaluation of Print

Evaluation and comparison of impression evidence should be performed by a good trend footwear and tyre marks examiner. Evidence detection recovery handling and examination procedures laboratory and photography equipment and procedures. It is well established that every footmark has an individual entity that cannot be duplicated even with the best of human skill and scientific techniques the individual Liberty is given marks is established from the following features:

- a) Dimension
- b) Shapes
- c) Patterns
- d) Peculiarities

The dimensions of the cost vary due to nature and quality of the surface, expansion of foot footwear real monks and costing materials the mode of imparting the mark and nature of the creation mode but the variations and dimensions are within limits. Analysis of footprint impression can reveal much about the activities of an individual at the Crime scene. Impression allowed their number to be counted footwear can make an additional mark, as well as print evidence of scuffs or dragging of feet, can tell an alert. Investigator about the activities of individuals at the Crime scene. Footprint/ footwear impression is allowed overlap by those of others that can be demonstrated to be associated with the crime. Naked-eye footmarks are frequently found in the investigation at the crime scene in India they sometimes provide positive evidence. The marriage in consists of an outline

of the heel and the inner and the outer boundary line of the food on the hill may be oval or round. Some deformed feet may live separate marks for hills and soles. The inner and outer margins and continuous in such cases. The shape and size of the toes vary greatly. Many characteristics identification features, Riding toes, long and short toes, missing toes, partially cut toes and the damaged toes sometimes offer useful characteristics and may be sufficient by themselves for identification purposes. Phalange marks are created by the phalange of the toes their presence position shapes and sizes are usually identifying features. they are found in the foot mark frequently. The identification of a footwear mark is possible even when the same of incomplete because it carries several identifying features. Hill marks alone may identify the shoe sometimes. The damage to a shoe, like the cut and cracks of the chipping portion of the sole, also confers individuality on the sole. Individualization of the bookmark is difficult. Often the nature of the animal alone can be given sometimes damage to the hoof for wear and tear of the iron shoes of the shod animal permit individual identification of the animal. The most important evaluation of footprint a gate pattern is identified for the direction line the walk line, the food line, the food angle, the step angle disturb length the steps with step and another special feature of the foot or footwear.

### Taking Control Samples for Preparation

Control samples are any type of well now forensic sample is used to assure the analysis are properly performed so that results are reliable also called control know samples to control simply is one important part of quality control and procedures that forensic scientist used to eliminate the inaccuracy of laboratory. The examiner measures the various element within the footprint design as well as length within of the impression and then compare those measurements to what is seen in Crime scene print or impression. In low magnification and special lighting and sometimes used to determine many various characteristics are accidental or something that was created during the manufacturing process [14,15].

### Forensic Significance of Footprint

- i. Footprints are the impression or image left behind by a person walking or running. The print left at a Crime scene can give vital evidence to the perpetrator of the crime.
- ii. At Crime, scene shoe has many different prints based on the sole design and the wear that the has received this a help to identify the suspect.
- iii. Footprint present in a crime scene take photography for the casting of footprints can be taken to preserve the finding analysis of footprints a specialist part of forensic science.
- iv. Footprint can also find the approximate height from footprints and shoe prints. The foot tends to be approximately is of the person's average height.

v. The number of individuals person at the Crime scene is often difficult to determine unless separate footwear/ print impressions allowed their number to be counted.

vi. A shoe print can be unique because of many variables. Wear Pattern can show how long it was worn and sometimes the walking pattern of the owner of the shoes.

vii. Analysis of footprint impression can be revealed much about the timing of activities of an individual at the Crime scene.

viii. Footprints have found us other two-dimensional trends for three-dimensional impressions. Prince is made by depositing (blood, soil) or removing (dust, blood) material from a hard surface.

## Conclusion

Track evidence is footmark footwear marks hoof marks, tire marks, skid marks, the impression of Stick or pug marks beast and included in the track evidence. Individual marks and their collective pattern are both useful in the identification of individuals principles and methods for the evaluation of marks are like, though some collection techniques differ for print and impression. Most recent techniques for collection of footprints like a hologram, electrostatics techniques, silicon costs. Sometimes required to determine whether a person was walking running and standing. The track mark identification of a science and whether it is recovered under section 45 of the Indian Evidence Act or not. The legal conflict was whether the police or the magistrate could order the taking of footmarks under-identification of the Prisoners Act or not. Some courts held that it is against article 20 (3) of the constitution. The ruling of the Supreme Court has not finally decided the matter. The taking of specimen footmarks impressions has been held lawful.

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