Ambient Fields: Representing Potential Sensory Information

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Scenegraphs: Pros and Cons

- State compression
- Coherent representation
- Allow us to get started

- Single time base
  - Forward driven
  - Tick rate

- Haptics are difficult
- Simulations are difficult
Scenegraph: Naïve Time Handling

Process Input → Simulate → Render

30Hz/60Hz/120Hz
Scenegraph: Example “Real” Time Handling

- Process Input
- Simulate
- SceneGraph TripleBuffer
  30Hz

- SceneGraph TripleBuffer
- Render
  60Hz/120Hz
Upcoming challenges

• Re-rendering at display rate (pixel rate e.g. 165MHz, not 120Hz)
• Driving robotic systems at control rate (1000s Hz)
• Dynamics of audio (doppler)
• Encounter-style haptic devices
• Physics simulations
Challenges For Eye Display

Lens

Eye

900°/s

1000°/s

165MHz
Ambient Fields

• Represent potentially senseable information
• Over 1-100ms represent that information the senses can sample
• In tactile, vision, audio, smell, etc.
• As the body moves the sense organs, provide as close as possible rendering
Lightfield for Visual Representation

• Lightfields represent light in a volume in a 4D parameterisation
• Lightfield cameras are one holy grail for filmmakers
• However, lightfields are very easy to render
E.G. Ambient Lightfield Rendering

- Process Input
- Simulate
- SceneGraph TripleBuffer (30Hz)
  - SceneGraph TripleBuffer
  - Render
  - Lightfield Buffer (60Hz/120Hz)
    - Lightfield Buffer
    - Render (165MHz)
Proposal

- Ambient Field rendering would replace or be lower level that current GPU/audio, etc. hardware
  - This hardware outside the control of operating system
- Ambient fields are purposefully separate from scene graph, don’t want to just drive the scene graph faster
- Ambient fields also give us a way to reason about fidelity (and latency) in a more sophisticated manner
Next Steps

• Discussion

• (Also see our paper on frameless rendering, Tuesday ~9am)