C6 Determining Vehicle Speed in a Fatal Pedestrian Impact: A Case of Tampered Evidence

Christopher J. Furbish, BS, Biodynamics Engineering, Inc., 3720 East LaSalle Street, Phoenix, AZ 85040; Parris Ward, JD, Biodynamics Engineering, Inc, 17383 West Sunset Boulevard, Suite A300, Pacific Palisades, CA 90272; and Hrire Der Avanessian, PhD, Biodynamics Engineering, Inc., 2831 Montrose Avenue #5, La Crescenta, CA 91214*

After attending this presentation, attendees will learn a method for determining vehicle speed and orientation for a vehicle-to-pedestrian impact.

This presentation will impact the forensic community by providing a description of a reconstruction method for determining vehicle speed and configuration in some pedestrian impacts.

This presentation identifies and demonstrates a method for determining vehicle speed and orientation in a fatal pedestrian impact. A mathematical dynamic modeling (MADYMO) simulation was utilized to reconstruct the vehicle-to-pedestrian interaction and determine the approximate speed of the vehicle at the moment of impact. The damage observed on the vehicle, as well as the injuries sustained by the pedestrian, allowed for a verified method in determining contact locations of the pedestrian on the vehicle and, thus, vehicle speed for this accident.

This accident occurred when the front driver's side of an SUV made contact with the right side of the pedestrian's head and body. This was a hit and run accident that occurred as a result of driver intoxication as well as driver distraction. According to statements recorded by the investigating police officers, the struck pedestrian was found in a semi- conscious state in a supine position on the side of the roadway. The pedestrian sustained multiple bruises, contusions, and lacerations to the right side of his head, thorax, and pelvic regions. Additionally, treatment at an emergency medical center revealed multiple pelvic and lower spine fractures. As a result of the severity of his internal injuries, the pedestrian later succumbed to excessive internal bleeding and was pronounced dead on the following morning. The pedestrian's point of rest was documented, but because it was not initially determined to be a hit and run accident, firefighters at the scene hosed down the blood on the roadway. The driver of the SUV was not apprehended until a week following the accident. During this period of time, the driver had reportedly instructed a third party to put additional dents on the hood of the SUV, and some repairs had already been conducted by a body shop at the time it was located and impounded. However, an inspection of the vehicle allowed for a distinction to be made between preexisting damage, the intentionally produced damage, and the damage that was related to the subject accident.

The MADYMO simulation was conducted with various critical factors incorporated to provide the most accurate results. The SUV and the pedestrian were modeled independently within the program. Multiple measurements of the front and top of the SUV were recorded and utilized within the MADYMO model of the SUV. A TNO human pedestrian model with a similar height and weight as the subject pedestrian was utilized for the simulation. Because the front and top of the SUV were the areas making contact with the pedestrian, particular care was taken to model the contour, location, and height of these structures.

Once the vehicle and the pedestrian were independently modeled within the simulation program, an iterative approach was taken to determine the position of the pedestrian relative to the roadway. The configuration of the pedestrian relative to the vehicle and the speed of the vehicle were adjusted until the contact locations on the model SUV by the model pedestrian matched the locations of the actual contacts on the subject SUV. A key component in determining the vehicle speed was a dent observed on the roof panel of the subject SUV. Simulations using lower vehicle speeds did not cause the pedestrian to ramp up and contact the roof structure. Thus, the vehicle speed was increased until contact was made in this corresponding location. Because the blunt trauma locations of the actual pedestrian and vehicle damage related to the subject accident were well-documented, it was possible to accurately reconstruct the speed of the vehicle at the point of impact.

In conclusion, when the vehicle-to-pedestrian contact locations are thoroughly documented, this method presented can be utilized to reconstruct the accident, determine the configuration, and the speed of the striking vehicle.

Pedestrian, Vehicle Speed, MADYMO

 ** Presenting Author*