

PRE-CONFERENCE – SUNDAY, MARCH 2, & MONDAY, MARCH 3

SCANNING PRACTICAL EXERCISES

To demonstrate the practical capabilities of 3D laser scanning and other advanced measurement techniques, FSM 2008 features two Scanning Practical Exercises – a simulated crime scene (Exercise I) and a simulated pre-event security planning scenario (Exercise II). IAFSM Technical Advisors (technology developers) together with service-provider partners will document a scene before the conference, then post-process the data for presentation on Day 3 of FSM 2008. Registered attendees of FSM 2008 and the co-located SPAR 2008 are welcome to observe Practical Exercise I, space permitting. This exercise will be held at a fixed location adjacent to conference hotel. (Spectator viewing of Exercise II will not be practicable as this exercise entails frequent movement by investigators among multiple locations.)

Practical Exercise I: TEENAGER IS DISCOVERED TO BE MISSING

Sunday, March 2

8:00 am-Noon *Leica Geosystems / Plowman Craven / NextEngine*

Noon-4:00 pm Z+F

Responding officers have found an abandoned vehicle at a hotel. When the plates are run, a call is made to the owners of the vehicle. It was discovered that their teenage daughter was last to use this vehicle and she has not come home or been heard from for the past 18 hours and was due home the evening before. She had gone to the hotel club to dance with some friends. This required investigators to do a more detailed search of the surrounding area. During this search, investigators uncovered a nearby area where a scuffle appeared to have occurred, and identified evidence of shots having been fired. Small blood samples have been recovered, 3 cartridge casings, bullet holes identified (trajectory rods placed), and 2 sets of footprints have been located. The area has been secured and is awaiting the "crime scene documentation team" to respond. The CS Team will report to the "on-scene detective" and his experts, who will walk the team leader through the scene and identify all critical elements needed for this ongoing investigation. Upon arrival, the CS team has only 4 hours to capture whatever they can. The presentation will be based on satisfying the questions in which the lead investigator will supply at the scene. This will be an outdoor scene and location will most likely to be at the hotel. The site will be secured.

Practical Exercise II: PRE-EVENT PLANNING SCENARIO

Sunday, March 2

8:00 am-Noon *IntelliSum*

Noon-4:00 pm *FARO*

Monday, March 3

8:00 am-Noon *Riegl USA*

Physical security is more important than ever in today's society. A major advancement in security planning is the use of 3D models in pre-event briefings, real-time responses and post-event debriefings.

**Exterior model of a designated structure:** A hotel has just been designated to be used as a secure facility during the visit of a protectee. This particular hotel is where the protectee and family will be staying during their visit to Houston. A highly accurate 3D model must be produced in order to assist with the security planning. This model should include the entire exterior building structure and a perimeter distance that will be given onsite. Special attention needs to be focused on security vulnerabilities to include building entrances/exits, motorcade paths, etc. This model is to be used as a site familiarization tool and for security features placement and personnel positioning. The Security Team will report to the "on-site security experts", who will further instruct the team leader through the scene and help identify critical elements needed. Upon arrival, the Security Team has only 4 hours to capture whatever they can. The presentation will be based on satisfying the questions supplied by the security experts at the site. This will be an outdoor scene and the location will most likely be the conference hotel. The site will be secured.

DAY ONE – TUESDAY, MARCH 4

Forensic Training Class: Introduction to Crime Scene Investigations

*Instructors: Forensic Scientist Sgt. Keith Johnson & CSI Sgt. Michael Haag, Albuquerque Police Department*

IAFSM presents this opportunity to its Service Provider Members and Technical Advisors for continued training in the area of basic protocol and procedures for processing crime scenes. This class is being provided by IAFSM exclusively for its Service Provider Members and Technical Advisors as part of an ongoing series of forensic classes.

PRESENTATION ABSTRACTS Page 2 of 9

IAFSM would like to thank the Albuquerque Police Department for their continued support by providing expert instructors and their willingness to put these classes on. Please arrive early so the class can begin promptly and make full use of the allotted time.

Opening Ceremonies

*Presenter: Larry Sonntag, President, IAFSM, & Captain (retired), Albuquerque Police Department*

Welcome

*Presenter: Houston Police Chief Harold L. Hurtt*

Keynote

*Presenter: Tom Greaves, CEO, Spar Point Research LLC*

Welcome

*Presenter: Albuquerque Police Chief Raymond D. Schultz*

Chief Schultz will present an overview of some of his department's investigations and challenges utilizing its 3D laser scanners.

Session T1 FBI Biometric Center of Excellence

*Presenter: Johnna Hoban, Criminal Justice Information Services Division, FBI Biometric Center of Excellence*

The FBI Science and Technology Branch is pleased to announce the inception of its FBI Biometric Center of Excellence (COE). The FBI Biometric COE embodies the gold standard for superior United States Government state-of-the-art biometric technology services in the global quest to fight crime and terrorism.

Session T2 Calibrated Video Surveillance

*Presenter: Dr. Peter Tu, Research Scientist, General Electric Global Research*

This presentation outlines a number of in-house video analytics capabilities that can be targeted for potential productionization:

**One world view tracking:** By walking in front of a set of cameras, the location and orientation of each camera is automatically inferred. We then track all people in each view and transmit these locations to a central server. Using the calibration information, the tracked locations are shown in a One World View. This enables an operator to see the entire site at a glance. In addition if tracking is performed at the edge of the network, then significant reduction in bandwidth can be achieved. An ideal beta site for this application would be a factory or corporate campus.

Individuals are detected directly detected in multiple video feeds; these detections are combined into a bird's eye view.

**PTZ Face Capture and Enhancement:** Using autocalibration methods, a PTZ camera can be automatically slaved to focus on detected objects and individuals. In addition multiple PTZ cameras can perform target handoff. If a face is targeted then our face modeling methods can fit a 3D model to the face and super-resolution methods can be applied to create an enhanced facial image. The 3D modeling also enables a continuous estimate of where people are looking.

PTZ slaving

Model Fitting

Super Resolution Face Enhancement

**Person counting in crowds:** Using our crowd segmentation algorithms, the number of people in a crowd can be estimated. This facilitates person counting across a virtual gate and the ability to track people through a crowd.

**Simple event detection:** Based on track data, we can generate simple alert events. These include:

- object/person entering restricted area
- any object moving within a designated area
- object/person leaving a designated area
- any object moving faster/slower than a specified velocity
- count of N individuals in an area or across a line exceeds a threshold within a certain period of time
- two objects come close together, within a designated area

**Person Reacquisition:** For each person that is observed by a camera, a signature is generated based on general appearance. We can then develop a number of applications such as:

- Find out where this person has been for the last few hours.
- Keep track of this person even if he leaves the field of view.
- Develop general descriptors so if this person reenters the site, an alert is raised.
- These signatures can be used as meta-data for forensic searches in databases (i.e. show me all the people wearing a workers uniform)
- Create a user-assisted paradigm such that an operator can help track a person using lists of likely candidates.

**Complex event detection:** Learn normal trajectories of people or vehicles, detect abnormal trajectories. Can be 2D (specific to a fixed camera) or 3D with calibration.

**Left luggage detection:** Be able to detect left luggage in complex environments.

PRESENTATION ABSTRACTS Page 3 of 9

Near view tracking of face and hands: Given a high-resolution video of a person, the face and hands can be tracked resulting in important cues for behavior recognition.

Fully articulated modeling of people: We have the ability to capture fully articulated models of people. This enables more advanced behavior recognition and pose invariant signature generation.

Super Resolution for stationary objects: Given a video sequence of stationary objects, multiple frames can be combined to give a high-resolution image of the object in question.

Session T3 Reverse Projection Photogrammetry: Reconstructing a Scene & Determining Suspects' Heights

*Presenter: Dr. Nicole Spaun, FBI FAVIAU (Forensic Audio & Video Image Analysis Unit)*

FAVIAU conducts photogrammetric examinations in criminal and intelligence cases in support of the FBI's mission. A common request is to determine the height of an individual depicted in a surveillance video image. A less frequent request is to reconstruct a crime scene and locate the positions of objects and persons within that scene using photographs taken at the time of the incident. In both cases, FAVIAU examiners typically use the reverse projection technique to determine the original camera station(s) and then reconstruct the scene using an overlay technique. This presentation will discuss the general approach to performing these exams and will provide examples from casework. Specific cautions regarding the use of this technique in height determination exams will also be noted.

Session T4 Visualized Crime Scene

*Presenters: Paul Lucas, Project Manager, 3D Crime Scene Imaging/Forensic Visualization, & Alexander de Bruijn, Police Rotterdam Rijnmond*

Session T5 Fabricating the Future: How Additive Fabrication Systems are Changing Forensics & Crime Scene Investigation

*Presenter: Fred Fischer, Product Marketing Manager, Stratasys, Inc.*

This presentation will explore how additive fabrication systems such as 3D printers, rapid prototyping systems, and direct digital manufacturing systems have changed the world of Crime Scene Investigation and modern Medical procedures.

Topics covered include:

- History of the additive fabrication industry
- Benefits of additive fabrication technology
- Real world CSI and Medical applications of additive fabrication technology
- Future of the additive fabrication industry/market

You'll also hear about other real world applications from companies such as: Medtronic, UCLA Medical Center, Royal Canadian Mounted Police, BMW, Boeing, and AlignTech.

DAY TWO - WEDNESDAY, MARCH 5

TRACK 1: SYMPOSIUM

Session WS1 3D Reconstruction of Incident Scenes Using 3D Scanning & Radiological Imaging

*Presenter: Ursula Buck, Bern Police Force, Switzerland*

Session WS2 Real-Time Laser Scanning Trial

*Presenter: Officer Nick Cooper, Collision Investigation Unit, South Wales Police, UK*

After fatal traffic collisions caused lengthy closures of two strategic roadways in South Wales in 2006, questions were asked at the government level as to why, and what steps could be taken to alleviate future disruption.

Session WS3 Turning Jurors into Witnesses

*Presenter: Craig Fries, President & CEO, Precision Simulations, Inc.*

Session WS4 3D Analysis of Video Footage

*Presenters: Gerda Edelman & Jurrien Bijhold, Netherlands Forensic Institute*

CCTV footage can be used to track, trace and identify perpetrators. However, with the growing number of security cameras, the amount of information increases rapidly. This makes it necessary to improve the process of capturing, converting, synchronizing, viewing and analyzing video files. Surveillance images could be used more effectively with the help of 3-dimensional models of the scenes that are visible in the surveillance images.

PRESENTATION ABSTRACTS Page 4 of 9

First, virtual camera views in 3D models can help to design a camera plan with an optimal coverage of the areas under surveillance. When these virtual camera views are matched with the real camera views, it becomes possible to estimate the position and speed of people and cars that are visible in the real video images.

With such information, it can be predicted when a person or car might show up in another camera. At the Netherlands Forensic Institute a project is being carried out that aims at the reconstruction of all movements of people and cars before, during and after a big incident from analysis of all available video footage.

In this presentation, a brief description of the project is given. Forensic aspects of the interpretation of video footage are demonstrated with video footage from a police investigation and a 3d-model of an urban area. The models are used as a tool for documenting observations in the video, combining these observations with other information sources, and for testing and documenting hypotheses on relations between events in different cameras.

Session WS5 Measurement & Visualization of IEDs

*Presenter: Duncan Lees, Head of 3D Services, Plowman Craven*

The use of modern metrology and visualisation techniques to present the construction, composition and explosive sequence of IEDs is increasingly prevalent in the world of counter terrorism. The visual representation of IEDs is used by both the terrorist, as a guide to bomb making, and those involved in the security and safety of our nations, as a guide to recognising and defusing devices. This talk will review progress to date and elucidate the stakeholders who can benefit from the work in the security sector, as well as provoking discussion about how this specialist work can progress to inform a wider audience without compromising national security.

Session WS6A Special Event & Venue Familiarization, Site Surveys – Lidar & Beyond (**Law Enforcement & Intelligence Agencies Only**)

*Presenter: William McPherson, Visual Information Specialist, FBI Laboratory, Special Projects Unit*

Purpose of presentation: To explain to law enforcement personnel how a typical pre-event site survey is collected and assembled for use. *Due to the topics and data to be discussed, this presentation will be for law enforcement and intelligence agencies only.*

Topics to be covered: Lidar – ground and aerial, GIS data, CAD and modeling software, spherical video, presentation tools, interagency and private sector relationships.

Scope: The presentation will provide an overview of what different kinds of information may be collected for special event support, using the 2007 MLB All Star Game as a case study. What went right, where the challenges were, the data collected, all the way to the final deliverables and on site event support. The attendee will be able to develop a template that they can then build on and/or edit to help with any special event Special Event Venue Familiarization Site Surveys that they may need.

Additionally, at the end of the presentation, attendees will have an opportunity (as time permits) to discuss any successes/challenges they have had or heard of during these special event site surveys. This sharing of ideas may provide other attendees with new “tricks and tools” that can be used for future work.

Session WS6B Expedient Replication: Coordinated Scanning & 3D Printing

*Presenter: Rick Moore, Rapid Technologies Team Leader, R & D Engineering Command, US Army Edgewood Chemical Biological Center*

This presentation will explore the fundamentals and theories of close range, sub-millimeter laser scanning and subsequent 3DPrinting/Rapid Prototyping (RP). Techniques and lessons learned will be reviewed relevant to the optimized preparation of raw scan data for additive manufacturing, commonly known as 3D Printing. Discussions will include: guidelines for selection of the most appropriate rapid manufacturing process based upon the specific application; a comparison of some of industry's leading RP systems; and the pros and cons of investing in these technologies versus outsourcing. Examples from the US Army's Edgewood Chemical Biological Center at Aberdeen Proving Ground, MD will show how many of these technologies have been utilized to transform virtual 3D laser scan data into high fidelity physical replicas for a variety of applications.

Session WS6C How Do We Make a Difference? Measuring the Contribution of 3D Data to Investigations and Operational Planning

*Co-Presenters: Anthony Martin & Kathryn Mannoch, Metropolitan Police Service, London*

Session MS6D Status of Aerial Lidar & Mobile Lidar

*Presenter: Jim van Rens, Vice President, Riegl USA, Inc.*

Session WS7A 3D Face Scanner for Forensics & Security

*Presenters: Dirk Callaerts, President & CEO, & Nick Tesi, Vice President, Operations, Eyetronics, Inc.*

Eyetronics will present and demonstrate the use of a face scanner for the “IAFSM 2008 Symposium” to show the value and productivity of using such a technology.

---

PRESENTATION ABSTRACTS Page 5 of 9

We have been developing 3D scanning technology since 1998 and have been both supplying systems to application markets such medical, military, educational, fashion plus entertainment.

3D scanning technology has come a long way in giving the user or application a fast solution to be used by technicians, professionals & lay people alike. We understand the needs for custom systems to exactly fit applications. As you can imagine our solutions are generic but can be molded to work in different environments to give you the results you need.

3D scanning will quickly capture an exact likeness of a person for the likeness comparisons later, to quickly identify someone via a 3D monitor or any application that avhand drawing and or 2D pictures have been used in the past.

In 3D technology we will demonstrate how fast and accurate a 3D model can be acquired and viewed without having a lot of background in 3D processing. We will also demonstrate the ability to change the format if providing another agency or company a copy for their viewing or building a 3D physical model.

In the demonstration, someone from the audience will be selected and scanned. The audience will see within a few minutes the result of that scan. The rest of the presentation will be a PowerPoint presentation of 3D Scanning Technology.

Session WS7B HDS Laser Scanning in Forensic Analysis – Real-World Examples

*Presenters: Steven M. Schorr, President, & Hugh Borbidge, DJS Associates, Inc.*

Session WS7C Use of Computer Animation in Trials Presentation

*Presenters: Sgt. Francisco Carrera, Illinois State Police*

Sgt. Carrera will display a multimedia presentation showing examples of the types of Demonstrative Evidence created by the Illinois State Police, Forensic Diagramming and Animation Section. The presentation includes sample 3D animations demonstrating the section's capabilities in addition to actual real case animations, successfully admitted into past trials.

Objectives of presentation:

- Participants will receive information on the tools, techniques and services available from the Illinois State Police, Crime Scene Services Command in the area of Demonstrative Evidence and Forensic Animation for prosecutorial use.
- Participants will be encouraged to discuss how they could incorporate this technology.

This presentation would have direct application to providing Demonstrative Evidence (visual aids) for experts testifying in criminal cases.

Session WS7D Serious Gaming Based on High-Precision 3D Measurements for Safety & Security

*Presenter: William van Spanje, President & CEO, DelftTech BV / Delft Forensics*

DelftTech continues to offer its support to IAFSM, the International Association of Forensic and Security Metrology. This Association looks at virtual pre-planning and training security people and first responders including management support in 3D for important infrastructure and events. The models are derived directly from data mainly acquired with high precision 3D laser scanners. With these models for forensic and security training, i.e. serious gaming, as well as simulations, engineering, reconstruction, etc. DelftTech are the founders of this technology and uses it to get highly realistic models to train for events and to pre-plan events. An example: in a large project at Amsterdam Schiphol Airport. 3D camera coverage and other technology are combined for tracking and tracing suspects before and after calamities/events.

Session WS8A Error Rate Determination

*Presenter: Dr. H. Dale Nute, College of Criminology & Criminal Justice, Florida State University, Panama City*

An overview of what is meant by error rate determinations, how they apply to forensic science examinations, and how they are different from related topics, such as calibration, will be presented using a set of crime scene measurement exercises used to teach these distinctions in a forensic science course.

Session WS8B Four Steps in Forensic Laser Scanning

*Presenter: Jörg Meixner, Z+F*

Session WS8C ReFace Update

*Presenter: Dr. Peter Tu, Research Scientist, General Electric Global Research*

Session WS8D New Universal 3D Photogrammetry Software System with Fully Automated Image Orientation for Use in Law Enforcement

*Presenter: Harold Krause, President, Photo Messe Systeme, Switzerland*

The Elcovision 10 software is now in its sixth generation since the original launch in 1986. It now includes a module for full automated image orientation. No information is required regarding the point of view of the images, as

long as the images were captured with a calibrated camera. The software relies on prominent and common points in the images to classify them in a unique way. Next, the automatic orientation of the images is performed. After the operator defines a suitable set of coordinates (one known distance measurement or at least the distance of 4 control points), a cloud of points is automatically generated. These points reflect very accurate surface points of objects in the images. The cloud of points can be used in many law enforcement applications including accident reconstruction, crime scene mapping/reconstruction and modeling, blood splatter analysis and surveillance video image analysis.

## TRACK 2: ROUNDTABLE THINK TANK

### Session WR1 Who is This Person? A Comparison Study of Current 3D Facial Approximation Methods

*Presenters: Summer J. Decker, MA MABMH, & Dr. Don Hilbelink, Department of Pathology and Cell Biology, University of South Florida College of Medicine*

This presentation will provide insight into the current state of the field of facial approximation by providing the results of a unique three-dimensional study conducted on a living individual by an international team of human identification specialists. The results of the clay modeling and advanced computerized facial approximations will be compared both visually and quantitatively.

Anatomically accurate virtual models of both the skull and of the surface contour of the face were computed from CT image data of the head region of a living individual. The individual was CT scanned and the volumetric data from the scan was taken into the visualization software Mimics (© Materialise). A FloodFill method of seeding the image was done to select only the bone pixels in the data set. This 3-D volumetric pixel grouping was then filtered of artifact holes and closed to create one unsegmented structure. The data set was then rendered into a 3-D Model and exported as a stereolithographic file (STL). The virtual facial approximation participants were provided with the STL files and a standard biological profile determined by a forensic anthropologist. Virtual models were created using 3ds Max © (v.9). An accurate full size prototype of the skull was then produced from the computed virtual skull model using a 3D ZPrinter 310 (© ZCorp) printer which was then submitted to the clay model specialist.

The results from all methods (clay and virtual) were compared visually to each other and collectively to the actual features of the living individual to determine the level of accuracy and detail that each provided. A quantitative study was also conducted to establish the accuracy of each method. This project demonstrates the wide range of variation between commonly used facial identification methods. The benefit of this study was having a living individual to test the strengths and weaknesses of each method. Resulting images and models will be available for conference participants to review to provide additional input into our evaluation process.

### Session WR2 Using Ultra-Fast Image Capture to Obtain Precise 3D Surface Metrics of the Human Body

*Presenter: Jesse Knowles, Regional Sales Director, 3dMD, LLC*

The human form has historically been challenging to quantify for biometricians, researchers and medical clinicians wanting to work in the world of 3D in order to eliminate the inaccuracies inherent in 2D imagery. The development of active stereo photogrammetry now permits the ultra-fast capture of 3D body surface data in ~1.5 milliseconds, thereby eliminating motion artifacts associated with human form capture and enabling biometric quantification to an accuracy level of ~150 microns.

Beyond individual image quantification, images from different time periods can be mathematically registered to quantify linear, volumetric, and angular changes on the surface of a body. Examples include pre- and post-surgery/trauma, growth of a child's face, weight loss, wrinkling of tissue, etc.

Jesse Knowles of 3dMD will outline how active stereo photogrammetry is applied in medicine, biometrics, defense, rapid product prototyping, entertainment and any discipline requiring precise measurement of the human form.

### Session WR3 "Mad Trapper" Review

*Presenters: John Evans, Program Manager, Canada North-West Region, Canadian Police Research Centre, & Dan Gustafson, Marketing Director, NextEngine, Inc.*

We traveled to the far northern regions of the Canadian Wilderness to dig up and digitize the skeletal remains in order to verify the identification of the historical case of the "Mad Trapper". All digital data was captured in the wilderness. This presentation will discuss the events and challenges of capturing data in the middle of the wilderness and the results.

### Session WR4 Virtual Anthropology: 3D Imaging for Human Identification & Trauma Analysis

*Presenter: Dr. Erin H. Kimmerle, Department of Anthropology, University of South Florida*

Innovative advancements in imaging such as laser scanning and three-dimensional (3D) computed tomography (CT), combined with morphometric techniques allow for the analysis of biometric variables for personal identification and trauma analysis. These methods are being applied to meet the challenge of recovering missing

persons through the identification of unknown, unidentified decedents (from estimating ancestry to recreating facial images) and can at times provide data and critical evidence in criminal trials. A range of new techniques and recent methodological development for human identification from the field of forensic anthropology both in the US and internationally are reviewed. Examples of trauma analysis through 3D-CT imaging, specifically related to differential diagnosis are also presented. Finally, protocol and method development, the creation of an international osteological databank, and recommendations for best practice standards are discussed.

#### Session WR5 3D Face Scanner for Forensics & Security

*Presenters: Dirk Callaerts, President & CEO, & Nick Tesi, Vice President, Operations, Eyetronics, Inc.*

Eyetronics will present and demonstrate the use of a face scanner for the "IAFSM 2008 Symposium" to show the value and productivity of using such a technology.

We have been developing 3D scanning technology since 1998 and have been both supplying systems to application markets such medical, military, educational, fashion plus entertainment.

3D scanning technology has come a long way in giving the user or application a fast solution to be used by technicians, professionals & lay people alike. We understand the needs for custom systems to exactly fit applications. As you can imagine our solutions are generic but can be molded to work in different environments to give you the results you need.

3D scanning will quickly capture an exact likeness of a person for the likeness comparisons later, to quickly identify someone via a 3D monitor or any application that avhand drawing and or 2D pictures have been used in the past.

In 3D technology we will demonstrate how fast and accurate a 3D model can be acquired and viewed without having a lot of background in 3D processing. We will also demonstrate the ability to change the format if providing another agency or company a copy for their viewing or building a 3D physical model.

In the demonstration, someone from the audience will be selected and scanned. The audience will see within a few minutes the result of that scan. The rest of the presentation will be a PowerPoint presentation of 3D Scanning Technology.

#### Session WR6 Automated 3D Face Authentication and Recognition

*Presenter: Anshuman Razdan, PhD, Associate Professor, Division of Computing Studies, Director of Advanced Technology Innovation Collaboratory, Director of I3DEA, Arizona State University*

This talk will present a fully automated 3D face authentication (verification) and recognition (identification) method and recent results from our work in this area. The major highlights of our method are: (a) the method can handle data with different facial expressions including hair, upper body, clothing, etc. and (b) development of weighted features for discrimination. The input to our system is a triangular mesh and it outputs a matching % against a gallery. Our method includes both surface and curve based features that are automatically extracted from a given face data. The test set for authentication consisted of 117 different people with 421 scans including different facial expressions. Our study shows Equal Error Rate (EER) at 0.065% for normal faces and 1.13% in faces with expressions. We report verification rates of 100% in normal faces and 93.12% in faces with expressions at 0.1% FAR. For identification, our experiment shows 100% rate in normal faces and 95.6% in faces with expressions. From our experiment we conclude that combining feature points, profile curve, and partial face surface matching gives better authentication and recognition rate than any single matching method.

#### Session WR7 ReFace Update

*Presenter: Dr. Peter Tu, Research Scientist, General Electric Global Research*

#### Session WR8 High-Accuracy 3D Scanning Technologies for Forensic Applications

*Presenter: Michael Raphael, President, Direct Dimensions, Inc.*

Digital information has become the standard format for documents, images, and communication. The technology exists today for the capture, processing, and analysis of physical objects of almost any nature, size, and complexity to be represented, stored, and analyzed in a similarly digital format. This presentation will outline the use of 3D imaging using advanced laser scanning and other technologies for the accurate representation of physical forensic evidence in digital format. The presentation will present an overview of the equipment, software, processes, and skills that are required to 'digitize' a variety of physical objects typically involved in forensic investigations. The technologies for capturing various accuracies and resolutions will be discussed and compared for use within the forensic analysis applications. The presentation is being made by a founder and President of one of the largest services firm in the U.S. for the use of these solutions.

DAY THREE - THURSDAY, MARCH 6

TRACK 1: SYMPOSIUM cont.

Session TS1 Application of 3D Laser Scanning for Shooting Reconstruction and Crime Scene Investigations

*Presenters: CSI Sgt. Michael Haag, Firearms Examiner, Albuquerque Police Department, & Tony Grissim, Public Safety & Forensic Account Manager, Leica Geosystems*

3D laser scanning for documenting crime scenes is a growing use for a measurement technology which has already gained wide acceptance with surveyors, engineers and construction professionals. 3D laser scanning involves deploying an advanced type of survey/measurement instrument which is used to remotely measure and document crime scenes with extraordinary accuracy, completeness and speed. It is already being used by police agencies in the United States and Europe and can also be used for crash investigations, fire scene reconstruction, failure analysis, vulnerability and threat assessment as well as modeling simulation and analysis of environments.

The benefits of 3D laser scanning for any type of investigation are:

- Scenes can be recorded exactly as the first responder found it without altering evidence
- Exact body positions and evidence can be captured in great detail to an accuracy of 6mm at a distance of 50 meters
- Scanning is an objective scene recording tool which minimizes the chance of overlooking key evidence due to human error
- Measurements can be made between any objects in the scene long after the scene has been released
- The scene can be viewed in 3D from any viewpoint
- The data collected can be used to create compelling 3D jury exhibits

This presentation will describe the operation, application and capabilities of this new forensic tool. Additionally, the accuracy, precision and validity of the technique will be examined by comparing data generated with standard crime scene measurement techniques to those collected with a Leica Geosystems ScanStation 3D laser scanner. Actual crime scenes which have been scanned will be presented as they were documented to demonstrate the advanced capabilities of 3D laser scanning in the areas of captured detail, completeness, and 3D visualization. A visually compelling and accurate 3D method of depicting trajectories will be presented. Data from 3D laser scanning will be compared to trajectory measurements taken using standard methods for comparison in the areas of accuracy and precision. This will be accomplished by firing known impact angle shots through various materials and comparing the measurements using standard methods and tools like protractors, plumb bobs, inclinometers and photographs to those computed from scanned data. The data collected from both the scanning technique and manual methods for this controlled experiment shall be tabulated and compared in order to show the accuracy and validity of this technique. As more and more animations and exhibits generated from 3D laser scanning make their way into courtrooms it is becoming apparent that a generation of jurors raised on 3D video games shall have greater expectations for the kind of exhibits placed before them. It is anticipated that viewers of this presentation shall be impacted by understanding that 3D laser scanning is with us to stay and it will only be a matter of time before it becomes the norm for crime scene investigation.

At the conclusion of this presentation the audience will have a basic understanding of the principles, operation and capabilities of 3D laser scanning for crime scene investigation.

Session TS2 Photogrammetry of Crime Scenes

*Presenter: Ted Chavalas, President, Panoscan Inc.*

Ted Chavalas, founder and president of Panoscan Inc., will present their new technology for measuring crime scenes. This new technology allows 360-degree panoramic images to be surveyed and measured to a high degree of accuracy. The presentation will also cover the creation of fully texture-mapped 3D models from panoramic images. Issues that affect accuracy and shooting techniques will also be discussed. Panoscan Inc. manufactures and markets ultra-high resolution, digital, panoramic camera systems. Panoscan's MK-3 captures full 360 degree spherical images with extremely high resolution. With over 580 megapixel resolution and high sensitivity for low light capture the MK-3 is also the fastest digital panoramic camera on the market. The MK-3 is ideal for a variety of law enforcement applications including, crime scene documentation, tactical mapping, accident scene reconstruction and panoramic surveillance applications.



#### SCANNING PRACTICAL AND PANEL REVIEW

To demonstrate the practical capabilities of 3D laser scanning and other advanced measurement techniques, FSM 2008 features a simulated crime scene and a simulated security event. IAFSM Technical Advisors (technology developers) together with service-provider partners will document a scene before the conference, then post-process the data. In these sessions they will present and discuss the data deliverables created, together with the tools and work processes used.

Leica & NextEngine Scanning Practical Result  
Panel discussion

Z+F Scanning Practical Result  
Panel discussion

Riegl USA Scanning Practical Result  
Panel discussion

FARO & Scottsdale Police CSI Unit Scanning Practical Result  
Panel discussion

InteliSum Scanning Practical Result  
Panel discussion

#### MOOT COURT

Deliverables from one of the Scanning Practical Result sessions will be selected by IAFSM officers to go to trial. This moot court will demonstrate real-world challenges of presenting this evidence in court, and strategies for success.

#### TRACK 2: ROUNDTABLE THINK TANK cont.

Session TR1 Cone Beam Scanner (iCAT)  
*Presenter: Joe Harms, Imaging Sciences International*

Roundtable Think Tank Discussion Working Sessions