Shine a Light on Research: Use of Holograms for Decision-making
Agenda

• Introduction to Zebra Imaging Technology
• Value of Hologram
• Application examples
• Prepare and export research from ArcGIS 3D with Zscape Exporter
• Demonstration of hologram technology
Holographic Displays – Shine the light!

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
Rendering Features

GIS 3D Layers

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
Channeling and Overlays – To extend GIS layering
Zebra Technology

• Digital Data ZScape Holograms
  • Lightweight, thin-film 3D displays
  • Monochrome (green)
  • Originals, mass-produced copies

• Hologram Production Systems (Imagers)
  • Equipment for in-house hologram production
  • Monochrome, high-speed
  • Consumables and support services
  • Operational training

• 3D Production/Presentation Support Services
  • Graphics conversion and formatting
  • 3D modeling and data sourcing
  • Displays and illumination stands
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
Time - One of the 2011 Best Invention
Prototype delivered to US Army

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Value - A way to display 3D in 3D

Seeing data volumetrically is critical for understanding and communication

- Presentation and collaboration
- Measurement and exploration
- More natural interaction and navigation
- Cross-discipline decision consensus
- Fusion with other data

Digital Holographic Displays serve these needs today.
Value for Research and Decision Making

- Provides impact and depth to projects that convey with a z value!
- Extend 3D GIS research beyond the computer
- Presentation for
  - Funding
  - Stakeholders
  - Multi agency or public approval
- Briefings and Debriefings
- Education and Training
  - Security
  - Recreational

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Viewer Consumer

- Visualization for audiences of varying level of experience
- Clear representation of problem or design
- Presents Depth
- Helps viewers visualize when they cannot imagine
- Helps sell or understand a concept or your research
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
Zscape Digital Holographic Print for Operational Planning and Situation Awareness
Army Tactical Battlefield Visualization

- Operational Planning and Rehearsal
- Route Planning
- Line of Sight Visualization
- Ingress/Egress Route Planning for Aircraft
- Mission Debriefing
- HUMINT Operations and Communication with local nationals
- PSD Driver Training
- Military Police and Coalition Security Patrols

- Collateral Damage Understanding
- Force Protection Planning
- Assist Host Nation Soldiers visualize the battlespace
- Reconstruction Operations
- Construction/Topographic Surveys
- Virtual Recon
- Situational Awareness
- Direct/Indirect Fire Planning
Situational Awareness….IN ACTION!
Emergency Management

Like the Army, Emergency Planners operate in complex environments
- Must leverage information sharing
- Focus on enhancing situational awareness
- Advanced decision making

Information Sharing
- Need to coordinate information from multiple sources
- Information synthesizing: Field to EOC

Briefing & Operations
- Inclusion of federal, state & local stakeholders
- Integrate multiple agency data
- Accelerates operations planning
Zscape Digital Holographic Print for Presentation and Understanding
Understanding the problem - Holograms for stark visual clarity

Brunswick, Georgia Hospital storm surge flood models

- County-wide aerial LIDAR acquisition
- CAT 3, CAT 5 Hurricane storm surge modeling / superposition
- Holographic display and overlay presentation to board, safety personnel
- Modification of safety and evacuation plans
Military Engineering Application

Improved Project Awareness - *superimposed with*:

- Engineering information
- Operational, grid, and/or elevation data
- Assists in information sharing at all levels
- LOS, shadow analysis, key details

**Collaboration Tool**

- Multiple simultaneous viewers at all levels
- Highly collaborative and intuitive environment
- Multiple stakeholder decision-making

**Other Applications**

- As-Built Documentation
- 3D Footprint Visual
- Trades Communication

“Zebra Imaging holograms help us communicate very complex designs to our clients and other consultants by allowing them to see in 3D, saving us time and resources”

– Bridgers and Paxton Consulting Engineers

Photo Credit: USACE Grafenwoehr’s Netzaberg Village

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Architectural Engineering and Design

Planning / Pre-Design
• terrain holograms
• As-built LIDAR point-cloud holograms
• Block and simple-shaded models

Schematic Design
• Color structure+terrain holograms
• Simple to medium complexity models

Design Development
• High Fidelity Color holograms
• Design details, complete structures
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 indentify 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
Hologram to show Subsurface, Geophysical, Environmental, Bathymetry
Application Example
Planning – Understanding Problem and Conveying Impact

Esri video 2011 GeoDesign – Philadelphia Redevelopment

- Look at existing
- Proposed scenario “what if”
- Analyze…line of site analysis, glare analysis
Current discussions with various USACE

- Facility Management / BIM
- Land Management & Planning
- Design Alternative Presentations
  - Possible joint project with the New England Office to use hologram for display of the dam
Making of a hologram from 3D GIS
Zscape Exporter
Esri ArcGIS ArcScene – Build 3D project
ZScape Exporter for ArcScene™ 10.0 Plug-In

Multiple sizes/scales, monochrome or color

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ZScape Exporter for ArcScene™ 10.0 Plug-In
ZScape Exporter for ArcScene™ 10.0 Plug-In

Previewer rotates hologram data to simulate 3D
Video
Demonstration of Zscape Holograms