Measuring Crash Scenes long after the event with iWitness™

In August of 2008, the Nevada Highway Patrol (NHP) Major Accident Investigation Team (M.A.I.T.) was dispatched to a two-vehicle collision at the intersection of Sahara and Highway 215 in Las Vegas. Both drivers involved in the crash sustained injuries and were transported to the hospital. Reportedly, M.A.I.T did not measure the collision area of impact (AOI) or the final rest positions of the vehicles involved. This was because, at the time of the accident, the injuries did not appear to be life threatening.

Unfortunately, one of the drivers involved in the crash subsequently died, thus necessitating a full "scene mapping" of the accident. The only potential evidence that could support such a mapping were a number of digital camera images recorded shortly after the crash event by one of the NHP troopers.

One of the most efficient ways to provide a scene mapping to support accident reconstruction is through the technology of close-range photogrammetry, which involves the dimensional reconstruction of 3D objects and scenes via 2D measurement of images.

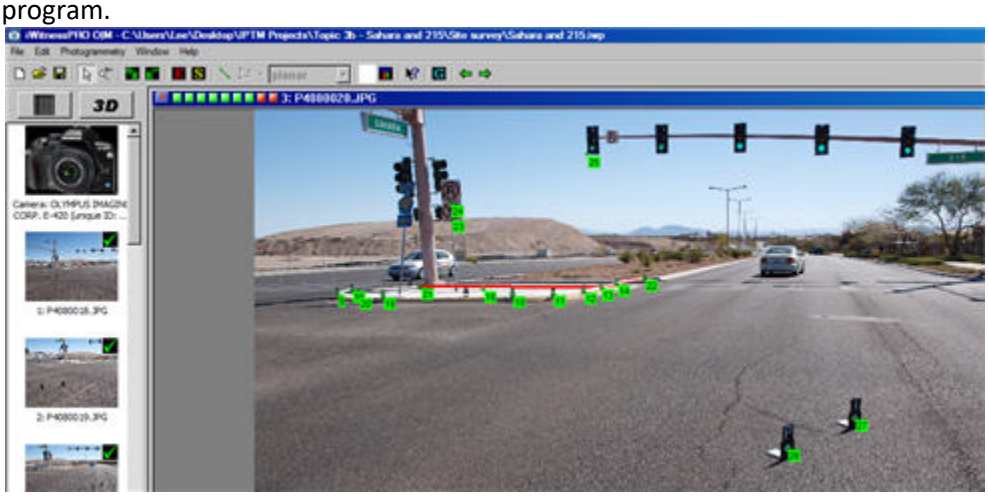
Fortuitously, four of the images recorded by the M.A.I.T trooper at the time the crash scene were well suited to photogrammetric measurement, even though this occurred months after the accident. This was ascertained during a training session for the *iWitness* photogrammetric system, which was being conducted by DeChant Consulting Services – DCS Inc. It was apparent that one image could be rectified to provide a full 2D representation of the AOI, while the other three images from the Trooper's Sony camera could be used to measure the final 3D vehicle rest positions with respect to a traffic island at the street intersection of Sahara and Highway 215.

In order to orient the images with respect to features at the intersection, a number of natural feature points were identified in the scene, these appearing in some or all of the images. A site visit was then undertaken, eight months after the accident, by NHP and DCS personnel for the purpose of determining the 3D coordinates of these feature points, again using the *iWitness* photogrammetry system.

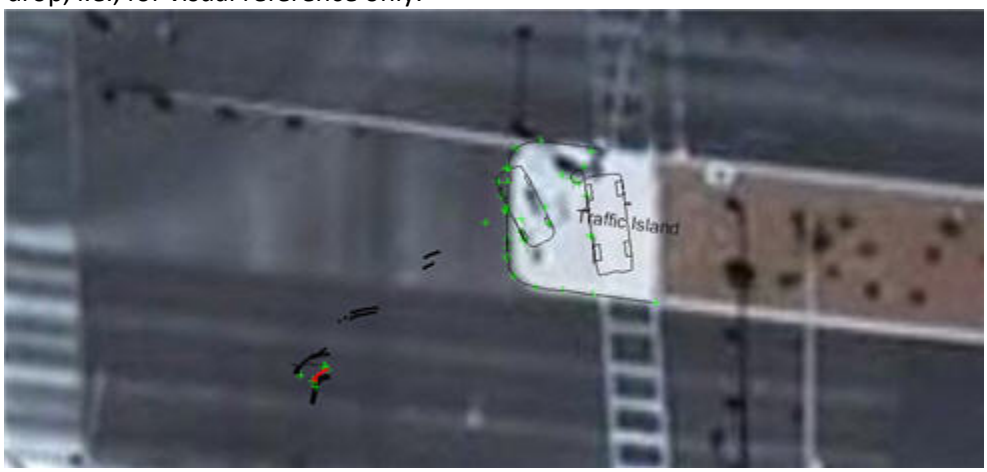
In the span of only 10 minutes, a series of images were recorded with an Olympus E-420 digital camera (recently metrically calibrated using *iWitness*), without any disruption to traffic at the intersection. The 3D coordinates of the features, or control points, were then determined, and this information allowed the rectification process and 3D measurement from the original three images to be performed in *iWitness*.

Ten images were employed from the post-event site visit to compute the Control Point positions that were then used in the *XYRectify* software to provide a plane rectification of one of the original images. This allowed the 2D coordinates of AOI tire mark and gouge locations to be determined with respect to

the street intersection and traffic island for both vehicles. The rectified image was scaled and imported into a CAD program.



The trooper's other three digital images were measured in iWitness to establish their position and orientation, again relative to the traffic island. The 3D *iWitness* measurements were also exported to the same CAD system. Also, an aerial image was scaled and imported into the CAD diagram to serve as a visual back-drop, i.e., for visual reference only.



It took approximately one hour to "*iWitness* measure" the post-event images and also to rectify the single image in XYRectify. A further hour was required to complete the 3-image, 3D survey of the final vehicle rest positions using the trooper's Sony digital images, with the subsequent CAD diagramming also consuming about 1 hour.

Summary

In spite of the fact that the original images were recorded without any consideration being given to the requirements for 3D scene mapping, the photographic data was nevertheless sufficient to produce an accurate and complete dimensional reconstruction of the accident scene some eight months after the event. Such a successful post-event scene mapping illustrates the flexibility, accuracy and ease of use of the low-cost *iWitness* and *XYRectify* software systems as image-based measurement tools for crash scene documentation.