CASE STUDY

VISUAL LAW

FARO® Focus3D Laser Scanner Used to Clarify Body-Camera Film

Mark Johnson, J.D. | Principal & CCO | Visual Law Group |

Challenge:

Exterior shooting scenes, such as one on the San Jose University campus in 2014, are difficult and time consuming to properly document. Even if captured with a body-worn camera, the lens distortion and limited point of view may not provide a clear picture of events. It is critical that other methods be used to ensure all details of the scene are accurately recorded.

Solution:

Visual Law Group, a company that specializes in providing forensic scene visualization and documentation, chose to document this shooting scene by capturing it with both a FARO Focus3D Laser Scanner and a drone. This technique allowed them to quickly record a dimensionally-accurate, 3D model of the scene that was used to clarify events filmed with the officer's body-worn camera.

Results:

By combining their FARO Laser Scanner and a drone, Visual Law thoroughly documented this three-block crime scene in a minimum amount of time. The data captured was used to digitally preserve both the smallest details of the scene and a macro, over-head view that included the roofs of vehicles and buildings. This data was used to clarified body-camera film that was taken at the scene and determine measurements critical to the case. The shooting was determined to be justifiable.

The entire scene was scanned using a FARO Laser Scanner to create a dimensionally accurate, 3D point cloud. The scanned data was used to create a "virtual camera" that could be matched to the point cloud.

Evidence Captured with a FARO Focus3D Laser Scanner and a Drone Helps to Clarify Body-Camera Film of Officer-Involved Shooting

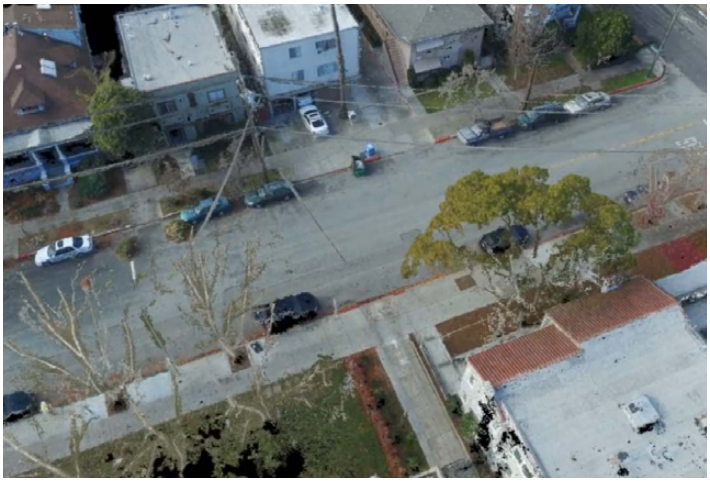
On February 21, 2014, a student of San Jose State University called 911 to report a man with a large knife stabbing the air and acting erratically. Two University police officers confronted the man, Antonio Guzman Lopez, who was carrying a foot-long, drywall saw and appeared to be mentally unstable or intoxicated. When Sergeant Mike Santos and Officer Frits Van der Hoek arrived at the scene, they ordered the man to drop the saw. When he refused and kept advancing, they used a TASER® stun gun to try to subdue him. This did not deter the man and he charged towards one of the officers, so the second officer shot him twice in the back, killing him. Sergeant Santos, the officer Lopez charged towards, wore a shoulder-mounted body camera that recorded the events from his point of view.

Media coverage of the event focused on the fact that Lopez was shot in the back. Lopez's wife filed a civil lawsuit claiming wrongful death, saying the body-camera video clearly showed Lopez was trying to run away from the officer when he was shot. To ensure a thorough investigation, additional evidence was needed to determine the position of both officers and how far away the suspect was from the officers before the shots were fired.

FARO®

FARO Focus^{3D} Laser Scanner Used to Clarify Body-Camera Film

Visual Law, a company that focuses on forensic scene visualization and documentation, was employed to document the crime scene. According to Mark Johnson, Visual Law's creative director and forensic graphic supervisor, one of their goals was to verify the position of both officers and the suspect, when only one officer was shown in the body camera's video. "We knew where and when shots were fired, and we also generally knew what motions and actions were taken by the officers and suspect," Johnson said. "However, lens distortion is common with these cameras and it can affect how we interpret the film. We had to determine what the body-worn camera footage was really showing."



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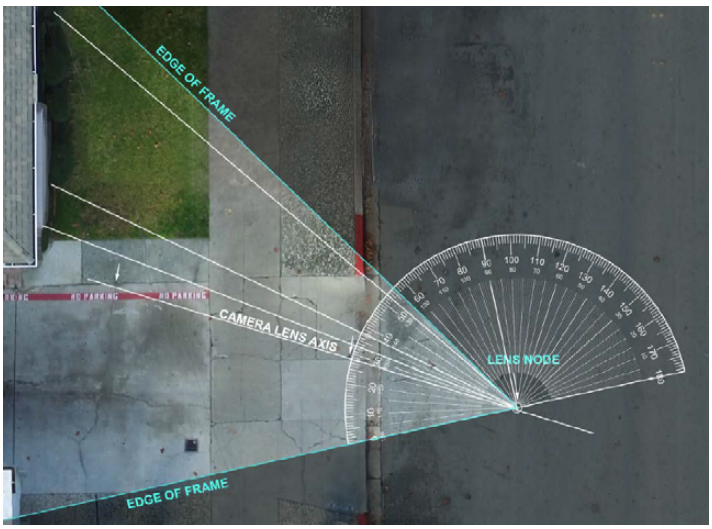
Body-worn camera footage can sometimes be difficult to interpret due to perceived distances and the limited objects captured within the field of view. For this reason, Visual Law did not want to rely only on the camera footage to document the scene. "We wanted to recreate the entire scene so that we could produce a virtual crane shot to show what happened from a higher vantage point," Johnson explained. "To produce a true, down-to-the-inch, recreation of character positions required a dimensionally-accurate, 3D replication of the scene," Johnson added.

For this case, Visual Law chose to use their FARO Focus^{3D} Laser Scanner and DJI Inspire® 1 drone to digitally preserve the entire shooting scene. They took approximately 12 scans to document the details on both sides of a city block and they used their drone to capture a larger view of the scene from above. "With one flight of the drone, we were able to document telephone poles, rooftops and other objects overhead," Johnson commented. "The drone gives you extraordinary amounts of real estate in a very quick fashion, while the laser scanner preserves all the small details with much higher accuracy than the drone can provide.

Sgt Santos wore a body camera that captured footage of the event, including this frame of the suspect running towards him. Determining the distance between the suspect and the officers was critical to the case.

By combining data from both the scanner and the drone, we had a, three-dimensional record of three city blocks that was much more complete that we could have obtained by using just one device."

Next, the Visual Law staff used the captured laser scanner data, along with the specifications of the body camera's optics and to build a "virtual" camera. They matched key landmarks in a specific frame of the video with the same landmarks visible in the point cloud, such as a unique crack in the concrete and a steel post on a building. This let them project back to find the position of the lens This virtual camera could then be used to "reverse engineer" the body camera positon within the shooting scene for each frame of footage. They used a similar process to accurately locate the camera's field of view and projected each edge of the frame back to verify the position of the lens, as worn by Sgt. Santos.

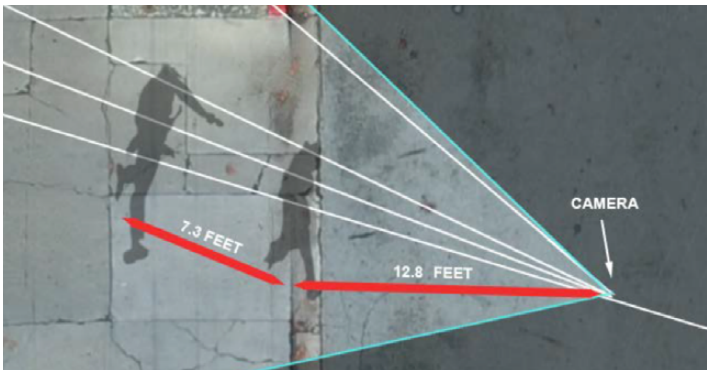


By matching landmarks in the point cloud and camera footage, Johnson built a "virtual camera" that could be applied to obtain measurements from the 3D point cloud for any frame of the video footage.

FARO Focus^{3D} Laser Scanner Used to Clarify Body-Camera Film

Mark Johnson, founder and Chief of Creativity of Visual Law Group, shows off his FARO Focus 3D X 330 which he used to capture critical data for the Lopez case.

It was a sunny morning the day of the event and the body camera footage clearly showed shadows cast by the suspect and Sgt. Santos. The event happened at 11:00 am and the shadows were cast nearly parallel to curb of the street that is visible in the camera footage. Again, using cracks in the concrete and other details, Johnson was able to accurately reproduce the size and position of the shadows in the "virtual camera" view of the scene. It was then possible to accurately measure the distance between the suspect and each officer.

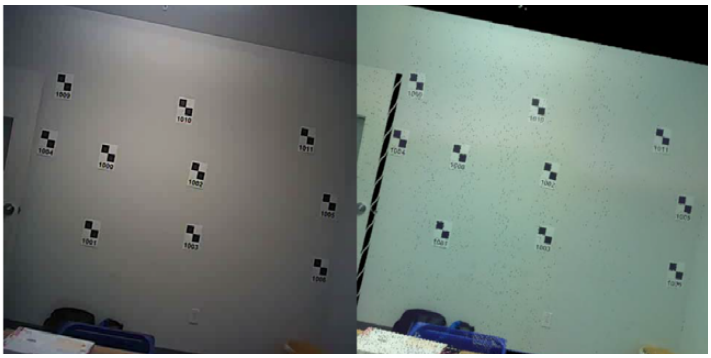


Using the virtual camera, shadows from the camera footage were accurately placed into the point cloud so the distance between the officers and suspect could be measured.

In addition, Johnson also performed a test at the San Jose Police Department where he filmed a room with the actual camera worn by Sgt Santos and scanned it with his FARO Laser Scanner. Their goal was to create a virtual model of the camera's field of view that could be positioned in the 3D point cloud to recreate and take measurements from any video frame.

It was determined that the officers acted in self-defense and the shooting was justified.

Calibration Frame **Virtual Camera Calibrated to Point Cloud**



Johnson calibrated his "virtual camera" by taking video footage in a building with the camera used by Santos and matching it with scanned data of the same room.

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After a successful career as a dynamic plaintiff's trial lawyer, Mark Johnson is now recognized as the foremost expert in 3D forensic visualization and animation as well as incident reconstruction technologies. Featured on CBS 60 Minutes, ABC Good Morning America and in numerous news and industry publications, Mark's advocating for the use of advanced technologies in the courtroom has received high praise. Co-founding Visual Law Group and currently serving as its chief of creativity, Mark Johnson continues to push the limits of innovation in litigation.

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