Examples of Integrating 3D Online Learning Environments into Blended Course Offerings

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3D Online Learning Environments

- Combines
  - Context
  - Unified Communications
  - Collaborative Tools
  - Scales across the Digital Divide
Why 3D?

- Are you worried about student satisfaction for online courses?
- Are you worried about bandwidth?
  - Student connection?
  - Campus connection?
- Are you wanting to build community?
- Are you wanting to distribute access?
- Do you want to continue using similar access paradigm as web-based delivery?
- Do you want to increase feedback and interaction?
Why is 3D more possible now?

• 1999 and 2000
  • Consumer Computer Technology Plateau
• Barriers to Access begin to decline
  • Internet common and affordable
  • Personal Computer Performance
  • 3D GPU in 80% of shipped units
• We have gone from 20,000 polygon displays in 1999 to 3D scenes derived from 200 million in 2004.
• Games and 3D graphics are the “new literacy” created by the availability of technology.
Entertainment Industry

- Is driving the technology development
- In 2003, video game industry sales topped $11 billion in the U.S.
- In 2003, more than 239 million computer and video games were sold, or almost two games for every household in America.
- This impacts
  - Tools
  - Available Talent from Industry and Schools
  - Cost
  - Technology
From 1998 to 2004 Graphics

Excerpt from half-life2 demo.
Virtual People in 2004 Graphics

Excerpt from half-life2 demo.
CRG 3D Visual eXplorer Interactive

- Portal-based 3D environment that was created to support distributed learning.
  - Provides for just-in-time transmission of visual data
    - Unlike a game doesn’t depend on all the data to be present at run-time.
  - Controls data by location context
  - Support audio and other interactions
  - Support 1999-2000 graphics
- UNT, Univ of Hawaii, NIME, and others have been pilot testing the software for distributed courses.
- NASA MGS MOLA project incorporated into the system (97% of mars)
Some examples of published uses

- Appalachian State Univ
- University of Houston
- Arcada, Finland
- University of North Texas
- Harvard
- MIT CMS
- More…. 
Appalachian State University

- **College of Education**
- Appedtec provides a place for students in the Instructional Technology program at Appalachian State University to learn about building worlds and their use in learning settings. Students may build an area for delivering a course or may take a course in Appedtec. In addition, master's and doctoral degree students are afforded an opportunity to study the use of such environments in learning settings.
University of Houston

- Writing Center
- Presented last year at TxDLA
- A pilot course using a MUVE was conducted fall semester, 2003, and continued in spring 2004.
- Course provides instruction in human resource management / business writing and was developed specifically for hospitality industry majors.
- It helps students see and present themselves more clearly as valuable employees.
Arcada Polytechnic, Helsinki, Finland

- Flash based system
- Marketing related classes
- Showed improved student interaction
- System didn’t scale well - so
  - They did models
  - They are working towards another system
University of North Texas

- CRG 3D Distributed Learning
- Masters and Doctoral Courses in Technology and Cognition
- Research across multiple areas
  - Attitude Towards
  - Interactions
  - Discourse Analysis
  - Theory
Examining Attitudes Toward Information Technology between Students in Internet-based 3D and Face-to-Face Classroom Instruction

- Fall 2003
- CECS 4100
- 3 sections 3D (treatment), 9 sections face-to-face (control)
- Pre-Post Test using IITTL Instrument
  - “Instruments for Assessing Attitudes Toward Information Technology”
- Discussion
  - Students in 3D paralleled students in face-to-face
  - Students felt the 3D system was like meeting face-to-face
    - Narrowed this down to interaction and feedback
## Consumer Technology Lag

<table>
<thead>
<tr>
<th>Introduction</th>
<th>Widescale Adoption</th>
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<tbody>
<tr>
<td><strong>1999</strong></td>
<td>➔</td>
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<tr>
<td>3D Graphics Acceleration</td>
<td>2003-2004</td>
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<tr>
<td>≈ 50,000+/- polygons</td>
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<tr>
<td><strong>2002</strong></td>
<td>➔</td>
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<tr>
<td>Pixel and Vertex Shaders</td>
<td>2006-2007</td>
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<tr>
<td>≈ 500,000+/- polygon</td>
<td></td>
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<tr>
<td><strong>2004</strong></td>
<td>➔</td>
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<tr>
<td>Normal Maps</td>
<td>2007-2009?</td>
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<tr>
<td>1+million polygons</td>
<td></td>
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</tbody>
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Interaction and Collaboration 3D

✓ Capture, Creation, and other means of creating Environments and Interaction will get cheaper and easier.
✓ Current Web-browser design is not the solution.
✓ Game Engines provide a partial solution, but they don’t scale well.
Old Barriers Gone, New Barriers Emerge

- Old Barriers
  - Graphics Card
  - Internet Access
  - Computer Performance

- New Barriers
  - Content
    - Capture, Storage, Presentation
  - Investment
    - Few Standards and changing standards
    - Content Creation Expensive
    - Content Interoperability and Migration Issues
Parthenon - Siggraph 04

• USC film project that combines scans from different locations to create a new integrated model

http://www.debevec.org/Parthenon/film.html
Parthenon

- 3D Model of the British Museum and sculptures from the Parthenon's East Pediment
Parthenon: Rebuilt

- The Frieze of the Ancient Parthenon, and the Cella of the Ancient Parthenon with the Statue of Athena
Parthenon: Scanning Outside
3rd Tech
3rd Tech
So -- where do we find ourselves?

- For wide scale deployment and adoption means using 1999-2000 technology
- Thus:
  - Low-Res environments (<75,000 polys)
  - Limited texture buffer
  - Limited data transfer between CPU and GPU
- However, this does not meet current needs:
  - Scans are creating millions of polys minimum
  - Kids and young adults are expecting current graphic expectations
The Potentials ("Serious Games")

- I believe the real power of 3D online interfaces is in the creation of virtual spaces for interaction and collaboration.
  - Training and Online Sync / Async Courses
    - Situated Learning, Complex Systems, Community
  - Museums
    - Allows anyone to visit the museum
  - Libraries
    - Visual interface potential, Community
  - Law Enforcement
    - Simulate and Integrate Data
  - Tourism
    - Simulate
  - etc
More Standards Needed

- **Objects and Textures**
  - VRML (old)
  - X3D
  - COLLADA
  - All XML based, which are good for storage, not good for transmission

- **Interactions**
  - No real standards
  - This means
    - limited portability for more complex environments
    - Increased hesitance of potential implementers
The Future

• By 2005-2006 we should begin to see most users with pixel and vertex shaders
• More tools and open source scene renderers
• By 2008-2009 we should begin to see user with normal map capability
• Content creation will continue to get cheaper and simpler to use
• Interest in “serious games” will continue to grow and fund pilot-projects to show potential
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