7-30-2009

Types of Digital Visuals in E-Learning

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TYPES OF DIGITAL VISUALS

in E-Learning
Objectives

- Discuss dimensionality (1D to 4D) in digital imagery
- Highlight some affordances of digital imagery
- Introduce some types of digital imagery used in e-learning
- Highlight some rarer technologies for capturing and creating digital imagery for e-learning
- Offer some pedagogical insights regarding the use of digital imagery in e-learning
Dimensionality

1D to 4D ...
Image Dimensionality

- Spatial depiction of imagery
- 1D: a pixel
- 2D: an image with length and width, along the x and y axes
- 3D: an image with length, width and depth; along the x, y and z-axes
- 4D: a 3D image with movement added
2D Visuals

- Sketches, drawings, diagrams
- Timelines
- Charts, tables
- Icons, symbols
- Screenshots
- Photographs, montages
- Non-photorealistic images and depictions
- Video grabs
- Satellite imagery
- Acoustical imagery
3D Visuals

- 3D metaworlds
- Fractals
- Haptic-visual interfaces
- Augmented reality, ambient spaces
- 3D video
- Holography
4D Visuals

- Video
- Animated agents, avatars, maquettes / models
- Live data-fed images
Some Affordances

Types of Digital Visuals in E-Learning
The Power in Visualization

- Representative, descriptive (realistic, high-fidelity... or fictional... or low-fidelity, symbolic); low stylized (natural) or high stylized (artificial)
- Born digital or from-world
- Process dynamism and high change vs. static; continuous vs. discrete
- Holistic or partial depiction, image decomposition / disaggregation
- Macro- or micro- perspectives
- Extreme visualizations (nano v. mesoscale; microscope vs. telescope; small-scale vs. large-scale)
The Power of Visualization (cont.)

- Mental modeling
- Visual memory (short-term and long-term) activation
- Designs and blueprints
- Phasing of projects, processes
- Brainstorming
- Integration of complex information
- The digital reconstruction of events
- Digital cartography / mapping
- Deformation and animation of soft objects
- Projections into the future

Types of Digital Visuals in E-Learning
Data Culling

- Hyperspectral imaging
- Tumor cross-sections
- Projections into the future over time
- Simulated gas dispersion in simulated accidents
- Forensic analysis
- Disaster response planning
- 3D camera capture
- Facial identifications of live video feeds
- Traffic patterns analysis
Digital Data Enhancement

- De-noising image data
- Orthographic corrections
- Color eliminations to highlight visual aspects
- Spatial data overlays
- Computerized recognition

Types of Digital Visuals in E-Learning
High Tech Affordances

- Informational structure mapping (ontologies, taxonomies; spatial layouts (bubble graphs, node-link diagrams); knowledge systems; mental mapping
- Greater informational complexity and spatial overlays (user-directed)
- Multiple channels
- Full-sensory simulations and experiences (sequential, branched)
- Situated cognition

Types of Digital Visuals in E-Learning
High Tech Affordances (cont.)

- Interactive
- Complex movements and animations
- 3D immersive spaces (x, y and z axes), scripted ‘bot behavior in digital enclosures
Types of Digital Imagery

In E-Learning
Image Maps

- Offers spatial information (and relationships)
- Offers some interactivity
- Integrates text and images
Glyphs or Icons

- A sculptured figure or relief carving
- A font type as an element of writing
- A visual object that contains one or more data variables (coded in the shape, color, transparency, orientation, or other aspects)
- Used in map-making, logic, semiotics (the study of signs and symbols) and pictorial information systems
Photomosaics

- Aerial or seabed photos that are aligned to form a composite image
- A visual effect in which a large image is comprised of many smaller images
- Sometimes used for forensic analysis
# Screen Captures

<table>
<thead>
<tr>
<th>Screenshots</th>
<th>Screencasts</th>
</tr>
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<tbody>
<tr>
<td>- Representative of the visual on the computer screen</td>
<td>- Process-oriented, sequential, annotated</td>
</tr>
<tr>
<td>- Static, non-motion, non-dynamic (or) dynamic; may include voice overlays</td>
<td>- Used to show computer interfaces</td>
</tr>
<tr>
<td>- Annotatable</td>
<td>- Captures of live, synchronous interactive experiences (with voice, video, slides, text, and live annotation)</td>
</tr>
</tbody>
</table>
Fractals

- Geometric, elegant, relational, representative of mathematical formulas
- A kind of machine art
- May show relationships and trends
- Self-similarity in design (at least stochastically)
- Tends towards irregularity and recursiveness
- Meaningful at both the macro and micro levels

Types of Digital Visuals in E-Learning
Photorealistic Images

- Scans, digital photo captures, machine-captures
- May be microscope or telescope-enhanced
- True color required based on a correct white balance
- May be editable
- May be overlaid with information
- May be realistic, illustrative, decorative, or used in other ways
- May be mixed modes
Non-Photorealistic Images

- Image morphing
- Photo-mosaicing
- Cartoon rendering from images
- Computerized drawing
- Fictional avatars
- Photogravure effects / intaglio print-making / etching simulation
Non-Photorealistic Images

- Machine art
- Acoustic-created synced imagery
- Digital sculpting
- Theoretical modeling and visualizations
- Synthesized image overlays (real images overlaid with info)

Types of Digital Visuals in E-Learning
Digital Video

- Involves color, movement, sound
- May be realistic or stylized (on a continuum)
- May be interactive if interspersed with Flash or other types of digital objects
- May be segmented for easier deployment (as in webisodes)
Avatars

Human-Embodied

- Human or animal or symbolic shapes—animate or inanimate; playable characters
- May interact with others in multi-sensory ways (voice, sound, text, gestures, and deictic movements)

Al-Driven Agents

- May be AI-driven avatars ("intelligent agents") with full personalities, emotions, back-stories, and other motivating and autonomous elements
- Artificial life (a-life) entities and beings based on biological life (with flocking, herding)

Types of Digital Visuals in E-Learning
Live Multi-stream Data-feed Images

- Remote sensor-fed, database-fed representations for multi-variate, multi-source and integrated data
- Evolving and changing
- Real-time
Visual Simulations

- Digital wetlabs
- *Machinima* (machine + cinema), role-plays, avatar acting
- Virtual fly-throughs of structures and landscapes
- Fantasy landscapes
Machine-Generated Art

- Based on formulas
- Synthetic art
- “Chaos tools,” “morphogenesis,” “cellular machines,” “neuronal co-evolution,” and visualization algorithms
Immersive and Persistent Virtual Worlds

- Live, unpredictable, human-embodied avatars
- True serendipity
- May be interspersed with AI-driven robots (‘bots)
- Multi-sensory information
- Real-time scene updates
Augmented Reality

- Real-space with an overlay of digital images and sound through wearable computers or head-mounted devices
- Used for coordinated multi-participant practices in real-space
- May be location-sensitive and place-sensitive or fully mobile / place agnostic
- May involve visual enhancements overlaid on real spaces in real time
Ambient Intelligence

- In-built electronic environments
- People aware
- Adaptive
- Anticipatory of unique human needs
- May be built into furniture, textiles and clothing for tactile and haptic interfaces
- Digital installations, smart rooms and houses,
Technos for Capturing and Creating

Digital Imagery
Digital Image Capturing Technologies

- Cameras (on telescopes, on microscopes, panopticon angles, automated foveations)
- Scanners
- Mobile devices, in-field devices
- Sensors (in the field)
- Studio setups
- Computational photography (enhanced image capture through digital sensors, optics, lighting, and other strategies)
Digital Image Capturing Technologies
(cont.)

- Computer screen captures
- Pen and tablets
- CAD / CATIA
- Data visualization software
- Thermal imaging
- Deep sea sonar captures
Pedagogical Insights

Types of Digital Visuals in E-Learning
Types of Digital Visuals in E-Learning
... aids visualization

mental modeling

comparison and contrast

understanding

visual textures and sensations

Types of Digital Visuals in E-Learning
... expresses creativity

Types of Digital Visuals in E-Learning
... manages complex ideas

Types of Digital Visuals in E-Learning
... humanizes and personalizes

direct address
calls to action

Types of Digital Visuals in E-Learning
... captures new information

Types of Digital Visuals in E-Learning
... conveys structured information

multiple data points

user-manipulable systems for deeper understandings of relationships
... entertains and engages

Types of Digital Visuals in E-Learning
... immerses (in digital time and space)
... supports social engagement

... and collaboration

... and interactivity

Types of Digital Visuals in E-Learning
... archives and preserves the real

in a context of “slow fires”
Applied Uses of Imagery in E-Learning

- Digital storytelling
- Digital wetlabs
- Medical analysis
- Outer space exploration
- Aerial image analysis
- Museum and art preservation

- Video ‘tooning
- Manga illustrations
- Architectural designs
- Geographical mapping
- Machine art
- Simulation spaces / design …
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Note: A few of the slides are derivative of a slideshow “Building Mental Models with Visuals for E-Learning” that the author presented at MERLOT in Aug. 2008. The images here were all either public domain or released through Creative Commons™ licensure.