C16 3D Reconstruction of Non-Lethal Shooting Incidents Using Computed Tomography (CT) Scan Data

Parris Ward, JD, Biodynamics Engineering, Inc, 17383 W Sunset Boulevard, Ste 290, Pacific Palisades, CA 90272*

After attending this presentation, attendees will understand how X-rays and Computed Tomography (CT) scans can be used to model non-lethal shooting events on the computer.

This presentation will impact the forensic science community by demonstrating techniques for enhancing the accuracy of computer models used to analyze shooting events though the use of radiological data such as CT scans.

In creating a 3D model or animation of a shooting event on the computer, CT scans or other radiological data can be helpful in accurately depicting bullet paths through the body, especially in non-lethal shootings where no autopsy is performed.

Shooting events are often analyzed on the computer using 3D modeling and animation software because of its ability to demonstrate the interaction between objects and projectiles in terms of time and space. A computer model of the scene is created and mannequins are placed in the scene to represent the individuals involved. Bullet paths can be depicted as lines through space, from their point of origin to the objects they strike. When a person is hit, the path of the bullet through the body can be depicted with lines placed through a mannequin much the same way a pathologist places rods through a body. The lines representing the bullet paths are typically placed according to descriptions and measurements noted in the coroner's report, as well as autopsy photos of the wounds. Of course, if the victim isn't killed in the shooting, there will be no coroner's report or autopsy photos. Thus, in non-lethal shootings, one has to rely upon other information in defining the bullet's path through the body. In this case study, CT scan data was used to determine a bullet path.

In this shooting incident, a police officer shot a suspect inside the suspect's home. According to the officer, he was hit over the head by an unknown assailant and fell to the floor when he entered the home. After a brief lapse of consciousness, he remembered someone dragging him by his head toward the back of the house while someone else pulled at his belt. He said he was able to get to his hands and knees and fired one round at the person in front of him. The suspect who was shot had a different recollection of events. He said he had been asleep in another room and walked into the dining room rubbing his eyes. He saw the police officer, heard a shot, and felt an enormous amount of pain. The suspect was shot in the abdomen and subsequently recovered from his injury.

There were no photographs taken of the wound, and medical records merely described the wound as occurring in the "right upper quadrant of the abdomen about midway from the umbilicus to the costal margin." Fortunately, a CT scan was taken before surgery. Both the entry wound and the bullet itself were visible in the scans.

The angle of the bullet path through the body was reconstructed from the CT scans. Using such data has certain advantages over autopsy findings. Whenever a bullet path through a body is replicated on the computer, there are limitations to the precision of such placements. A computer model of a person, or mannequin, is an idealization of the human structure. Human body types and proportions vary from person to person, thus a computer model cannot exactly match a specific individual's anthropometry. It also cannot articulate exactly like a human. The data found in the coroner's report has limitations too. The pathologist's measurements are typically taken while the body is on a table using a linear tape or rule rather than with a 3D measuring device. Yet, despite these limitations, a computer model can be produced that generally shows the direction and location of bullet paths through the body. When CT scan data shows the entry wound, the path, and the location of the projectile in the body, there is more information available to work from. There is better accuracy in terms of defining the location of both the wound and the projectile and anthropormetric data unique to the individual is available, such as the dimensions of the chest and abdomen, which allows for increased accuracy in defining the angle of the bullet path. In this case, the angle of the bullet path helped to determine whether the suspect was standing or bent over at the time he was shot.

Shootings, CT Scans, 3D Animation

 ** Presenting Author*