The Art of PhysX
A Guide to Game Creativity
Overview

- Integrating GPU PhysX
- Case Study: The Great Kulu
- Case Study: UT3 Tornado
- Other GPU PhysX Examples
- Questions
Integrating PhysX Features

1. Select showcase features
2. Prototype concepts
3. Verify gameplay

- Fluids
- Cloth
- Softbodies

Prototyping → Gameplay Testing
Showcasing Features

- Particles
- Cloth
- Softbodies
Maximizing PhysX Features - Particles

- Colliding or flowing over surfaces
- Reacting to forces
- Particle-Particle interaction
Maximizing PhysX Features - Particles
Maximizing PhysX Features - Cloth

- Visualize forces
- Clothing movement
- Conforms to surrounding surfaces
Maximizing PhysX Features - Cloth
Maximizing PhysX Features - Softbodies

- Compression
- Rippling Forces
- Secondary Motion
Maximizing PhysX Features - Softbodies
Prototype Concepts

- Let the artist/level designers play
- Create test levels with physics
Gameplay Testing

• Testers should experiment
• Enhance the gameplay experience
  • Are features noticeable during gameplay?
  • Are players using the features effectively? (Destruction)
Questions

• Will interaction and interactivity enhance the experience?
• Will your feature be noticeable by the player?
• Will your feature affect gameplay?
• Does your feature need to be networked?
Case Study: The Great Kulu

- **PhysX Feature** - Softbody
- **Goal** - Illustrate softbody behaviors
- **Plan of Attack** - Create a large soft sea creature
Key Softbody Advantages

• Secondary motion from animation
• Surface interaction
• “Organic” behavior

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Basic Softbody Example

Compare that behavior with a softbody cube as it is dropped.
The Great Kulu - Prototype Features

- Creature
  - First animated softbody
  - First use of softbody in a game setting
- Force Interaction
Softbody Animation Technique

1. Create Model
2. Generate Tetrahedrals
3. Attach Verticies
The Great Kulu - Prototype 1
Animating the Creature

Create Model

Generate Tetras

Tetra Attachment

Final Result

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The Great Kulu - Prototype 2
The Great Kulu - Forcefield
The Great Kulu - Escape
The Great Kulu - Door Squeeze
The Great Kulu - Eggs
The Great Kulu - Explode
“The Great Kulu gives us an interesting glimpse at how games could feature more "organic" objects that bend and squeeze depending on what they collide with. I can't be the only one tired of seeing rag-doll character corpses that behave like they're made of cast titanium.”

-TechReport.com
Case Study: UT3 Tornado

- Rigid Bodies: Blocking Paths
- Cloth: Line of Sight
- Particles: Visualize Forces
- Forcefields: Add Energy
UT3 Tornado - Paths

- Paths are continuously changing
  - Opening Paths
  - Closing Paths
  - Tornado itself
UT3 Tornado - Changing Environment
UT3 Tornado - Networking

- Synchronization
  - Gameplay affecting rigid bodies
  - Use state changes wherever possible
UT3 Tornado - Destruction
Other PhysX Integration Examples
Weapon Effects: UT3
Environmental Effects
Environmental Effects: GRAW 2
Character Effects

- Character Animation
- Clothing/Hair
- Softbodies
Character Animation: Backbreaker
Clothing: Nurien
Summary

- Particles
  - Visualization of forces
- Clothing/Hair
  - Visualize character movement
- Softbody
  - Visualize organic behavior

GRAPHICS + PHYSX = MORE REALISM
PhysX Tools

- **Prototype**
  - Samples, Max/Maya PhysX plugin

- **Scale and Author**
  - Adaptive Physics Extensions (APEX)

- **Debug / Optimize**
  - Visual remote Debugger (VRD), agPerfmon
Questions?