



Point Based Global Illumination

An introduction [Christensen, 2010]

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Introduction to PBGI

*The following introduction is based on the SIGGRAPH presentation of
[Christensen, 2010]*



What is PBGI?

A two pass method to achieve Global Illumination.

- ① Generating a direct illumination point cloud.
[Christensen, 2010] assumes that all surfaces are diffuse!
- ② Calculating the Global illumination using the point cloud.



Pointcloud?

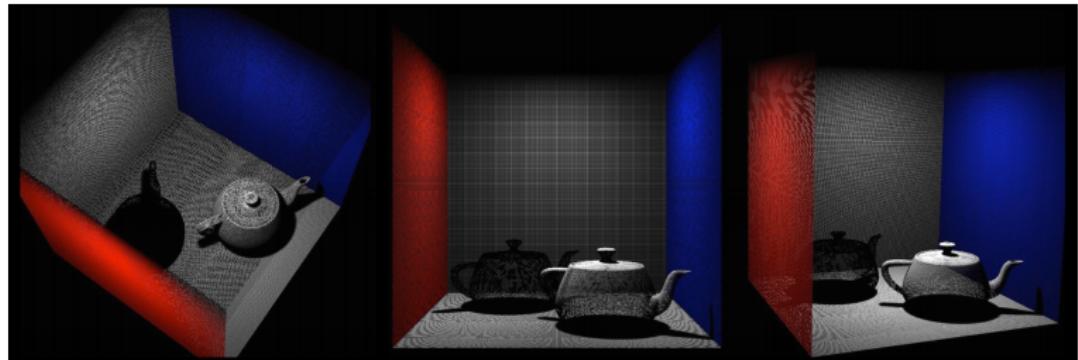


Figure: Point cloud from Cornell Box [Christensen, 2010], property of Pixar Inc.®



fill lights



Figure: Point cloud from "Up" [Christensen, 2010], property of Pixar Inc.®

Calculating Global Illumination

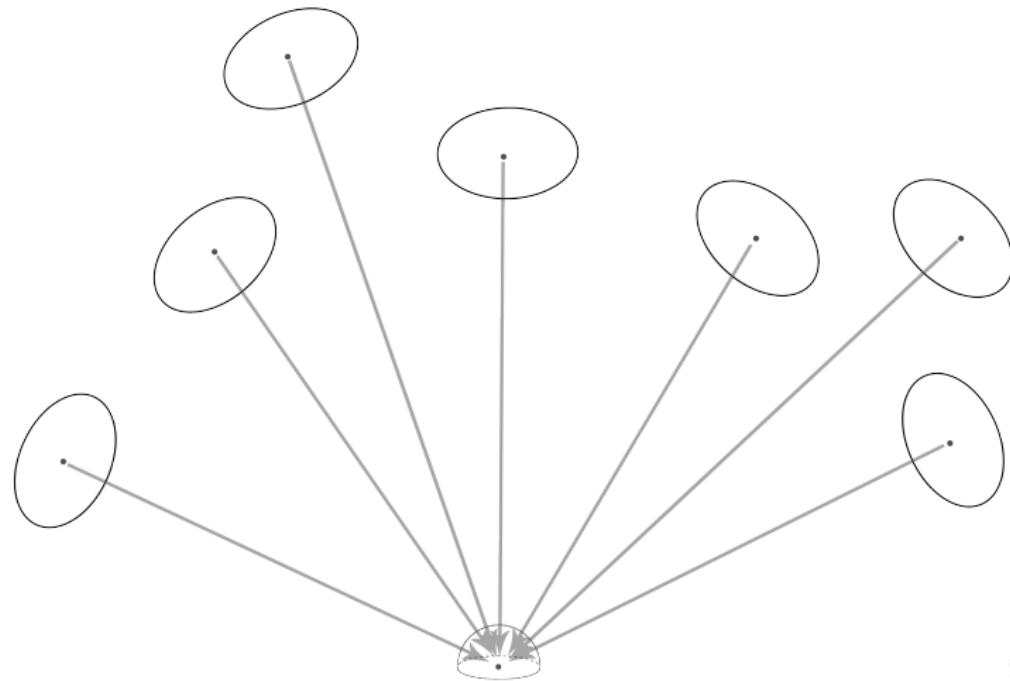


Figure: Point Based Global Illumination

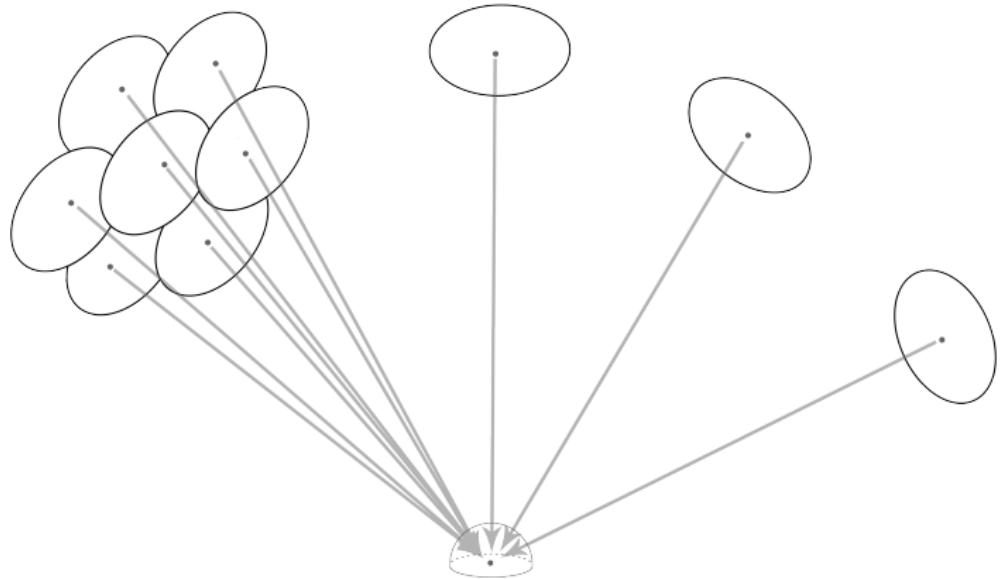


Figure: Clustering pointcloud in octree



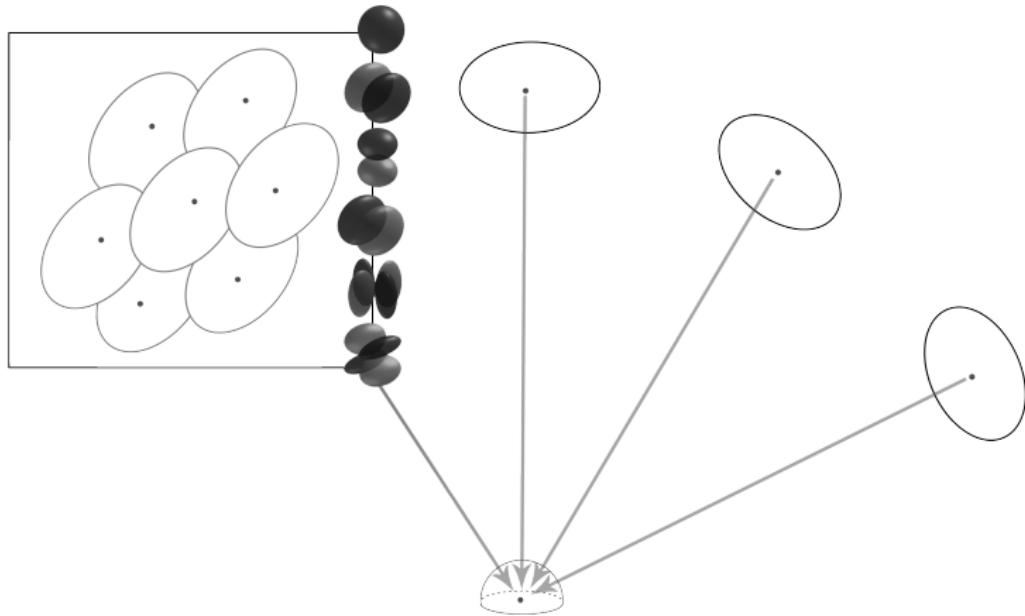


Figure: Approximate nodes in octree as a new surphel or spherical hormonical



Approximated Global Illumination

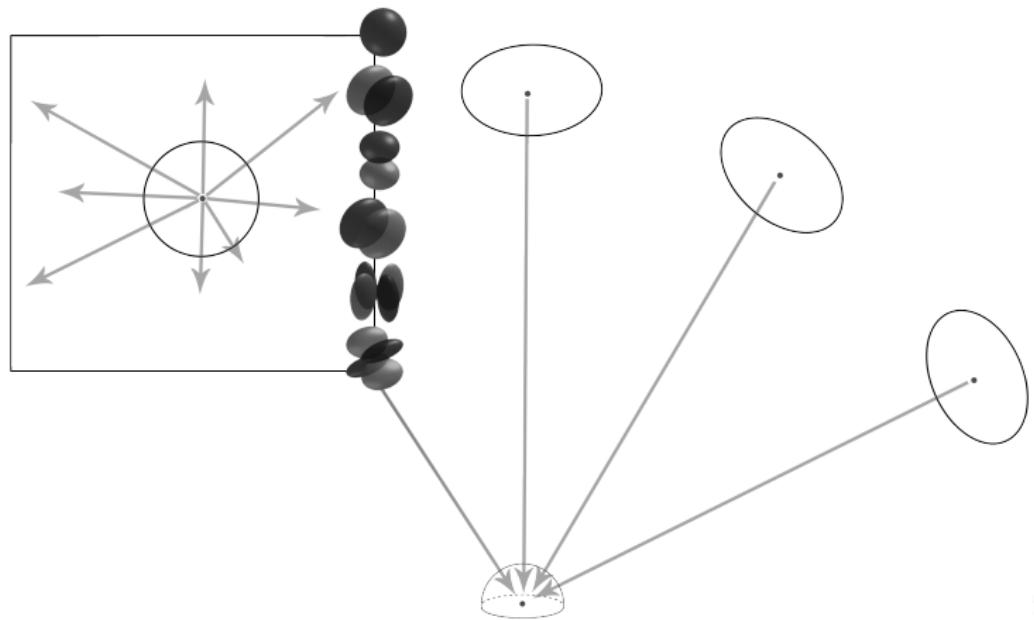


Figure: Approximate nodes in octree as a new surphel or spherical hormonical

Approximated Global Illumination

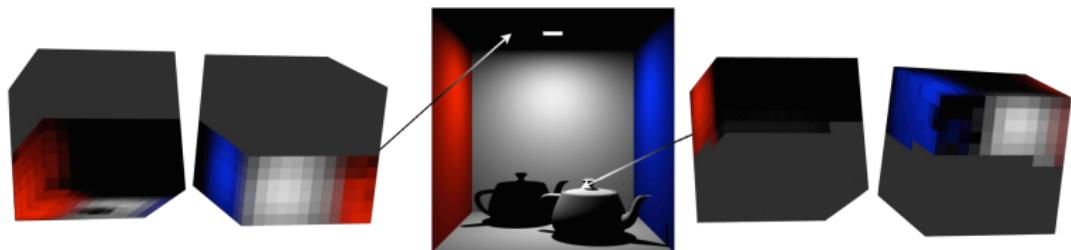


Figure: Using microbuffers instead of hemispheres
[Christensen, 2010], property of Pixar Inc.®



Approximated Global Illumination

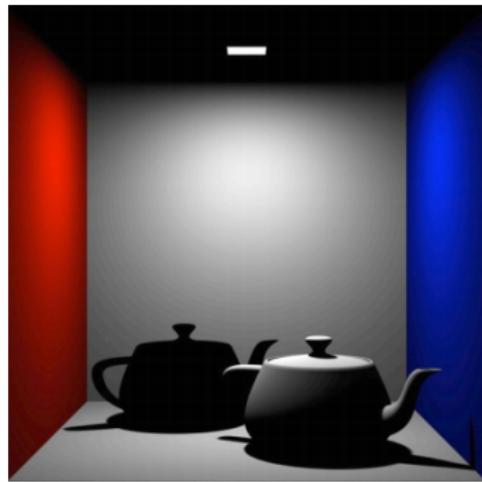


Figure: DI (9s) vs GI (21s)
[Christensen, 2010], property of Pixar Inc.®



Multiple bounces?

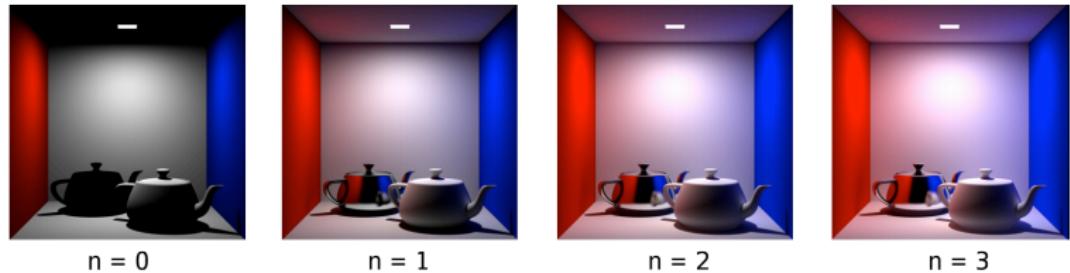


Figure: Multiple light bounces
[Christensen, 2010], property of Pixar Inc.®



Applications

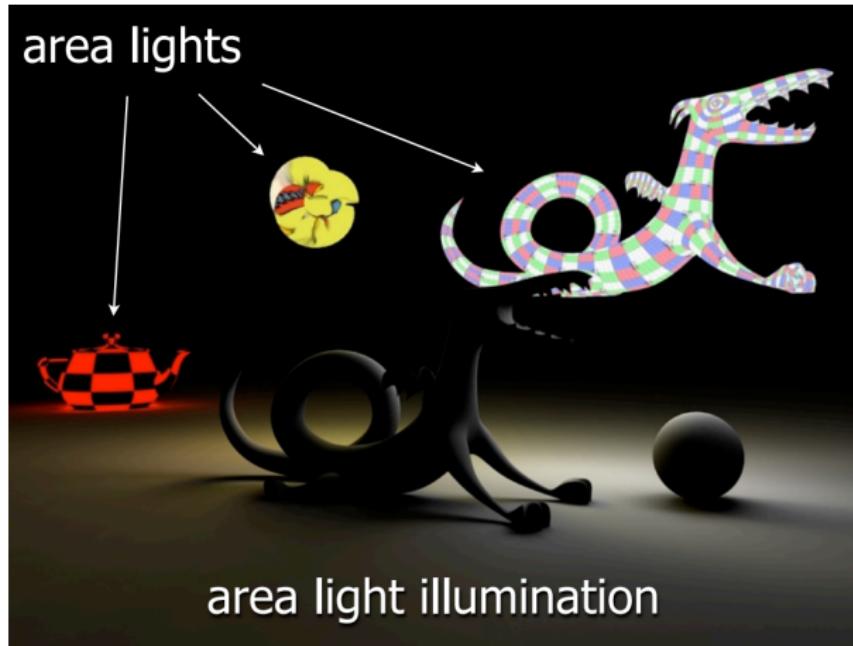


Figure: Simulating area lights
[Christensen, 2010], property of Pixar Inc.®





Figure: [Christensen, 2010], property of Pixar Inc.®



Figure: [Christensen, 2010], property of Pixar Inc.®



Figure: Direct Illumination, [Christensen, 2010], property of Pixar Inc.®



Figure: Global Illumination, [Christensen, 2010], property of Pixar Inc.®

What are the benefits?

- Fast
- Relative Low memory
- No noise! (Movie production++)
- Handles complex geometry (hair, explosions, displacements, ...)



Questions?



References

Per H. Christensen. Point-based global illumination for movie production, August 2010. URL
<http://graphics.pixar.com/library/PointBasedGlobalIlluminationForMovieProduction/Slides.pdf>.

