D78 Crime Scene Registration Using Photography and Laser Scanning for the Purpose of Documentation and Scenario Testing

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The goal of this presentation is to provide guidelines for crime scene registration in all stages of a forensic investigation using state of the art techniques including panorama photography, video, laser scanning, aerial photographs, GPS and geodimeters, and data from cell phones and surveillance video; and to provide guidelines for presenting 3-D computer models of crime scenes and animations showing scenario's

This presentation will impact the forensic community and/or humanity by providing simple guidelines for more accurate and complete crime scene registration and how to take full advantage of new technologies such as photogrammetry, laser scanning, computer modeling, and animations that might be available within their organizations or that might be offered by commercial companies.

Since commercial companies have been offering services, such as 3-D animations of scenarios for crimes and accidents and 3-D laser scanning of crime scenes, a program was started at the Netherlands Forensic Institute (NFI) to do an extensive exploration of all the possibilities and limitations of these new technologies in criminal case investigations.

The first case in this program was the investigation of the firework disaster that happened in Enschede in 2000. In this case a 3-D model of the scene and an animation to demonstrate a scenario for the chain of happenings that led to the fatal explosion based on the outcome of all forensic investigations was created. Then, a number of new questions came up that could be answered by use of the 3-D model and photogrammetry. Since then, experience with 3-D modeling for the purpose of photogrammetry in video material (e.g. estimation of the body length of a robber or the speed of a car), reconstruction of bullet trajectories, virtual blood spatter stringing, and visualization of crime scenes and scenario's for industrial accidents and murder cases has been acquired.

In all cases, researchers have observed that animations and visualizations can be very suggestive in unexpected and surprising ways. In a 3-D visualization of a scene it is important to give information about the geometrical accuracy and the completeness of details and traces. In animations it is important to show the difference between facts and hypotheses.

Further, it was noted that crime scene recording happens in different stages. During the first response to a crime incident, no systematic registration is done and a lot of changes of the crime scene are unavoidable. Information has to be gathered from eyewitnesses, surveillance video, phone taps of emergency calls, photographs and video taken by by-passers or journalists, etc. This information can be used to get an overview of the scene during the crime and the changes during the first response. Then, the forensic investigation starts which an overview and close-up photographs are taken. In this stage the crime scene is changed when evidence material is gathered for further investigation.

Finally, in some cases it is necessary to go back to the crime scene to do a more accurate registration of the scene for the purpose of documentation, photogrammetry, reconstruction of trajectories of bullets, blood spatters, cars, people, etc., and validation of results. In the last two stages use of 3-D laser scanners was tested.

One of the main problems observed with the use of close-up photographs, overview photographs, and laser scans taken by different people in different stages of the investigation is to assess the relative position and orientation of the depicted objects, persons and traces.

This paper, discusses some techniques and guidelines for crime scene registration in different stages of the investigation using photography, video, laser scanning and markers. Some examples of crime scene documentation using interactive 3-D visualizations are given.

Crime Scene Registration, Computer Modeling, Virtual Crime Scene

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