Hot Topics Panel: Advances in 3D Image Applications

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Interactive and Collaborative 3D Online Environments

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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 200million 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
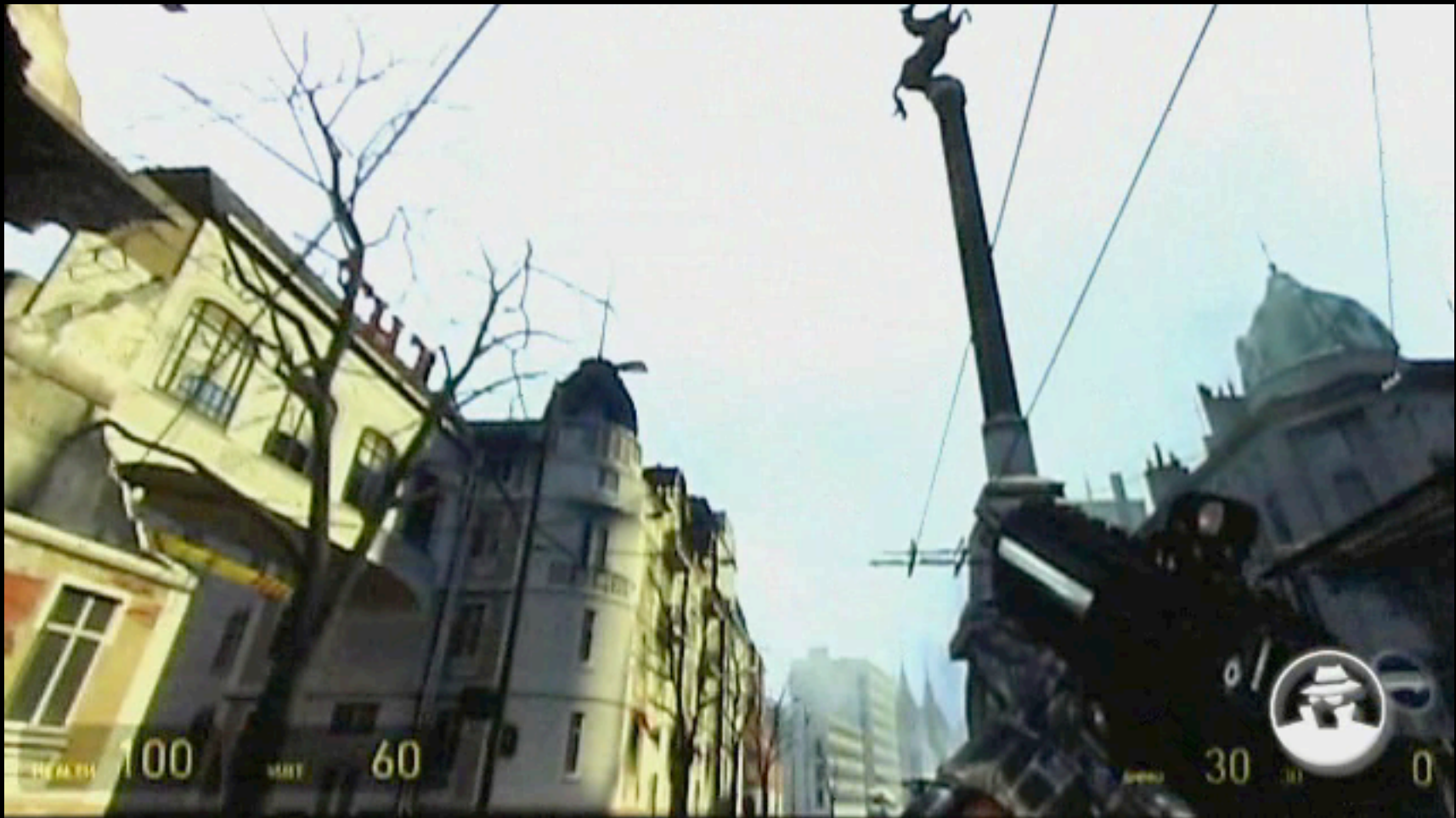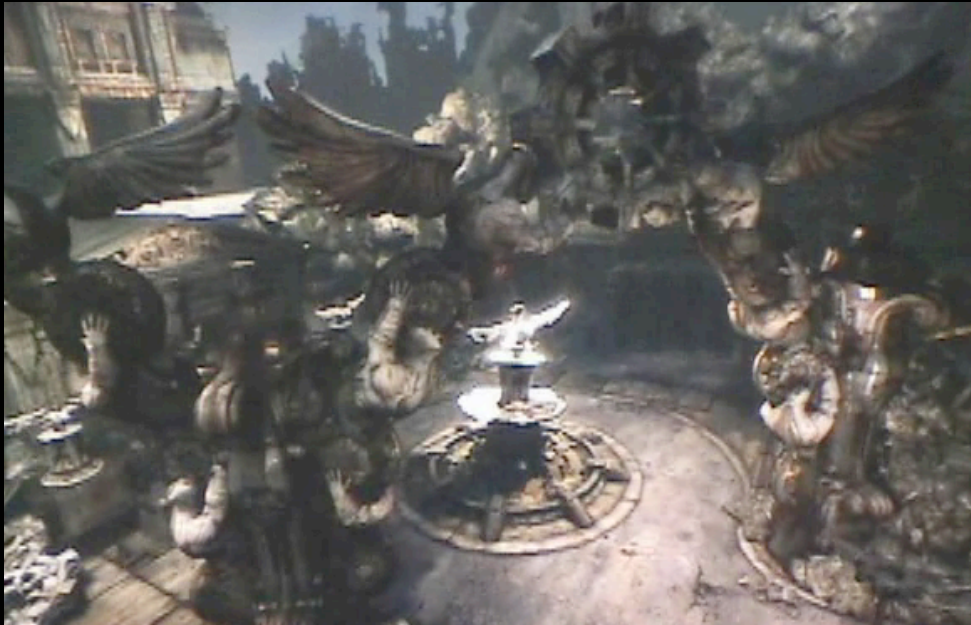 - Cost
  - Technology

From 1998 to 2004 Graphics

Excerpt from half-life2 demo.

Virtual People in 2004 Graphics

Excerpt from half-life2 demo.

Photorealistic 3D Environments

Excerpt from half-life2 demo.

Scene and Physic Engine 2004-05

Excerpts from UnrealEngine3 & Halflfe 2.

Consumer Technology Lag

Introduction		**Widescale Adoption**
• 1999	➤	2003-2004

- 3D Graphics Acceleration
- ≈ 50,000+/- polygons

• 2002	➤	2006-2007

- Pixel and Vertex Shaders
- ≈500,000+/- polygon

• 2004	➤	2007-2009?

- Normal Maps
- 1+million polygons

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

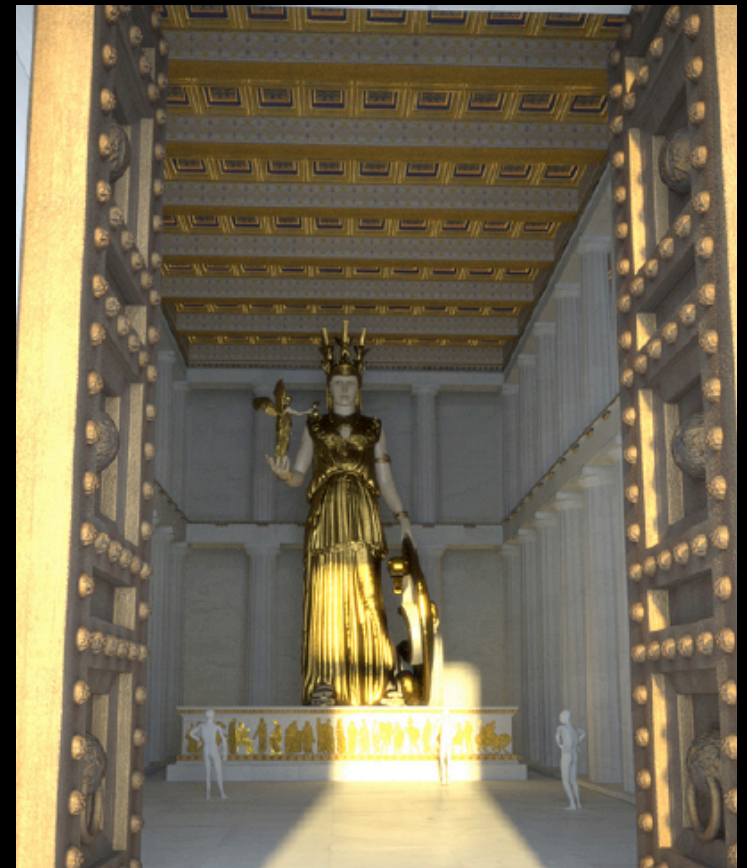http://www.debevec.org/Parthenon/film.html

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

Parthenon: Scanning Inside

3rd Tech

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

CRG 3D Visual eXplorer Interactive

- Portal-based 3D environment that was created to support distributed learning. (http://created-realities.com)
  - 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)

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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