

Returning to the Scene of the Crime

By Lieutenant Raymond E. Foster, LAPD (ret.), MPA

High definition surveying gives law enforcement a whole new picture of a crime scene.

It's a given that criminals often return to the scene of the crime, such as an arsonist or serial murderer returning to the scene as a means to relive the crime. It's not only criminals that do so; detectives, prosecutors and juries also need to revisit the crime scene. For the detective, it may be to re-examine the evidence; the prosecutor for case preparation; and for a jury to assist members in making a decision.

Typically, investigators rely on photographic evidence and two-dimensional (2D) drawings as a means to re-evaluate crime scenes. The problem is we live in a three-dimensional (3D) world and it can be difficult to visualize the positional relationships of evidence with 2D tools.

What if agents could measure with extreme accuracy thousands of data points per second in a crime scene? What if an agent could capture that information, recall it and create his or her own virtual representation for use during a trial?

Through a combination of laser and computer technology, HDS creates a virtual crime scene that gives investigators the ability to manipulate every piece of evidence in that crime scene.

Cloud of Information

Understanding evidence documented on a 2D drawing of a staircase is difficult, said Derry Long of Plowman Craven & Associates (PCA), a land surveying company

Returning to the Scene of the Crime

based in the United Kingdom. If you create a 3D staircase and cut-away, the relevance of evidence is often clear.

Long spent 12 years as a civilian employee of Scotland Yard, where he designed police stations and developed computer modeling. At PCA, he uses high definition surveying (HDS) to reengineer crime scenes down to the sub-millimeter level. Although PCAs focus is working with builders and developers, Long has created the first HDS call-out team in Europe for criminal investigations.

His team, on-call 365 days a year, responds to about 150 incidents each year including 20 major crime scenes in the last year alone. Long has taken high technology from the surveying industry into the arena of crime scene investigations, and he said the chief value of HDS is that it produces evidence, not an interpretation of evidence. Many times, Long responds to a scene weeks after the investigations are concluded at the actual crime scene. His job, then, is to scan the scene and use the photographic documentation and crime scene notes to reengineer the scene. Long recalled a recent homicide wherein it was believed the murder actually occurred in the kitchen, but no one could determine how the body ended up in a hallway. By reengineering the crime scene, investigators were able to examine different points of view and the positional relationships of the evidence. Now it made sense, the investigators were able to see what had happened, said Long.

An HDS scanner can remotely emits millions of eye-safe bursts of laser light over a 360 degree field of view said Tony Grissim, Homeland Security & Law Enforcement Liaison for Leica Geosystems HDS, Inc., based in San Ramon, Calif. The HDS is measuring millions of points, creating a point cloud.

Returning to the Scene of the Crime

The laser light is reflected off objects in the crime scene and back to a digital sensor on the HDS, Grissim explained, and then 3D spatial coordinates of the objects are calculated and stored using algebraic equations.

Think of letting off an old-style insect bomb in your first apartment. Millions of particles create a fog, and the resulting cloud settles on all of the objects in your apartment. With HDS, instead of millions of data particles settling on the objects, those data points are bounced back to the receiver, collected, converted and used to create a virtual image of any location.

An average desktop personal computer can now take the data file and project the location onto your screen. Not only has the scene been preserved exactly, the perspective can be manipulated. For instance, if the crime scene were the front room of an apartment, the 3D image allows the investigator to move around and examine different points of view.

Or perhaps the victim was found seated. An investigator could see and show a jury what the victim might have seen. If witnesses outside said they looked in a living room window, an investigator could zoom around and view what the witnesses could or could not have seen through that window.

Keeping the Scene Clean

A basic concept taught to first responders is securing a crime scene so that the contamination of evidence is minimized. Crime scene contamination can take on many forms. It might be someone leaving additional trace evidence, such as touching an object and leaving their fingerprints, someone inadvertently taking evidence from the scene, perhaps picking up fibers on their shoes, or moving evidence.

Returning to the Scene of the Crime

The analysis of a scene's evidence helps to tell the story of what happened, and if an item of evidence is moved or disturbed from its resting place the analysis could be faulty. National Crime & Operations Faculty (NCOF) Special Adviser Mark Harrison, MBE., talks about the golden hour, the time after a crime has been committed during which there is a maximum potential for the recovery of forensic evidence. Harrison, an 18-year veteran of British policing is on loan from the Bedfordshire Police to the NCOF, a national organization in the UK that provides special services during complex investigations. He commonly uses HDS technology as a stand off device: the HDS technology allows him to approach the scene in stages, scanning from the outer perimeter and moving into the heart of the scene.

The laser doesn't care if its day or night, Harrison said. It captures the information and allows me to interrogate the crime scene with my laptop before it has been disturbed. In the past, the method of preserving information about the evidence was photographic documentation and 2D drawings. Later, not only could someone testify to the recovery of the evidence, they might also provide expert interpretation. Drawings and photographs assist investigators in the investigation and ultimately assist prosecutors in telling the story to a jury.

In many cases, Harrison said, the value of evidence is in its positional relationship. It could be blood splatters, a firearm, shell casings or any other pieces of physical evidence, he said. Investigators often go to elaborate means to reconstruct scenes. Unfortunately, no matter how good your photographer there is always something else an investigator wants to know. Photographs and drawings are helpful, but they are 2D. Moreover, photographs and drawings are the technicians interpretation of the scene.

Returning to the Scene of the Crime

Long and Harrison agree that observer bias always creeps into the photography and crime-scene drawing. If an HDS device is used at the scene, detectives, prosecutors and juries can return to the scene of the crime in its preserved state.

Matter of Perspective

The investigative and prosecutorial value of virtual crime scenes is evident. Being able to re-visit the scene and demonstrate exactly where evidence was recovered and its relationship to other evidence is stunning. Moreover, being able to show a jury exactly what a witness could have or could not have seen can be very valuable.

Recently, Craig Fries, president and CEO of Precision Simulations, said his company was asked to reengineer an officer-involved shooting in the San Francisco area that had occurred on year earlier.

There were more than 40 witnesses to the incident, he said, and the scene itself was approximately 400 feet by 2,000 feet; an entire city block with businesses and apartments. Using HDS technology, Fries scanned the scene, the involved vehicles (at the impound yard) and used photographic evidence to reconstruct a virtual model of the incident that could be examined from almost any point of view.

Once the plaintiff knew what we were able to provide, they dropped the lawsuit, Fries said, adding that HDS technology is beginning to be a tool used by both the defendant and plaintiff. If done well, it's very compelling to the jury. HDS works equally well in a large rural area. Harrison recalled a political execution in Ireland wherein the crime scene was a large pasture. HDS technology allowed investigators to document the entire scene in a relatively short period of time and was extraordinarily useful in their investigation.

Returning to the Scene of the Crime

Long and Harrison also said UK agencies have scanned vehicles, train crashes, river crossings, buildings and planes. From the point-cloud data, investigators in the UK can develop 2D line drawings, 3D models, animations and interactive multimedia packages. The system has training applications. Currently, there are driving, pursuit and use-of-force simulators. Using HDS, police officers could be taken into a virtual world to practice their skills. With HDS, police officers also could be taken back to actual events and debriefed on their own, or other police officers actions.

HDS technology has significant application for tabletop exercise, and in addition to training, the technology has a real-time application in tactical situations. Harrison explained that if there were a hostage situation on an aircraft, a similar aircraft could be used to create a virtual representation of the problem. Within about two minutes you could scan the interior of the second aircraft, upload the data and hand virtual goggles to the tactical team, he said, and with that data, combined with other real-time intelligence, the team could explore the interior of aircraft before taking action.

In the UK, government agencies are beginning to use HDS to document critical infrastructure as a means of furthering emergency planning. It would be valuable for fire, emergency medical or tactical teams to have access to virtual information about a building. Imagine a tactical team being able to virtually visit the inside of a school where children are being held hostage. As with the aircraft scenario, the HDS could produce a virtual school and combined with real-time information could give tactical teams an edge over the hostage-takers.

For this to be effective, though, the HDS scanning of critical structures must take place before the incident. As we go forward in the 21st century, we will likely see this

Returning to the Scene of the Crime

technology take an important role in the criminal investigations, civil liability, training and emergency preparedness.

About the Author

Lieutenant Raymond E. Foster retired from the Los Angeles Police Department after 24 years of service. He is the author of “Police Technology (Prentice Hall, July 2004) and number articles on technology, leadership, terrorism and policing. Raymond is a part-time lecture at California State University, Fullerton and a part-time faculty advisor at the Union Institute and University. He has three current book projects. They are on terrorism, policing and leadership.

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