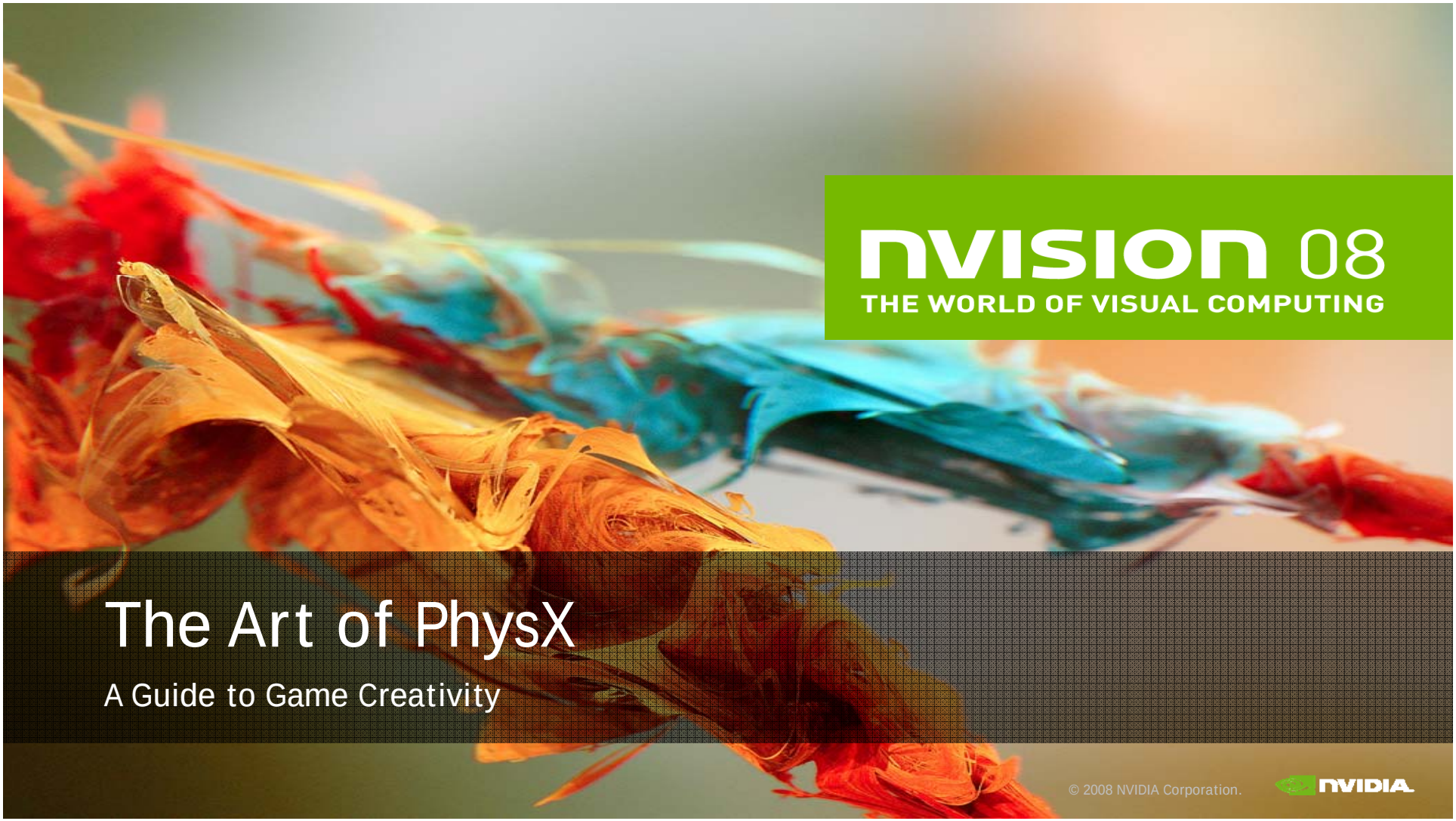


The Art of PhysX

A Guide to Game Creativity

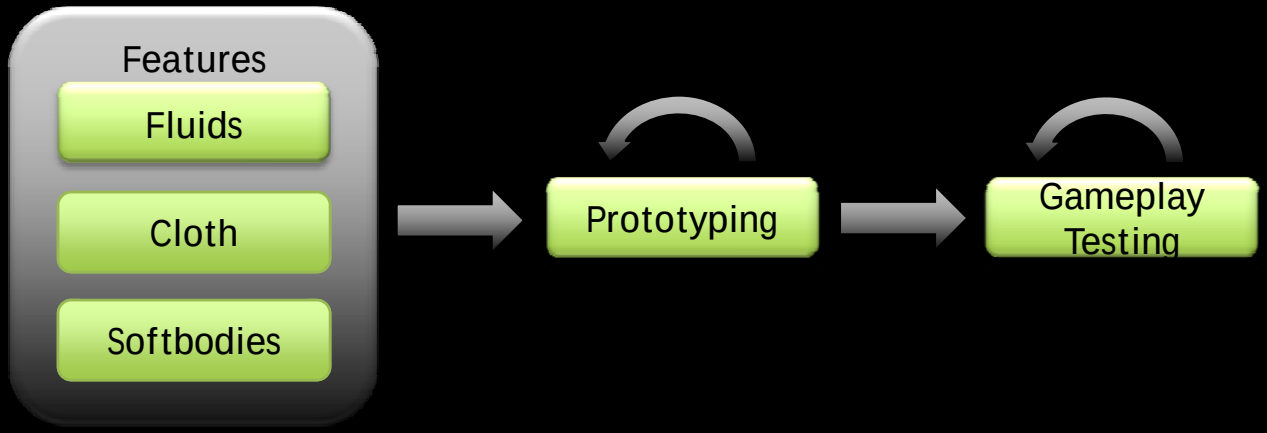
NVIDIA

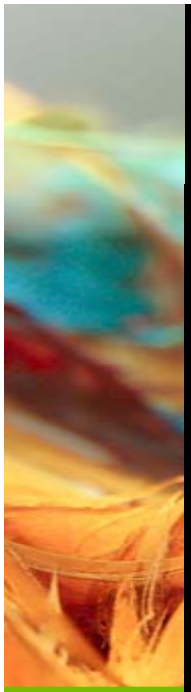
Overview

- 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





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Showcasing Features

- Particles
- Cloth
- Softbodies

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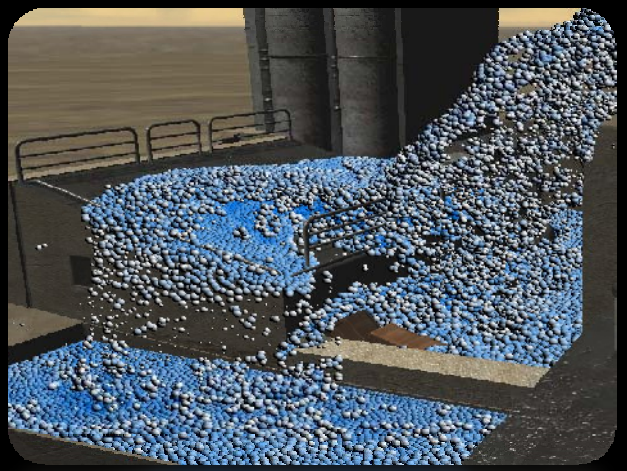
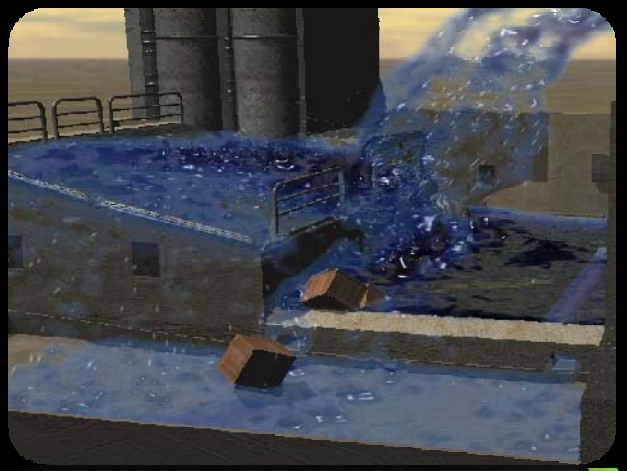
Maximizing PhysX Features - Particles

- Colliding or flowing over surfaces
- Reacting to forces
- Particle-Particle interaction





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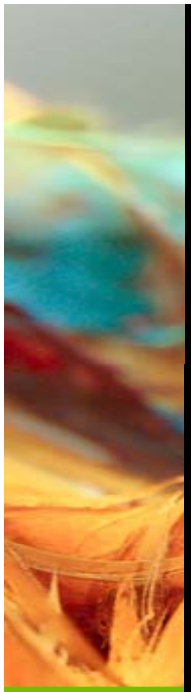
Maximizing PhysX Features - Particles



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Maximizing PhysX Features - Cloth

- Visualize forces
- Clothing movement
- Conforms to surrounding surfaces

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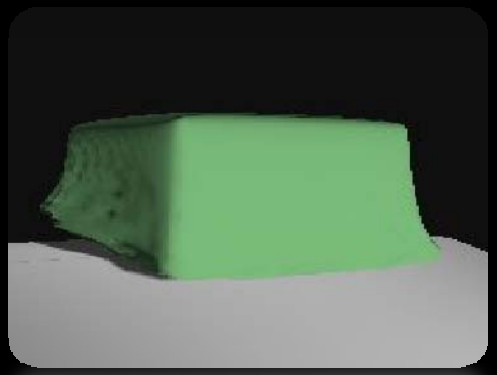
Maximizing PhysX Features - Cloth

Maximizing PhysX Features - Softbodies

- Compression
- Rippling Forces
- Secondary Motion



Maximizing PhysX Features - Softbodies

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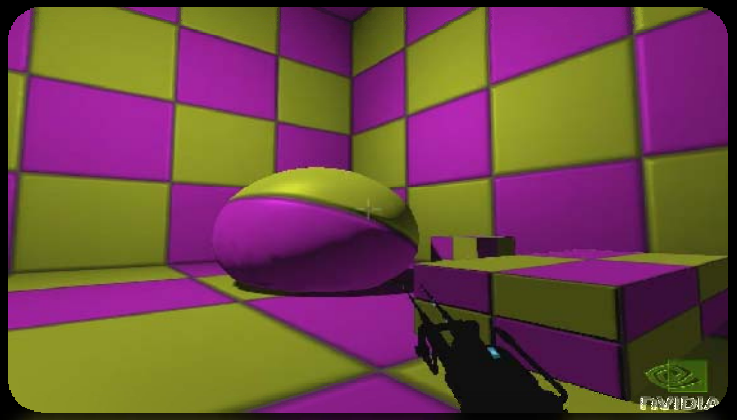
Prototype Concepts

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



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Gameplay Testing

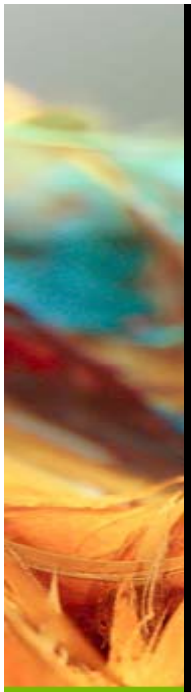
- Testers should experiment
- Enhance the gameplay experience
  - Are features noticeable during gameplay?
  - Are players using the features effectively? (Destruction)

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

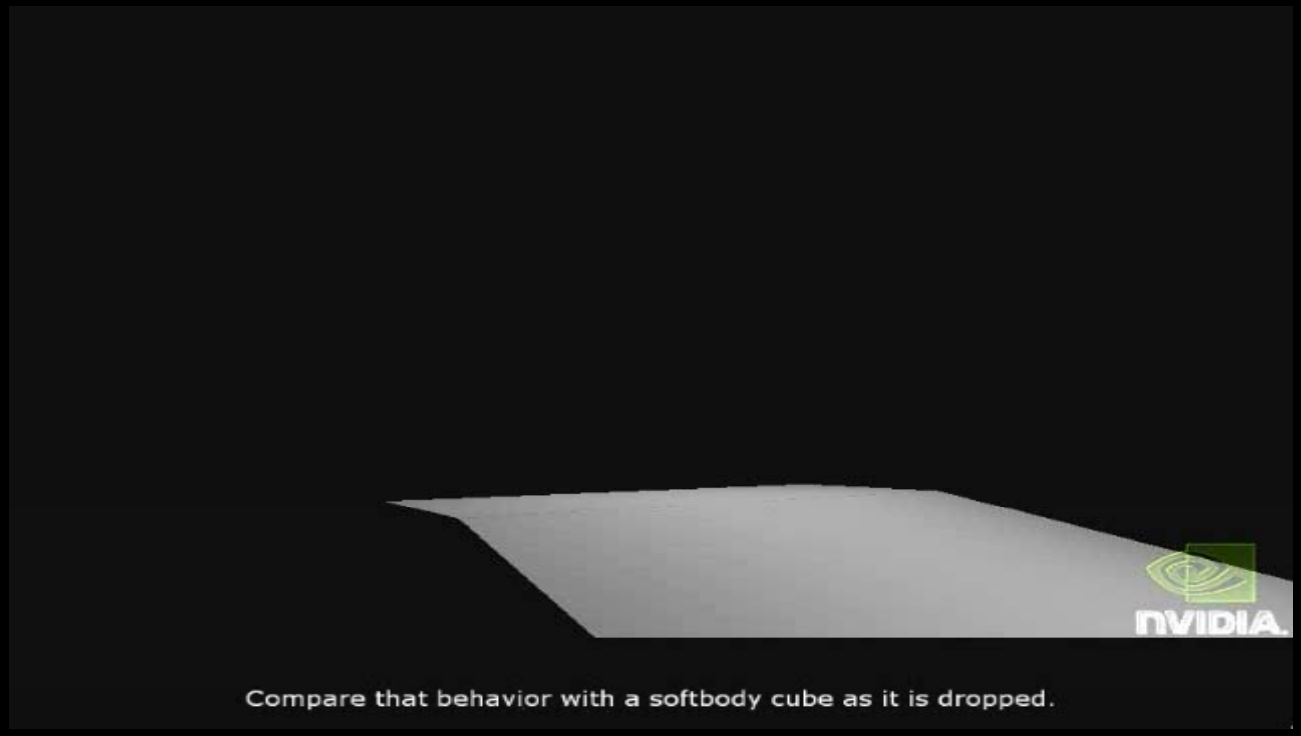
- **PhysX Feature** – Softbody
- **Goal** – Illustrate softbody behaviors
- **Plan of Attack** – Create a large soft sea creature



Key Softbody Advantages

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

Basic Softbody Example

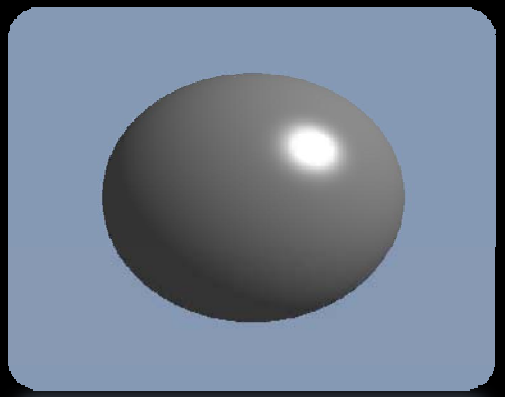


The Great Kulu – Prototype Features

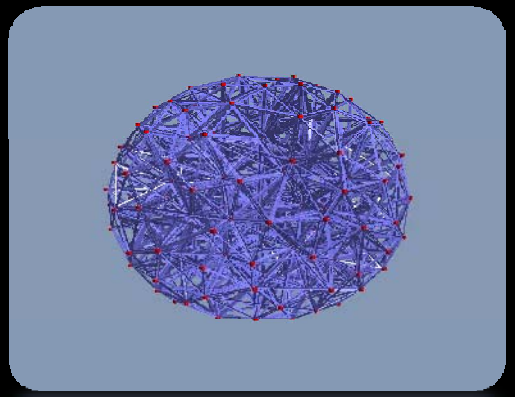
- Creature
  - First animated softbody
  - First use of softbody in a game setting
- Force Interaction

Softbody Animation Technique

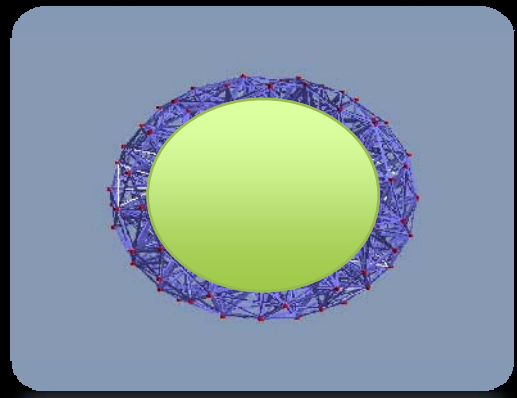
Create Model



Generate Tetrahedrals



Attach Verticies



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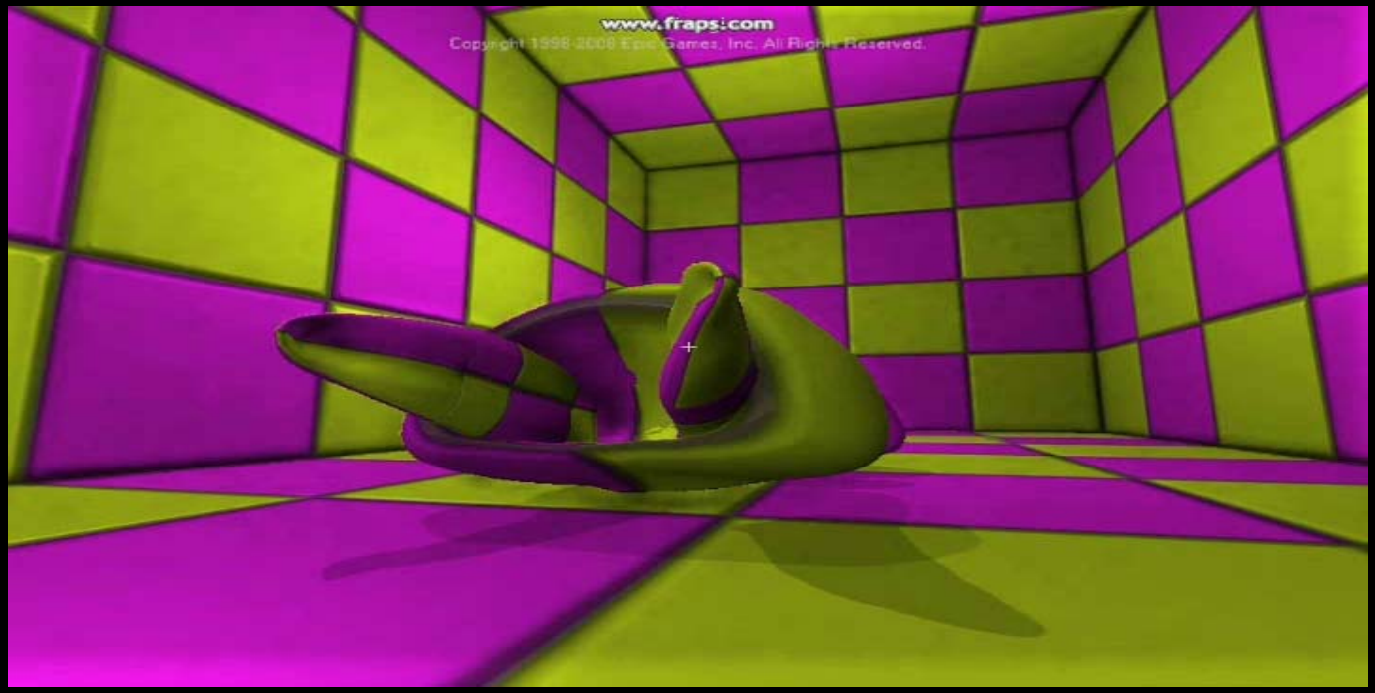
The Great Kulu – Prototype 1



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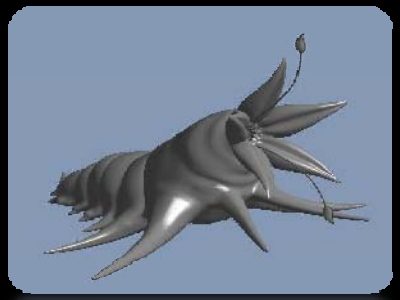
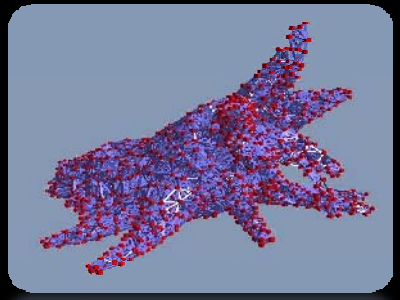
Animating the Creature

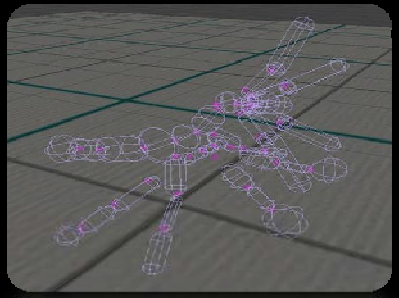
Create Model



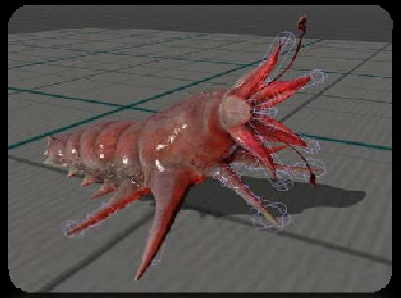
Generate Tetras



Tetra Attachment

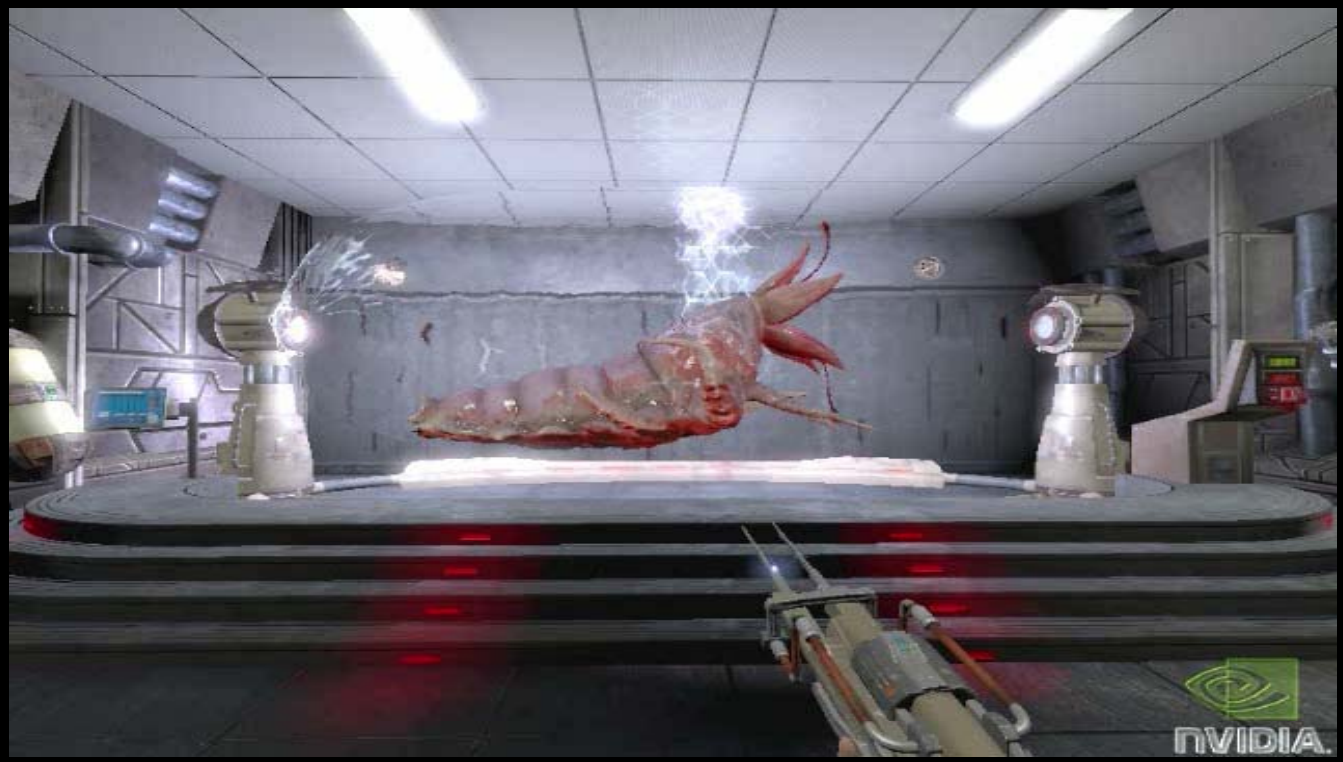


Final Result



The Great Kulu – Prototype 2

The Great Kulu – Forcefield

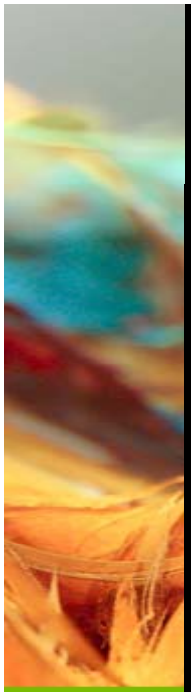


The Great Kulu – Escape

The Great Kulu - Door Squeeze

The Great Kulu – Eggs

The Great Kulu – Explode



Reaction

"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

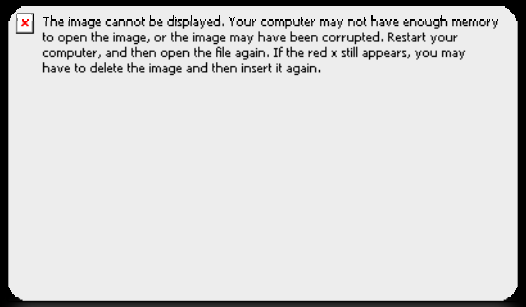
Case Study: UT3 Tornado

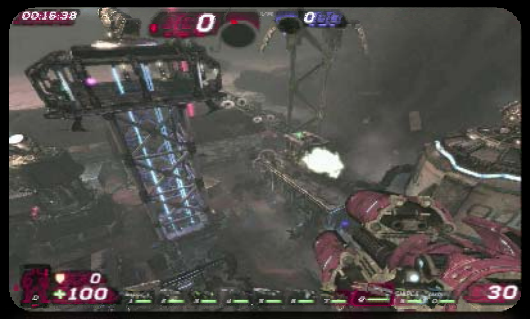
- Rigid Bodies — Blocking Paths
- Cloth — Line of Sight
- Particles — Visualize Forces
- Forcefields — Add Energy

UT3 Tornado – Paths

- Paths are continuously changing
  - Opening Paths
  - Closing Paths
  - Tornado itself

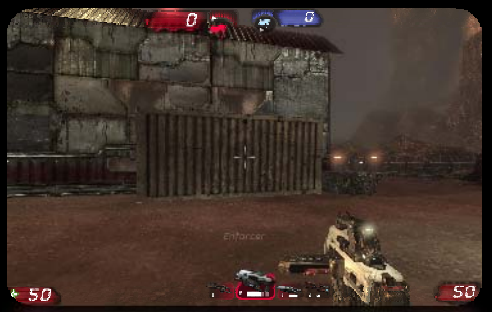
UT3 Tornado – Changing Environment

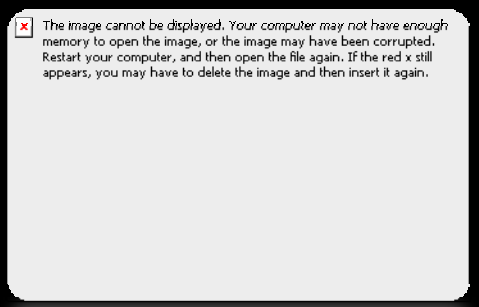




UT3 Tornado – Networking

- Synchronization
  - Gameplay affecting rigid bodies
  - Use state changes wherever possible





UT3 Tornado – Destruction

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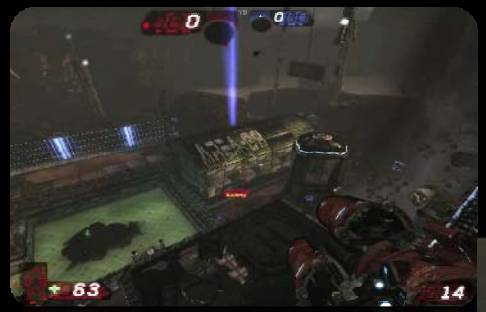
UT3 Tornado - Destruction



UT3 Tornado

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Other PhysX Integration Examples

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Weapon Effects: UT3

Environmental Effects

Environmental Effects: GRAW 2

Character Effects

- Character Animation
- Clothing/Hair
- Softbodies

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Character Animation: Backbreaker

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Clothing: Nurien

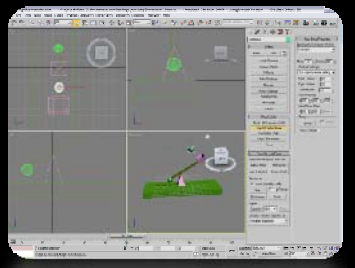
Summary

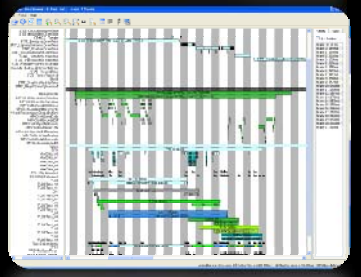
- Particles
  - Visualization of forces
- Clothing/Hair
  - Visualize character movement
- Softbody
  - Visualize organic behavior

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 ?

http://developer.nvidia.com/object/physx.html