

Some Important Points for Meaningful Crime Scene Reconstruction

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Abstract

Physical evidences plays an important role in crime scene investigation, position and their relative directional distances are important for forensic experts in crime scene reconstruction about determining or eliminating the events occurred at crime spot. Crime scene reconstruction is an art of interpretation of the physical evidences their position at crime scene in accordance with witnesses, accused, deceased and circumstances present at the crime scene spot. This study highlights some points for meaningful crime scene reconstruction.

Keywords: Crime Scene Reconstruction; Physical Evidences.

Introduction

Physical evidences plays an important role in crime scene investigation, position and their relative directional distances are important for forensic experts in crime scene reconstruction about determining or eliminating the events occurred at crime spot. Crime scene reconstruction depends on the forensic expert's ability to make minute observations at the spot, the use of logical approaches to theory formulations. Logic, careful observation, and considerable experience, both in crime scene investigation and forensic examination of physical evidence, are necessary for proper interpretation, analysis and, ultimately, crime scene reconstruction. The Locard theory of transfer is the fundamental basis of any forensic investigation which usually starts from recognition of the potential evidence and separation of this from those items that have no evidential value. Reconstruction is based on the results of crime scene examination, laboratory analysis, and other independent sources of information to reconstruct case events generally involves the use of inductive and deductive logic, statistical data, and information from the crime scene, pattern analysis, and laboratory analysis results of a variety of physical evidences. Reconstructions are considered as complex task scientific fact-gathering

process often desirable in criminal cases in which eyewitness evidence is absent or unreliable which involves linking many types of physical evidence, stain pattern information, analytical results, investigative information, and other documentary and testimonial evidence into a complete entity. This study highlights some points for meaningful crime scene reconstruction.

The crime scene reconstruction involves several sequential steps like data collection, conjectures, hypothesis formulations, testing and theory formations. The information collected at the crime scene, from the victim, or witnesses before any detailed analysis of the evidence is obtained, a possible explanation or conjecture of the events involved in a criminal act may be done, but it must not become the only explanation being considered at this stage further accumulation of data is based on the examination of the physical evidence and the continuing investigation. Crime scene examination and inspection of the physical evidence includes interpretation of bloodstain, impression patterns, gunshot patterns, fingerprint evidence, and analysis of trace evidence. Once a hypothesis is formulated, further testing must be performed to confirm or disprove the overall interpretation or specific aspects of the hypothesis.

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Additional other information may be acquired during the investigation about the condition of the victim or suspect, the activities of the individuals involved, accuracy of witness accounts, and other information about the circumstances surrounding the events [1-12].

Physical Evidence and Crime Scene

Physical evidence can be classified according to its physical state, the type of crime, and the nature of the evidence, its composition, or the types of questions to be resolved [13]. Each of these is useful in developing conceptual ideas and practical approaches at the crime scene investigation. [14]. On the basis of nature and form the physical evidences are classified as follows.

1. Transient evidence

Transient evidences are the variable nature, temporary, easily changed or lost evidences for examples odors, temperatures, color, and some biological and physical phenomenon such as rigidity or the drying of blood. Due to temporary nature, these type of evidences must be documented as soon as the evidence is observed at the scene of crime.

2. Conditional evidence

Conditional evidence is generally produced by a set of actions or inactions if these evidences are not observed and documented immediately at the crime scene, the evidence will be lost forever for examples lighting conditions, television and computer settings, smoke or fire, condition of the victim's body, window positions, or exact locations of specific evidences within the scene.

3. Pattern evidence

Pattern evidences lies at crime scene in the form of imprints, indentations, striations, or other markings such as fractures or depositions. The pattern evidences may be blood spatter or stain patterns, glass fracture patterns, fire burn patterns, furniture position patterns, projectile trajectory patterns, track-trail patterns, clothing or article patterns, tire or skid mark patterns, modus operandi patterns, and gun powder or residue patterns.

4. Transfer evidence

Transfer evidence, also known as trace evidence

and generally produced by physical contact between persons, objects, or persons and objects. Example blood, fingerprint, hair, fiber, body fluids, soil, glass, drugs and chemicals.

5. Medical evidence

Medical evidences includes victim's, suspect's, or witness's injuries, the type and degree of injury the location and condition of a wound, the number and size of the wounds, medical history, the type of medical equipment on the person, house or car, the prescription history, including date and amount prescribed.

6. Electronic evidence

Due to modern advances in and availability of electronic devices, most individuals own a cell phone, Personal Computer, IPod, Ipad, tablets, smart watch, health gadget and other personal devices. Many house and business institutes have installed surveillance cameras, monitors, digital cameras, phone answering machines, video cameras, computers and data storage devices. The informations includes cell phone call records, e-mail messages recovered from a suspect's computer hard drive, and videotape recorded from a bank security camera.

7. Associative evidence

During the course of an investigation, specific items located at a crime scene includes suspect's vehicle or wallet, victim's ring, watch, button or other personal belongings found on the suspect, receipts, tickets or business cards.

Types of Crime Scene and Their Reconstruction

There are many ways to classify a crime scene [9]:

The original location at which the crime was committed like primary scene and secondary scene. The type of crime committed (e.g., homicide, sexual assault, robbery). The physical location (e.g., indoor, outdoor). The physical condition (e.g., buried, underwater). The boundaries of the scene (e.g., house, train, bank, computer, car). The appearance of the crime scene (e.g. organized, disorganized crime scene). The activity (e.g. active, passive scenes) and the size of the crime scene (e.g. universal, macroscopic, microscopic scene).

Depending on the nature of the crime, the questions need to be answered, the types of events

that have taken place, and a reconstruction that is based on the actions of the expert reconstruction are classified in four types

1. Incidents, in this category accident and crime reconstructions generally performed which includes traffic accident and other transportation accident reconstruction like automobiles, trucks, motorcycles, trains, airplanes, boat accidents, industrial or construction accident reconstruction: building collapses, machinery, etc. can be included in this category. Apart from these some crime reconstructions include homicide, arson scene, rape case and white-collar crime reconstruction.
2. Events, in this category sequence, direction, position, relational conditional and identity determinations are performed.
3. Involvement, in this category total case, partial case, limited event and specific pattern reconstructions are performed.
4. Special physical evidence reconstruction includes pattern evidence, shooting investigation evidence and serological evidences.

Importance and Role of Different Evidence in Reconstruction

Pattern of physical evidence generally found at a majority of crime scenes should be carefully documented, processed, enhanced, or collected by various techniques, these results from the fracture, breaking or cutting of an object some patterns evidences like bloodstain, glass fracture, fire burn, furniture position, track-trail, tire or skid mark, clothing article damage or position, modus operandi and crime scene profile, projectile trajectory and powder residue and injury or wound patterns etc. plays important role in interpretation of sequence of steps and events.

In blood pattern analysis some important points are direction of travel of the blood droplets, distance of blood source to target surface, angle of impact, type of blood droplet, determination of blood trails, their direction, and the relative speed of motion, nature of the force and sequencing of multiple events associated responsible for the bloodshed, interpretation of contact or transfer patterns, estimation of elapsed time and volume of bloodshed. Blood patterns generally remains dropping, impacted bloodstain spatters, and special bloodstain configuration patterns, their documentation are usually recorded by scaled photography.

Glass fracture patterns are generally found in burglary, criminal mischief, shooting incidents, and fire scenes. Broken glass at crime scenes are very useful in reconstruction and provides information about the events which took place, and assisting in proving or disproving an alibi or witness's story. These are useful in finding direction of impact force applied, approximate force of impact, approximate angle of impact of force, determination of the type of glass fracture. These are helpful in determination of the sequence of firing, direction of firing, and the type of firearm for the projectile holes present. In arson cases they are helpful in estimation of the fire temperatures, direction of fire travel, and the intensity of heat from the melted glass are useful in fire and arson cases.

Fire burn patterns often provide information on the various factors which are helpful for cause of fire and useful in determining the point of fire origin, the direction of fire travel, and the degree of damage of a fire, which provides clues for arson investigations. Every fire forms a pattern that is determined chiefly by the configuration of the environment, the availability of combustible material, and the type and intensity of the fire therefore these must be included in reconstruction process. The general patterns may found at fire scenes like inverted cone or 'V' pattern, multiple points of origin burn patterns, low burn pattern configurations, depth of charring patterns or alligator patterns, trailer patterns, smoke stain pattern, melted material patterns, concrete spalling patterns which helps in crime scene reconstruction.

In an indoor crime scene, the position and condition of furniture generally provide information about the events that caused the pattern, their sequence, and possible actions of perpetrators and victims. Displaced or broken furniture indicate that struggle might took place. Patterns of disarray in ordinary or expected furniture placement or condition may further reveal actions taken by suspects or witnesses at scene of crime similarly the less encountered the track-trail patterns are also helpful at crime scenes. The proper interpretation of these gives information about how many persons were present at a scene, whether they were moving about, the nature of the movement and the direction of travel, and whether heavy objects were being carried or dragged. These patterns also provides information regarding such as shoe size, stride length, sex, weight, or any abnormalities in movement or gait of the persons present there.

The value of tyre skid mark patterns in outdoor traffic accident reconstructions is important and

completely documented for information about the number and types of vehicles involved the possible speed of travel, direction of travel, whether or not brakes were applied, and whether turns were made, which helps in deciding the involvement of the vehicles.

Reconstruction of Fire Arm Related Crime Scene Cases

In shooting scenes reconstruction it is necessary to determine several factors the manner of death – homicide, suicide, or accidental, like the relative location(s) of the shooter(s) and victim throughout the incident it also helps in determine the muzzle-to-target distance, which can be a pivotal factor in distinguishing between a homicide and suicide. The trajectory reconstructions are performed to provide valuable information that can in many cases prove or disprove suspect, victim, or witness accounts of shooting scenarios. The components of a successful shooting investigation include investigative information, crime scene processing, autopsy and medical records, laboratory examination of physical and pattern evidence, and related reconstruction experiments. The meaningful reconstruction of shooting cases is highly dependent upon the quality of crime scene documentation, searching, and the collection, preservation of all relevant evidence and statements from all involved parties, is valuable not only to the overall investigation, but also to crime scene experts.

Gunshot residue analysis is of great value in helping determine who may have been involved in the shooting and approximate muzzle-to-target distances. However, gunshot residue can be easily lost if not properly collected and protected. Therefore swab the hands of the victim and any potential shooter for the presence of gunshot residue collected. A gunshot victim's clothing should be preserved as a gunshot residue distribution pattern can assist in distance determinations. Sometimes clothing from both victim and potential shooters should be seized as it may contain gunshot residue, blood spatter, glass fragments, other forms of trace or transfer evidence, or tears, damage or soil patterns that may be useful for reconstruction purposes, which be used to corroborate a statement regarding movement or events during and after the shooting incident. In cases where multiple shots were fired by one or more shooters it is imperative to account for and locate all associated firearms evidence. This can be accomplished by conducting a thorough inventory

of the total number of bullets each firearm could store and how many are 'missing', number of recovered shell casings, number of bullet holes, any bullet strikes or deflections, number and type of wound and to a lesser extent witnesses' accounts of the number of shots fired. Some times it is necessary to X-ray the victim or conduct an autopsy to get a clear understanding as to how many bullets or fragments struck the victim, and how many are located within the victim.

Projectiles recovered at crime scenes examined by forensic laboratories which provide valuable information and used in the reconstruction process. Firearms examination in the forensic laboratory can provide information about the type of firearms used in the investigation, such as the caliber of the firearm, type of ammunition used, and rifling characteristics that may provide a list of possible manufacturers and models. Microscopic examination of the projectile may also provide information about the types of surfaces contacted by the projectile after firing. Weapon-specific markings on projectiles Markings found on fired projectiles are class characteristics, individualizing characteristics, or markings received after leaving the muzzle. Post-muzzle markings and trace evidence Additional markings that can be used for reconstruction of trajectory are the markings placed on a projectile after it leaves a muzzle. These markings used for reconstruction can be attributed to silencers, intermediate target impacts, and the final impact surface or terminal trajectory marking sometime adhered material on bullets also be useful. The gunshot residues on hands and clothing and patterns of cylinder and muzzle flash.

Muzzle-to-Target Distance and Trajectory Determinations

Generally, distance determinations involve a comparison of gunshot residue distribution found on the item collected at the crime scene to laboratory-prepared gunshot residue patterns acquired at various distances. Visual examination of the target surface-macroscopically and stereomicroscopically. Infrared photography-Enhancement and mapping of distribution of GSR particles by chemical reaction for nitrites or lead. Determination of range of firing. A trajectory reconstruction can help determine the angle of incident.

Generally two geometric methods used by experts for trajectory determinations. i.e. physical methods (probes, rods and strings utilized for calculation of angle, trajectories and distance

respectively) and the other method is based on optical projection methods e.g. laser beams.

Shell Casings Ejection Patterns

These casings gives useful information and useful for subsequent comparisons to suspect guns, to determine if they fired that particular cartridge. If no weapon is found, the cartridge case can be entered into a firearms database. The location of the shell casings may be useful in determining the approximate location of the shooter in reference to the ejected shell casing. Glass fracture distribution patterns when bullets strike or penetrate glass the subsequent fracture lines can reveal information as to the location of the projectile hole, direction and approximate angle of incidence, and number of sequence of projectiles fired through the glass. vehicle dynamics also important when a vehicle is involved in a shooting incident the vehicle dynamics and motion must be accounted for during the reconstruction process. It may be beneficial to utilize an accident reconstruction expert to examine skid marks and vehicle damage to approximate the speed and direction of travel before, during, and after the shooting incident.

Police encounter shootings attracts significant media attention and public interest. In most of cases, there is a lack of witnesses, at least available witnesses within the early portion of the investigation.

Results and Discussions

The meaningful crime scene reconstruction requires all photographs of crime scene, autopsy reports, videotapes of scene, measurements, notes, spot inspection reports, witness statements and laboratory physical evidence testing reports. Whenever possible, visiting the crime scene at the time of the incident and direct observation of the scene and patterns may be most helpful like type of damage, stains and conditions will provide the best opportunity for further reconstruction analysis.. Complete and accurate documentation of a scene is also important.

Crime scene reconstruction must be objective and true to the facts reviewed it should contain detail of materials that were reviewed and considered during reconstruction process it should be accurate and in complete agreement with notes taken during the process. Labeled photographs should be aided in articulating all observations and comments known

to experts. If interpretations are limited due to a lack of data it must be mentioned in the report. Crime scene reconstruction facts should not over-commit or too narrowly limit opinions and observations with an open, objective mind the recommended words in report like: consistent with, similar to, most probable, inconsistent with available data or facts, inconclusive, cannot be determined with the available information, etc. in report restrict stating opinions until the summary or conclusion; facts, observations, and data separate. Be prepared to objectively evaluate a hypothetical with the stated facts, arriving at a different conclusion or opinion. Reconstruction report may be written in general way because many of the details must be reserved for oral testimony because anything written will be carefully reviewed by other experts. In nut shell, crime scene reconstruction is an art of interpretation of the physical evidences their position at crime scene in accordance with witnesses, accused, deceased and circumstances present at the crime scene spot.

Conclusion

At the scene of the crime of a murder case, forensic scientists have to determine the nature of death (i.e. whether the death is natural or unnatural, and if the death is unnatural, whether it is homicidal, suicidal, or accidental). Another important role of forensic scientists is to verify the witnesses' statements, if available. Extra care has to be taken during investigation to rule out any manipulation. Crime scene reconstruction can be described as putting together a quiz without knowing what the picture is supposed to look like and without even having all of the evidences. The crime scene reconstruction involves evaluating the context of a scene and the physical evidences lying there in an effort to identify what occurred and in what order it happened. Other times, the reconstruction contributes to securing conclusive useful evidence of simple clues or questionable evidence or, where appropriate, to removing them as worthless. Thus the crime scene reconstruction comes as evidence proceedings with specific features. The importance and role of the crime scene reconstruction in the criminal investigation of different types of offences can be highlighted only as a fair representation of its purpose, implicitly of its evidence value. The reconstruction constitutes a good opportunity to verify and confirm the reasoning used by the criminal investigation body in the initial phase of the investigation, but in no case can it be regarded as having the aim to verify the versions.

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