

BY

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“FORENSIC VIDEO ANALYSIS IS A VERY POWERFUL TOOL that can be used in search of the truth. There is no prosecution truth or defense truth; there is only the truth.”

To the lofty statement above, Jonathan Hak, Q.C., a recently retired major crimes prosecutor for the Crown Prosecution Services in Calgary, Alberta, Canada, adds this ominous thought, “Though forensic video analysis has been used in our courts for over 25 years, it remains an area of expertise that is constantly under attack.”

Prosecutor Hak points out,

These attacks include challenges to the science itself under Daubert and Frye; arguments that the trier of fact does not need expert assistance in understanding the video evidence; that the expert opinion evidence is too powerful and usurps the function of the trier of fact; that it was done incorrectly; that the analyst is not properly qualified, etc.

Rarely do the challenges cited by Prosecutor Hak gain any traction, but there is no indication that they are diminishing. But, why is a technique that has been used for over two decades “constantly under attack” in the first place?

As an impartial, third-party recording of events ranging from shoplifting to massive terrorist events, video can be decisive evidence in the fight against crime. Video is capable of not only recording suspects before, during, and after an event, but also indicating items used in the commission of crimes and identifying victims. Gone are the days of relying solely on eyewitness testimony. Now, testimony is corroborated by video.

For example, by the end of 2018, more than 70,000 cameras had been installed across Singapore. “It has thus become increasingly vital that the Singapore Police Force have the necessary resources trained properly in forensic video analysis to maximize the use of video footage in solving crimes,” states LIM Tuan Liang, head of the SPF’s Technology Crime Forensic Branch. By the end of 2017, video footage from SPF’s cameras helped to solve more than 2,300 cases.

What elevates the growing use of a video to a problem of epic proportions is the variety of video systems and formats that can enter into every investigation, including drones; high-definition; cloud-based storage; gaming systems; body-worn cameras; dash cams; and, especially, cellphones.

Why especially cellphones? This technology has led to a surge in the amount of crowdsourced video evidence and a considerable number of personnel are required to capitalize on it quickly and accurately.

Take into account, for example, two large-scale investigations conducted by the Federal Bureau of Investigation. At the time of the investigation, the Boston Marathon bombing in 2013 was the largest amount of security video and crowdsourced images ever collected by the FBI in a single investigation. The Bureau reports collecting more than 1,000 pieces of CCTV footage and receiving approximately 80,000 still images submitted by the public through its public-facing website. Four years later, the investigation into the Las Vegas Harvest Festival shooting yielded more than 21,500 hours of video and more than 250,000 images. This is an extraordinary amount of data for the FBI to parse, let alone most state and local law enforcement agencies.

THE NEED FOR VIDEO ANALYSIS EXPERTISE

The Miami-Dade, Florida, Police Department created its Forensic Video Unit in 2009 in response to the growing video trend. “The number of cases we’ve encountered that include video evidence is overwhelming,” according to Lieutenant Maggie Varela. “As with all forensic applications, we’ve discovered the importance of having properly trained and certified personnel for the collection, documentation, and processing of forensic video evidence.”

Handling, processing, and analyzing video evidence do require specific expertise—specifically, the expertise required to safely and accurately recover, playback, process, and interpret video evidence.

Proper training is required to accurately recover or enhance low-resolution video and images, as well as other visual complexities.



Windows Media Player is one of the most familiar digital video players; however, different video file formats require different players.



This is the same individual's face at different aspect ratios.



Video Evidence Recovery

In the past, video evidence recovery was uncomplicated. A law enforcement officer typically asked the owner of a security system to eject the VHS tape, placed the tape into an evidence bag, and entered that bag into the evidence room. Video savvy officers might even remove the “write-protect” tab on the VHS casing.

In the recovery of video evidence from digital video recorders (DVRs), the analysts are faced with learning the ins and outs of virtually every system with which they come in contact, none of which have common interfaces and operating systems. The analyst is expected to assess the system to determine which method ensures the highest quality video output to give the most accurate depiction of events.

Crucial information vital to the investigation and establishing the authenticity of the video can be gleaned from the DVR, if the analyst knows where to look (and what to look for). Information including software versions, motion detection, frame

rates, resolutions of imagery, and time and date of recording are central to establishing the video data information is what it purports to be, thus allowing its introduction in court.

Video Evidence Playback

The issues associated with the bygone days of the VHS carry over into video evidence playback. Due to the large number of DVR manufacturers, there are a similar large number of digital video file formats, with each file requiring an associated proprietary player or codec (coder/decoder) to properly play back. While an experienced analyst can often find the associated player, or a work-around, the inexperienced individual might give up trying.

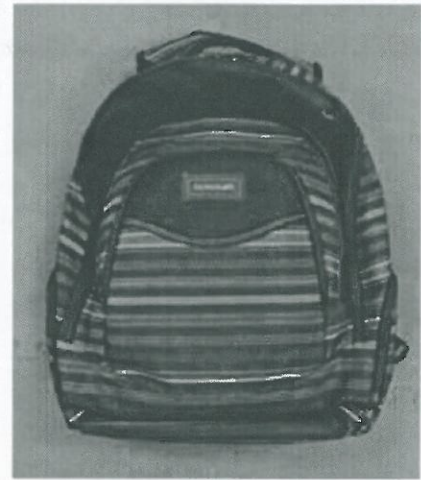
The issues don't end there. DVR manufacturers seem to think like engineers, not like artists, analysts, police officers, or courts. While the latter groups want an accurate image or video, the former usually thinks in terms of “How much data can I cram on the hard drive?” This thinking results in multiple issues that these video systems can cause, including the following problems:

- Distortion of aspect ratio—the changing of shapes of items in the image.
- Distortion of color and brightness.
- Frame rate distortions—The human eye requires approximately 12 frames (snapshots) per second to perceive fluid motion. What happens when the video offers only 1 or 2 frames per second? There is missing information. An experienced analyst is capable of explaining this phenomenon, including why what you (the officer, court, or jury) want to see might not be present or why the present frame rate is misleading.
- Motion detection can lead to large gaps in coverage and the possibility of missing video information.
- Color differences with infrared cameras—Fabrics reflect IR light differently than visible light, changing the way they appear when captured under IR (low-light) conditions. An experienced analyst knows how to explain this occurrence and can duplicate the effect when the tonality of an item is in question.

Video Evidence Processing

When it comes to video evidence processing, a major job of the analyst is to know what NOT to do. The untrained examiner can do major damage to video evidence through the introduction of further lossy compression (the discarding of visual

The same backpack is presented in both images; however, the black and white image is an infrared image.



information) if processed incorrectly. The job of the trained analyst is to clarify the video, preserving detail in the visual information, because once the video is compressed, that detail cannot be restored.

Also, DVRs are known to mysteriously adjust the timing of the audio and video, so the data are no longer synchronized. An experienced analyst recognizes clues to re-synchronize the audio and video. This information can be indispensable, particularly in investigations where the timing of events needs to be interpreted, such as during the investigations of officer-involved shootings.

Video Evidence Interpretation

An experienced and trained analyst should be capable of giving opinions regarding video evidence in court cases or when helping an officer understand the evidence. These opinions are sometimes regarding the technical details of the evidence, but they may be interpretations of the imagery as well. Common questions include, "Is the object in the suspect's hand a weapon, a cellphone, or something else?" or "What is the make, model, year, and license plate number of this vehicle?"

Using scientific methodology, a trained video analyst can compare people or items in two different images to determine if they are a match.



Forensic video analysts are often asked to complete advanced analytical tasks, including the following:

- *Photogrammetry:* Measurements of objects depicted in imagery, thus including or eliminating the subject of an investigation, the detail of a firearm, or the speed of a vehicle.
- *Comparison:* Like a fingerprint analyst, a video analyst uses a scientific methodology to compare questioned items or people to known items or people.
- *Authenticity:* When a question arises as to whether a video has been manipulated or whether it is digitally created (as is often the assertion in innocent imagery investigations), the experienced analyst examines the imagery and renders an opinion as to its authenticity for the purpose of playback in court.

THE CHALLENGES OF FINDING CERTIFIED EXPERTS

In many cases, the forensic video analyst can counter claims made by untrained individuals. While a multitude of "experts" advertise their experience in video editing, this is not the same as using scientific basis to present and interpret video evidence. It is common for attorneys to retain video analysts who lack specific forensic training, and it is also common for judges to allow them to testify. Public defenders frequently use analysts with little or no training in forensic video analysis. Some of these individuals have testified in cases even after being excluded by a judge in a previous case or being caught lying about their experience or during their testimony. The danger of this is considerable to both the prosecution and the defense.

George Reis is a certified video analyst and recognized as an expert witness in video analysis, photographic analysis, and photography. He has

TRAINING AND CERTIFICATION

To promote and support the education of forensic video technicians and analysts, two organizations have implemented training regimens, as well as certification programs, to identify individuals who demonstrate proficiency in tasks commonly associated with multimedia evidence. These organizations are the Law Enforcement and Emergency Services Video Association (LEVA) and the International Association for Identification (IAI).

LEVA is an organization dedicated to the training of forensic video technicians and analysts on a global scale. LEVA has been providing forensic video training since 2000 and introduced its certifications in 2006. Technicians achieve certifications through the completion of rigorous courses, and analysts (those certified to give opinions in court) attend additional courses and are required to pass an oral board examination.

LEVA has also begun a long-term partnership with Nottingham Trent University and Nottinghamshire Police to deliver established training and certifications in Europe.

IAI is an organization dedicated to training for forensic practitioners in general and has been in existence since 1915. IAI certification in forensic video analysis is achieved through a demonstration of a set number of training hours, recommendations, and written and practical tests. IAI certification for video analysis was established in 2011.

For more information about LEVA, training, or certification, go to www.leva.org or email LEVA Executive Director Mr. Jan Garvin at training@leva.org.

For more information about the IAI and its certification, go to www.theiai.org or email Kim Meline, chair of the Forensic Video Certification Board at kameline@fbi.gov.

had firsthand encounters with false experts in court:

These untrained analysts testify with the confidence of someone with more training and can mislead the jury in the case—calling into question the science of forensic video analysis. This often leads to a distraction of the case as more time needs to be spent on issues related to methodology, best practices, training, and competence, rather than on assisting the trier of fact to understand the value of the video evidence itself.

Grant Fredericks, also a certified video analyst, is a pioneer in forensic video analysis and has testified as an expert witness over 200 times in courts at all levels. He's discovered it's not uncommon for trained video forensic experts to sit across the aisle from an opposing "expert" who has analyzed evidence and offered an opinion, but has never taken any video-related courses. He pointed out,

They are usually experts in other areas who make the assumption that video is just a series of images that speak for themselves. They have no understanding of compression and the effects of prediction and artifacts in the video.

Fredericks knows it's a common argument in court by an attorney to present to the jury that the expert's vision is no better than theirs and the jurors should believe their own eyes. When that happens, the jurors often have 12 different opinions of what they're seeing.

Stacey Bailey of the Orange County, California, District Attorney's Office added,

I expect to be asked about my training when testifying... if I had to say under oath that I had little or no training, how could I expect a jury to take anything I had to say seriously? If the tables were turned and I was the juror hearing that the witness had no training, I might think, "Why do I need a forensic video analyst to interpret this video for me? I have eyes!"

Challenges vary around the world for accessing training (and funding for training) for video analysts.

"It's fair to say that comprehensive forensic video analysis training has been somewhat elusive to the UK," says Mark Davies, manager of the

Digital Image Evidence Unit for the Nottinghamshire Police. Davies said the ability to produce easily digestible digital media evidence for the criminal justice system plays an essential part in investigations. "As the complexity, quality, and quantity of source material increases the timeframes in which labs are expected to deliver it reduces," he noted.

The Virginia Beach Police Department faced five years struggling to find program funding for, as Julissa Armstrong of that Virginia agency put it "proper video training." The forensic specialists said they convinced their upper management that it was a necessity after logging how many cases they worked and how many of those cases had key video evidence. "It's becoming very beneficial now as our unit goes for ISO accreditation."

CONCLUSION

It is imperative the collected video is analyzed properly, and any conclusions drawn from the video are sound. Doing so saves time during an investigation and can save the department significant amounts of money in the event of lawsuits, as well as saving the agency's reputation in a court of law and the court of public opinion.

Evidence that substantially aids in the search for the truth will continue to be challenged by the legal profession. It is for this reason that those tasked with forensic video analysis must undergo a robust training process and must achieve a recognized level of competence. "That alone is not enough," warns Prosecutor Hak. "Attorneys who introduce this evidence in court must also have a strong understanding of forensic video analysis law in order to properly defend and present this evidence." ☐

IACP RESOURCES

- "Tech Talk: Video Evidence in the Courtroom" (article)
- "Video Evidence is Everywhere: Training and Respect Are Needed" (article)
- "Starting a Forensic Video Unit: What Chiefs Need to Know" (article)

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