Bring Lidar in a new light: use of holograms to extend your research
Agenda

• Introduction to Zebra Imaging Technology
• Lidar Value
• Two workflow export for hologram creation
• Demonstration of hologram technology
Holographic Displays

Film-based 3D images made from digital/digitized data, displayed with a simple light
Zebra Technology - 3D Holographic Prints
*communicates whole designs in true-3D*

- **Interactive, true-3D**
  - Reach into the model, walk around
  - See the whole design, not just portions
  - Full parallax
  - Viewable from 360°

- **No special equipment**
  - No glasses or goggles
  - No computers or projectors
  - No special software

- **No special user training**
  - Easy-to-use
  - Closes communications gaps immediately
Holographic Imager Systems

**M1 Monochrome**
- 3 hour production cycle
- 32” x 24” film sheets
- Semi-automated processes
- High resolution (1mm hogels)
- Monochrome (green) imagery
- Horizontal and vertical formats
- Available today

**M2/C1 Color/Monochrome**
- <2.5 hour production cycle (faster)
- 36” x 24” film sheets (larger)
- Automated processes, sheet or roll
- Higher resolution (0.7mm hogels)
- Color or monochrome imagery
- Reduced footprint, increased robustness
- Software application plug-in integration
Key Values of Holographic Displays

Effortless comprehension and common-view collaboration for multiple simultaneous viewers

- Correct 3D from every vantage point (“full parallax”)
- Wide viewing angle
- Portable, sturdy, and easy to use
- Monochrome or Full Color
- Scalable

Dissemination of accurate 3D visuals in intuitively understood formats

- No distortion
- Large depth volume
- Multi-view channel, 3D overlay capability
- Multi-source fusion
- Collection source and software-application independent
Validated Applications

**Military/Law Enforcement**
- Planning / After-action
- Situational Awareness
- Training
- Common Operating Picture
- Orientation, interviewing

**AEC Visualization**
- Geospatial context & Urban Planning
- Pre-schematic concept communication
- Schematic and Detail Design
- BIM Documentation
- Public Communication, Marketing
Rendering Features

GIS

Digital Elevation Maps (legacy)
- Geo-referenced
- Triangulated meshes
- Various DTED levels

Point-clouds
- Geo-referenced
- Shaded
- Geo-rectified color/textures
- Variable point sizes, shapes

Point-clouds (object-based)
- Detail and edge-enhanced
- Integrated shading
- Texture mapping
Detail Enhancement

Terrain and Textures

Edge-enhanced shading, expanded points

Scan data provided by Army Geospatial Center

Scan data provided by Smart MultiMedia

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Dynamic 3D Display Features

Dynamic 3D display for interactive graphic-intensive applications

– Easy to see 3D
  • No glasses or eye fatigue
  • No view-position distortion, flipping, or “sweet spot”
  • Correct 3D from every vantage point
  • Wide 360° visibility for team/collaborative viewing

– Electronically updated in near real-time
  • Compatible with visualization software applications
  • “3D Multi-touch” interaction-capable

– Modular & scalable design
  • Man-portable to > 6x6 feet
  • Horizontal, vertical, inclined orientations

DARPA-Sponsored Development Program initiated 2004
Zebra Imaging Dynamic 3D Displays

Prototype (simulated image)

Team viewing – wide viewing range enhances collaboration

Natural 3D (no eyewear) continuous viewing

Bright true-3D images

Text-legible quality

Self-contained table-like format display

Interactive

3D image volume, extends above & below table surface

1-meter diagonal, 12 Tiled Modules

Photo of actual 3D Image

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Functional Schematic – Zebra 3D Display

Links to software applications based on specific APIs, including:

- OpenGL – visualization, GIS
- OSG – simulation, virtual words, MMO games
- DirectX – Windows-based graphics
Case for Lidar in holographic display
LIDAR + Holographic Display Utility Case

• Come to consensus
• Provide instructional pre-visualization
• Express circumstances and context clearly
Holographic Displays for Rapid Consensus

Come to consensus over complex, multi-disciplinary problems (understand the design challenge)

- A problem/change/challenge is encountered
- Engineering, MEP need to avoid defensiveness & put their heads together to discuss, brainstorm solutions
- Finance needs to buy-in on level-of-effort, cost validation, priority
- Client needs to understand the trades, other stakeholders weigh in
- LIDAR acquires “ground truth”
- Comprehensive Holographic Display is produced
- An in-field meeting is called to review
Holographic BIM-driven Consensus

LAX-Bradley Terminal Modernization: Baggage Handling Area

- Conveyor system upgrade
- Scan called-in late in the project
- Project heavy with delays from clashes and interference of systems
- Strained relationship between Owner, Architect, GC and Sub-Contractors
- 3D scan and model used to identify and resolve problems with design team.
- **Hologram used to relay problems to tradesmen in the field** (channeled image as-is to design clashes)

Scan data: Clark-McCarthy / Scott Cedarleaf Joint Venture
Holographic Displays instruct and plan

Provide instructional pre-visualization in an intuitively understood form

- People in complex environments and critical structures need protection and safety
- LIDAR acquires key structures and details
- Way-finding/route-map, or baseline Holographic Displays are produced
- First responders, safety personnel, occupants can study periodically
- Immediate, straightforward consultation in an emergency
- Planners consult for modification, events contingencies
Holograms for stark visual clarity

Brunswick, Georgia Hospital storm surge flood models

• County-wide aerial LIDAR acquisition
• Lidar with aerial overlay
• CAT 3, CAT 5 Hurricane storm surge modeling / superposition
• Holographic display and overlay presentation to board, safety personnel
• Modification of safety and evacuation plans
Holographic Displays make the case

Express spatially-critical circumstances and context clearly and accurately

• Incident evidence must be archived, analyzed and courtroom-communicated
• LIDAR acquires post-event conditions, locations, dimensions
• Archive, analysis, and evidentiary Holographic Displays are produced
• Forensic specialists make visual consultations for lines-of-sight, burn patterns
• Insurance adjusters retain archives for liability
• A jury clearly understands physical elements critical to the case
Holograms communicate truth...fast

Forensic documentation (Structure issues or failure)

• LIDAR acquisition of scene
• Analysis can be applied: line of site, trajectory
• Placement, reconstruction, illustration of critical details
• Possible holographic display to jury or reviewers
• Hopeful for clarity of understanding and judgment
Data is supplied via secure FTP in a standard format (XYZ, PTC, LAS, VRML, ASCII, etc.)
• Verification renderings/movies are provided via email
• Holographic Display is recorded, laminated, integrated with light (optional) and shipped

Turnaround times in less than 1 week, with rush service available
Workflow for holographic print

Two Export Products

• ZScape Exporter for Esri ArcGIS 10.0 ArcScene ™
  – Update of exporter for new Lidar features at 10.1
• ZScape Preview for 3D models
  – Existing technology to access point clouds and lidar
Esri ArcGIS ArcScene – Build 3D project
ZScape Exporter for ArcScene™ 10.0 Plug-In

Multiple sizes/scales, monochrome or color
ZScape Exporter for ArcScene™ 10.0 Plug-In
Previewer rotates hologram data to simulate 3D
ZScape™ Preview

- Standalone package where 3D models (SketchUp, Microstation, Maya, Revit, 3DS Max) can be imported
- Formats (OBJ, XYZ, PTS, LAS, STL)
- Add texture maps, transparency and other effects from third-party graphics programs
- Combine point clouds with polygonal models for greater accuracy
Hologram Display Demonstration