Interactive Lighting of Effects
Using Point Clouds in "BOLT"

Dale Mayeda
SIGGRAPH 2009
The Challenge
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- Quality of lighting and bounce light is fundamental in art direction
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• Interactive illumination from organic effects is difficult to achieve
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• Believable lighting from organic effects onto volume smoke is also difficult to achieve
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• Believable lighting from organic effects onto volume smoke is also difficult to achieve
• How can we efficiently generate interactive lighting from any effects element?
Generating Indirect Bounce Light Using Point Clouds in Renderman
Generating Indirect Bounce Light Using Point Clouds in Renderman

- Data stored in point clouds:
  - Position, Normal, Radiosity and Area
Generating Indirect Bounce Light Using Point Clouds in Renderman

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- “bake3d” bakes data into point clouds
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- Data stored in point clouds:
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- "bake3d" bakes data into point clouds
- "indirectdiffuse" function reads the point cloud and treats each point as a small light emitter in the direction of the normal
Typical Point Cloud Usage

Indirect Bounce Illumination
Typical Point Cloud Usage

Indirect Bounce Illumination
Initial Inspiration

Animated Point Clouds Generated From Particles
Initial Inspiration

Animated Point Clouds Generated From Particles

Initial Animated Point Cloud Test

Copyright Disney
Generation of Point Clouds
Generation of Point Clouds

- Integrate “bake3d” into all effects surface shaders
Generation of Point Clouds

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- Integrate “bake3d” into all effects volume shaders
Generation of Point Clouds

• Integrate “bake3d” into all effects surface shaders
• Integrate “bake3d” into all effects volume shaders
• Randomly jitter normal for baked points
Generation of Point Clouds

• Integrate “bake3d” into all effects surface shaders
• Integrate “bake3d” into all effects volume shaders
  • Randomly jitter normal for baked points
• Houdini plug-in to directly write out point clouds
Tools Developed for Flexibility
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- Houdini point cloud reader and writer
Tools Developed for Flexibility

- Houdini
Tools Developed for Flexibility

- Houdini point cloud reader and writer
- Visualization of point clouds in Maya
Tools Developed for Flexibility
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- Houdini point cloud reader and writer
- Visualization of point clouds in maya
- Point cloud filtering to decrease heavy point clouds
Tools Developed for Flexibility
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Volume Illumination in Effects Pipeline
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• indirectdiffuse function integrated into all effects surface and volume shaders
Volume Illumination in Effects Pipeline

- indirect diffuse function integrated into all effects surface and volume shaders
- Uniform lighting
- “distribution” “uniform”
Volume Illumination in Effects Pipeline

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- Uniform lighting
  - “distribution” “uniform”
- Lighting from all directions
  - sum indirectdiffuse twice with N and -N
Volume Illumination in Effects Pipeline

- indirect diffuse function integrated into all effects
- surface and volume shaders
- uniform lighting
- "distribution" "uniform"
- lighting from all directions
- sum indirect diffuse twice with N and -N
Point Cloud Consumption in Lighting
Point Cloud Consumption in Lighting

• Lighting receives effects point clouds
Point Cloud Consumption in Lighting

• Lighting receives effects point clouds
• ptfilter with -filter colorbleeding
• Source and receiving geometry point clouds
Surface and Volume Illumination

Point Clouds from Fire Illuminating Surfaces and Volume Smoke
Fiery Ceiling and Helicopter

Fire Point Clouds Illuminating Ceiling Smoke Pass

Point Cloud Visualization of Fire
Animal Shelter Explosion

Point Cloud from Volume Illumination Passes
Animal Shelter Explosion

Point Cloud from Volume Illumination Passes
Animal Shelter Explosion
Point Cloud from Volume Illumination Passes
Animal Shelter Explosion

Point Cloud from Volume Illumination Passes
Bolt Transformation

Effects Illumination on Fur
Bolt Transformation

Effects Illumination on Fur
Fireworks

Fireworks Illuminating smoke
Illumination in Fire Sequence

Illumination of Surfaces and Volumes
Illumination in Fire Sequence

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Illumination of Surfaces and Volumes
Conclusions
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- Supportive tools can make this task an intuitive and integral part of the effects animator’s workflow.
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Thanks

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Lawrence Chai, Software Engineer
Questions?